Remember that the pesticide label is the legal document on pesticide use. Read the label and follow all instructions closely. The use of a pesticide in a manner not consistent with the label can lead to the injury of crops, humans, animals and the environment. The use of a pesticide inconsistent with the label directions can also lead to civil or criminal fines and/or condemnation of the crop. Pesticides are good management tools for the control of pests on crops, but only when they are used in a safe, effective and prudent manner according to the label.

These recommendations are not intended to replace the specific product labels. Always read and follow label instructions carefully.

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Insect, Disease and Nematode Control for Commercial Vegetables

By George Bird, Mary Hausbeck, Lynnae J. Jess, William Kirk, Zsofia Szendrei, and Fred Warner *

This MSU Extension bulletin was prepared to help commercial vegetable producers make informed decisions on pest management.

How to Use This Bulletin

Recommendations are organized into sections by crop. Within a crop, specific pests are listed along with their control recommendations. Frequent users may want to insert tabs for easy location of each crop section.

This publication focuses on chemical tactics and should be used in conjunction with an overall sound program of integrated pest management. Chemical recommendations are included for insect, disease and nematode control, as well as handling pesticides safely to prevent human and environmental harm. The management suggestions in this bulletin are designed to help protect the grower’s crop from the pre-plant stage to market and, in certain cases, through storage.

The suggestions include the basic information necessary for the chemical components of pest control. The majority of the suggested materials have been tested at Michigan State University to determine the most effective materials, rates of application, timing of applications, method of application and site of application on the plant or in the soil. When this information is coupled with week-to-week information on pest populations, as disseminated in Crop Advisory Teams (CAT) Alerts, the minimum number of chemicals and treatments need be applied to attain the desired level of control.

It is extremely important that growers monitor (scout) each individual field for potential pest problems. Pest populations (insects, nematodes, and diseases) vary not only from year to year, but also from field to field and even within a given field. Pest populations vary in first appearance, number of individuals and severity of damage. These observations are the prime responsibility of the grower.

Growers should make them known to county and university Extension personnel. Through this type of twoway communication, Michigan agriculture will remain in the forefront in quality and quantity.

A grower’s choice of a particular pesticide should be based on pests present, beneficial insects present (including honeybees and predators and parasites of pests), available materials, days to harvest, environmental and personal safety and cost.

Materials and rates of application listed on pages 22-123 are based on the latest information available at the time this publication went to press. Materials marked with an asterisk (*) are particularly recommended for problem infestations.

Recommendations are changed as products are removed from the market, new products are introduced, new uses are found for old products, or new restrictions are placed on their use.

Your county MSU Extension agent is informed of the changes as they occur through Crop Advisory Team (CAT) Alerts or the MSU Extension computer network. Recommendations may be updated in the on-line version of this bulletin (see Useful Websites). Check with your Extension agent for updates that have occurred since the publication of this bulletin. Always read and follow the directions and limitations on the pesticide label.

The information given here is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by MSU Extension is implied.

Some of the more hazardous pesticides are on the Restricted Use Pesticide (RUP) list. You will need to be certified by the Michigan Department of Agriculture in order to buy and use these RUP’s. Your county Extension agent has a current listing of the RUP’s and will advise you on the procedures for certification.

Safety Tips and Special Warnings

Your county agricultural agent can supply information on the dangers of environmental and personal safety with insecticides, fungicides and nematicides. You can get help for insecticide, fungicide and nematicide poison cases by telephoning the nearest Poison Control Center (see back cover). A list of insecticides and nematicides and their relative toxicities (LD50) is given on the following pages. The potential to leach into the groundwater or runoff into surface waters is given for both insecticides and fungicides.

Phosphate Insecticides. The phosphate group includes Imidan, Guthion and other similar materials. Many of these are extremely dangerous to users at the time of application. Read the label on the container for instructions for safe use. If any insecticide cannot be used according to those directions, do not use it at all.

Note to Aerial Applicators. Pilots and loading crews should know the dangers of applying methyl parathion and other hazardous insecticides. Take special care to avoid skin, respiratory and oral absorption.

- Always read the label before buying or using pesticides. Use pesticides only for the purpose(s) listed and in the manner directed.
- Pesticides that require special protective clothing or equipment should be used only by trained, experienced applicators.

* The authors are Extension specialists in Entomology, Plant Pathology, and Nematology; Lynnae is in the Pesticide Education Program.
• Do not apply more than the specified amount of pesticides; overdoses can harm you, the consumers and the environment.
• Keep pesticides away from food and dishes.
• Keep children and pets away from pesticides and sprayed areas.
• Do not smoke or eat while applying pesticides.
• Avoid inhaling pesticides.
• Never spray on a windy day.
• When mixing pesticides, use care to avoid splashing.
• Avoid breaking or spilling pesticide containers.
• Avoid contact with skin and clothing.
• If you spill a pesticide on your skin, wash with detergent and water. If spilled on clothing, change clothing immediately.
• Store pesticides in their original containers with proper labels in a locked storage area. Never transfer a pesticide to a container that would attract children, such as a soft drink bottle.
• Dispose of empty containers safely. Triple rinse (or equivalent) containers and offer for recycling or dispose of in a licensed sanitary landfill. Refer to your dealer for directions for disposal of specific containers.
• Wash with soap and water after using pesticides and launder clothes separately before wearing again.
• Getting any pesticide into the eyes or mouth can be especially serious. Read and understand first aid instructions listed on the label BEFORE you use the pesticide. Follow instructions explicitly. Flush eyes or mouth with water as soon as possible after exposure. Do not induce vomiting unless it is specified on the label. See a doctor immediately if there is any chance of poisoning. Take the pesticide container or label with you so that the doctor can read the “Instructions to the Physician” that are included on the label. Many labels carry the telephone number of a 24-hour emergency service offered by the pesticide company. Call this number for authoritative advice on diagnosis and treatment. Your physician can use this service if needed. The physician can also receive advice, when needed, by calling the nearest Poison Treatment Center listed on the back cover.

Pesticide Emergency Preparedness

At the time that the pesticide is purchased, ask the chemical dealer for a complete specimen label and Material Safety Data Sheet (MSDS are required for farms with employees) of the product you bought. This label and labeling information packet is an exact duplicate of the label information that is affixed to and must accompany the pesticide container. Use the specimen label material as a reference during any pesticide emergency. Bring the label along with any person who has become poisoned and needs medical attention.

Closely follow all the warning statements outlined in the Precautionary Statements section of the pesticide label. Be certain that you use all protective clothing and equipment as specified by the label. Make certain all persons involved in the operation of the farm know and can carry out the information in the Statement of Practical Treatment. (See also the section on SARA Title III.)

You can develop an emergency farm plan that will prepare you and your employees for pesticide and other farm emergencies, by completing the form in Extension Bulletin E-2575.

Pesticide Registration

Recommendations in this bulletin are based on field trials conducted in Michigan and other North Central Region states over a period of several years. All pesticides must be currently registered with the U.S. Environmental Protection Agency (E.P.A.) and the Michigan Department of Agriculture before they can be used legally in Michigan.

The pesticide label is a legal document on pesticide use. Read the label carefully and follow all instructions closely. Use of any pesticide in a manner not consistent with the label can lead to civil or criminal punishment and/or condemnation of the illegally sprayed crop. Do not mix and apply together any pesticides and fertilizers if it is forbidden on either product label.

Pesticide Tolerances (Residues) on Vegetable Crops

Tolerances are established by the E.P.A. for every pesticide registered in the United States. These tolerances are the maximum allowable residues in parts per million (ppm) of a pesticide that may be on or in a specified crop at the time of harvest. If residues of a pesticide on a crop exceed the tolerance established for that pesticide, that crop may be seized and destroyed.

To keep below the tolerance levels established for a pesticide, apply only the formulated amount of pesticide per acre as instructed by the product label. Do not exceed this restriction. Also, to meet the label-required pre-harvest interval, discontinue the use of pesticides the number of days before harvest that the label specifies. Always remember the following restrictions on the use of all pesticides: 1) The legal amount of active material per acre that can be applied during a given growing season; and 2) The number of days before harvest that chemical application on a crop must be discontinued.

Use of Pesticides for Pests Not on Label

The law regulating pesticides in the United States is the Federal Insecticide, Fungicide and Rodenticide Act, or FIFRA. FIFRA is administered by the Environmental Protection Agency (EPA) and in Michigan by the Michigan Department of Agriculture (MDA). FIFRA governs the registration, distribution, sale and use of all pesticides. Within FIFRA there exists a provision that allows the use of a pesticide for a pest not noted on the label as long as the application is made to a crop specified on the label. This provision is referred to as 2(ee). All rates and restrictions, including preharvest intervals, for the labeled crop must be followed. Please note, however, that the manufacturer will not assume responsibility for product performance so 2(ee) applications are made at the grower’s risk. For more information about 2(ee) applications, contact your local MSU Extension or Michigan Department of Agriculture office.

Record Keeping

The 1990 Farm Bill requires that all applicators who apply restricted use pesticides (RUP) keep records and maintain them for two years. Records to be kept include:

- brand name or product name and the EPA registration number,
- total amount of the product used,
- size of the area treated,
crop, commodity, stored product or site to which the pesticide was applied,
location of the application,
month, day and year of the application,
name and certification number of the applicator or applicator's supervisor.

Any record form is acceptable as long as the required data is included. Penalties are up to $500 for the first violation and up to $1,000 for subsequent violations. Provisions for protecting the identity of the individual producers are included in the law. Commercial applicators must furnish a copy of the required records to the customer of the RUP application.

Agricultural Chemical Use Precautions

The use of any pesticide, especially a restricted-use-pesticide (RUP), entails a significant amount of responsibility and liability on the part of the grower. Therefore, handle all pesticides with extreme caution and respect for the following reasons:

- to protect yourself and others.
- to protect your crop and soil from chemical damage.
- to protect the environment from chemical damage.

These points cannot be emphasized enough. Pesticide accidents occur most often during mixing and tank filling operations. Although accidental ingestion of chemicals is considered to be the greatest health hazard, there is also great danger of poisoning when pesticides contact skin or eyes or when dust or vapors are inhaled. To prevent such accidents, wear protective clothing at all times when handling and applying pesticides and cleaning spray equipment. Such mandatory garments include chemical resistant gloves and boots, splash-guard goggles and a respirator manufactured specifically for the type of chemical compound that is being used. Care for these items as you would your farm implements. They may save your life in case of an accident. Always heed all the precautionary statements on the product label and cover-up to protect yourself. (See MSU Extension Bullets E-1546, Take Cover! Protect Yourself from Exposure, E-2215, Using Pesticides Safely: A Guide for the Applicator; NC-204, Protective Clothing for Handling Pesticides, and AM-106, EPA Chemical Resistance Category Chart, for more information.)

Protecting yourself during any application of an agricultural chemical is required. Give the same consideration to any field worker(s) you may employ. Farm workers assisting in the application of any pesticide should also wear protective clothing, as specified by the product label.

Protect your crops and land by applying any pesticide at the label directed rate and under favorable environmental conditions. To do otherwise may be a violation of the label and could cause damage to the crop and carry over in the soil. Excessive pesticide residues in the soil may also leach into surface and groundwater. Overdosing will also increase residues on the crop and the number of days before the crop can be harvested legally. To avoid any pesticide damage and/or illegal residues on crops and in the soil, follow the recommended rates of application and use properly calibrated implements.

Pesticide drift from aerial and ground application is a serious problem. Drift can be a particular problem if houses, schools or urban areas are nearby. Drift can also contaminate sensitive crops and the environment (crop land and surface water). Avoid pesticide drift from all pesticides. Because few chemicals are allowed on forage for all types of livestock, exercise extreme caution when using any pesticides to avoid contaminating hay, pasture and stover. Where problems with pesticide drift exist, use the least hazardous materials with additives labeled to reduce spray drift. These additives add elasticity to spray suspensions to reduce the shearing effect (break up of spray stream) caused by spray dispensing equipment and air movement.

SARA Title III Emergency Planning and Community Right to Know Act

The Emergency Planning and Community Right to Know Law, under SARA Title III, requires farmers to notify their State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC), and local fire department that they store extremely hazardous materials, along with the name and telephone number of the facility representative. Check with your state Department of Natural Resources or MSU Extension to receive a list of EPA established “Extremely Hazardous Substances” and their threshold planning quantities.

The LEPC and fire chief may request maps of your storage facility and detailed lists of materials you store.

This law also requires that, in the event of a spill, the SERC, LEPC and National Response Commission be notified. The reportable quantities for spills is much less than for storage and can be obtained from the above sources. See Extension Bulletin E-2575 for more details on SARA Title III and a list of commonly used extremely hazardous substances.

Worker Protection Standard

New federal rules for farm worker protection, issued during 1992, require farmers to provide additional training and notification to farm workers to prevent accidental or occupational exposure to pesticides. Farmers should contact Extension agents to learn the details of this standard and availability of training materials for education of workers and handlers.

Read and follow the label instructions on Restricted Entry Intervals (REI) for every pesticide used. Some pesticide labels require both oral warning and posted signs to notify workers of pesticide applications. If the label doesn’t require both forms of notification, notify workers either orally or by posting warning signs at entrances to treated areas. (Greenhouses must post warning signs for every application.) When using posted signs, post 24 hours or less before the pesticide application and remove signs within three days after the end of the restricted entry interval. Keep workers out during the entire time the signs are posted (except for early-entry workers wearing the proper personal protective equipment).

Michigan Groundwater Stewardship Program (MGSP)

The Michigan Groundwater Stewardship Program is a cooperative effort between the Michigan Department of Agriculture (MDA), Michigan State University Extension, Conservation Districts, and the USDA Natural Resources Conservation Service. The program is funded through fees assessed on sales of pesticides and nitrogen fertilizers. MGSP-sponsored education, technical assistance and cost share help individuals reduce the risk of groundwater contamination associated with pesticide and nitrogen fertilizer use.

Producers who complete the environmental risk assessments for their farmstead and cropping systems (Farm*A*Syst and
Crop*A*Syst) will be able to determine what structural, management and record-keeping changes (if any) will be needed for their farming systems to be in conformance with Michigan Right to Farm guidelines and state and federal environmental laws.

Once a producer develops and implements a plan to address the risks indicated by the environmental assessments, he or she can contact the MDA to request farming system verification under the Michigan Agriculture Environmental Assurance Program (MAEAP). MAEAP-verified farms are eligible for various incentives.

Protect Nontarget Organisms

Bees and other pollinating insects are essential for successful production of tree fruits, small fruits, most seed crops and certain vegetables. Many insecticides are highly toxic to pollinating honeybees and wild bees. Be aware of how bee poisonings can occur from applying pesticides and how to prevent them. Take the following precautions to reduce the chance of bee poisoning:

- Do not apply pesticides that are toxic to bees if the site contains a crop or weeds which are in bloom. This applies not only to the fruit bloom but also to dandelions and clovers that may be reached by the spray. Mow cover crops and weeds to remove the blooms prior to spraying.
- Select pesticides that are least harmful to bees and select the safest formulation. Dusts are more hazardous to bees than sprays. Wettable powders and microencapsulated products are more hazardous than emulsifiable concentrates or water soluble formulations because particulate pesticide material may be carried back to the hive. Granular insecticide formulations are generally the least hazardous to bees.
- Reduce drift during application. Use drift control materials whenever possible.
- Time pesticide applications carefully. Evening applications are less hazardous than early morning; both are safer than midday applications.
- Do not let puddles of spray accumulate on the ground where bees might drink it. Supplying fresh water near bee’s hives can reduce this hazard.
- Do not treat near hives. Bees may need to be moved or covered before using insecticides near colonies.

The best way to avoid injury of beneficial insects and microorganisms is to minimize pesticide usage. Use selective pesticides when ever possible and apply only when necessary as part of a total pest management program.

Pesticides can be harmful to all kinds of vertebrates such as fish and wildlife. Most recognizable are the direct effects from acute poisoning. Fish kills can result from water polluted by a pesticide (usually insecticides). Pesticides can enter water via drift, surface runoff, soil erosion, and leaching.

Bird kills from pesticides can occur when birds ingest the toxicant in granules, baits, or treated seed; are exposed directly to the spray; consume a treated crop; drink and use contaminated water; or feed on pesticide-contaminated prey.

Endangered Species Act

To minimize the adverse impact of pesticides on endangered species, the EPA has initiated The Endangered Species Act.

Every implicated pesticide will have an endangered species warning statement regarding use of the product within the geographic area where endangered species restrictions apply. Users must obtain a county-specific endangered species bulletin from the local Extension office, which will identify the specific area where use restrictions apply. Application of listed pesticides in the identified geographic areas in that county will be restricted or prohibited.

Right to Farm

Farmers in Michigan are protected from nuisance lawsuits under the Right to Farm Act if they follow acceptable management practices. The Generally Accepted Agricultural and Management Practices for pesticide utilization and pest control, nutrient utilization, and manure management have been completed and are revised annually. Contact your Extension agent or regional office of the Michigan Department of Agriculture to obtain copies.

Pesticide Name

The insecticide trade name (first letter capitalized; Lorsban, for example) is used when an insecticide is sold under only one well known brand name. The accepted common name of an insecticide is used when it is sold under several brand names, with some trade names are shown on the following line(s). The fungicide and nematicide trade names are listed underneath the chemical formulation name.

Pesticide Formulations

Fungicides, insecticides and nematicides can be purchased in a variety of formulations. Not only is it important that a grower purchase the correct pesticide for the intended pest control (i.e., pesticide product labeled for both the crop and the pest), but also that the grower chooses the formulation best suited for the particular job. Such a decision should be based on the pesticide product’s effectiveness, cost, practicality and relative safety to the applicator, the crop and the environment. The following are some additional considerations worth remembering when choosing a specific formulation:

- Some formulations require constant spray tank agitation; others do not.
- Dusts and granules do not require water for application, but accurate calibration of equipment and uniform distribution are often difficult to achieve and maintain.
- The potential hazard to the applicator and the potential of drift and environmental contamination vary substantially among formulations.
- Dry formulations are generally less affected by subfreezing temperatures during storage than liquid formulations.
- Some crops may be treated with any formulation of a particular pesticide; others require using a specific formulation.
- The price per pound of active ingredient varies for different formulations.

Also remember that for two products with the same active ingredient but different formulation, the application rate to be used on a specific site and pest may be different. Always read and follow the label instructions carefully.
Restrictions
The pre-harvest interval, the minimum number of days required between last application and harvest or other use of the crop, is listed. Special limits on the use of the pesticide are also given when they apply. Follow these restrictions exactly to avoid possible deleterious residues on the crop at harvest. Pesticides that are relatively safe around honeybees are also noted when pertinent.

Compatibility
When two or more chemicals are mixed together in a spray tank, they may or may not mix well, or the mixture may cause injury to germinating seeds or plants. This relationship is called compatibility. The lack of compatibility could affect the application and effective ness of the chemical spray.

It is usually not advisable to mix different formulations such as wettable powders and emulsifiable concentrates together in a spray tank. This is especially important if other materials, such as foliar nutrients, are included in the spray and applied in low gallonage per acre. Always be sure to read and follow the directions and limitations on the pesticide label before mixing.

Pesticide Additives
During the development of a pesticide, chemical companies attempt to formulate the active ingredient to optimize performance, mixing and handling under diverse conditions. Every commercially available pesticide formulation contains its own particular set of additives to accomplish this action. However, sometimes additional additives are required for specific applications or when compatibility or mixing problems occur. The pesticide label will describe the need and use of these additives. Avoid indiscriminate use of additives because they may not improve pesticide performance and may actually reduce pest control or cause crop injury.

The following are some definitions of pesticide spray additives. For more information on types of spray additives and when to use them with herbicides, see MSU Extension Bulletin E-1858, Using Spray Additives with Herbicides.

- Adjuvant—any substance that enhances pesticide effectiveness, an added ingredient.
- Surfactant—a surface active material that can facilitate emulsifying, dispersing, spreading, wetting, sticking or other surface-modifying characteristics of a pesticide solution.
- Emulsifier — an agent that promotes the dispersion of one liquid in another.
- Wetting Agent Spreader— an ingredient that reduces water surface tension causing better contact between the spray solution and treated surfaces.
- Soap—sodium or potassium salts of fatty acids. These additives can form insoluble materials in hard water. Detergents are synthetic materials used for cleaning.
- Sticker—a deposit builder that increases pesticide adhesion to plant surfaces.
- Defoaming Agent—reduces or eliminates foaming in the spray tank.
- Drift Control Agent—an agent that prevents the formation of very fine spray droplets that are especially subject to drift; improves coverage.

- Compatibility Agent or Co-solvent — an inert ingredient that may aid in the dispersion of otherwise incompatible mixtures.

Pesticides are applied in a number of ways, so adding and using an additive is up to the applicator. Sometimes, additives are only required for pest control treatments made during adverse climatic conditions. In other cases, the nature of the pesticide may require adding an additive to the spray mixture rather than the formulation. The pesticide label always gives directions for the use of additives, if they are required.

Soil Type Considerations
Soil texture (sand, silt, clay) and organic matter content influence the effectiveness of soil-applied pesticides. In general, lower rates of pesticides are required on sandy (coarse-textured) soils than on clays or soils with high organic matter content (fine-textured) to obtain the same level of control. Pesticide rate recommendations in this bulletin are given for medium-textured soils with greater than 3 per cent organic matter content, unless otherwise noted. Clay and organic matter absorb pesticides, making them less available to kill soil-borne pests. Soils with high clay and organic matter content require greater pesticide rates for adequate pest control. Sandy soils with low organic matter content require careful pesticide rate selection to avoid crop injury.

Poor application of soil insecticides, such as plowing or drilling the insecticides deeper than about 4 inches, or using niedressings when broadcast treatments are best, reduces the value of pesticide treatments. Do not expect the impossible in your efforts to control soil-borne pests. As with foliar sprays, materials need to be carefully applied to achieve maximum effectiveness.

Pesticides and the Environment
Many people obtain their drinking water from wells. Well water is groundwater. Groundwater is stored in water-bearing geological formations called aquifers. It moves through aquifers and is obtained at springs, streams, or wells.

The upper level of the saturated zone in the soil is called the water table. The water table depth fluctuates, depending on the amount of water removed from the ground and the amount of water added by recharge.

Both surface water and groundwater are subject to contamination by point and non point source pollution. Point source contamination refers to movement of a pesticide into water from a specific site. Nonpoint source contamination generally results from land runoff, precipitation, acid rain, or percolation rather than from discharge at a single location.

Several factors influence the fate of pesticides in groundwater. Adsorption is the binding of chemicals to soil particles. The amount and persistence of pesticide adsorption varies with pesticide properties, soil moisture, soil pH, and soil texture. Soils high in organic matter or clay are the most adsorptive; coarse, sandy soils are much less adsorptive.

A soil-adsorbed pesticide is less likely to volatilize, leach or be degraded by microorganisms. It is also less available for absorption by plants. Therefore, pesticides used on highly adsorptive soils may require higher rates or more frequent applications to compensate for soil adsorption.

Volatilization occurs when a solid or liquid turns into a gas. A pesticide in a gaseous state can be carried away from the treated
area by air currents. This is called vapor drift. Unlike the drift of sprays and dusts that can sometimes be seen during application, vapor drift is invisible.

Avoid applying volatile pesticides when conditions favor volatilization, such as temperature inversions. Pesticide labels usually mention the potential for volatility of pesticides. Volatilization can sometimes be reduced through the use of low volatile formulations or soil incorporation of the pesticide.

**Photodegradation** is the breakdown of pesticides by the sunlight. Pesticides applied to foliage or the soil surface may be broken down by exposure to light. Soil incorporation can reduce pesticide exposure to sunlight.

**Microbial degradation** occurs when microorganisms such as fungi and bacteria use a pesticide as a food source. It can be rapid and thorough under favorable soil conditions, including warm temperatures, favorable pH levels, adequate soil moisture, oxygen and fertility. The amount of adsorption also influences microbial degradation. Adsorbed pesticides are more slowly degraded because they are less available to some microorganisms.

**Chemical degradation** is the breakdown of a pesticide by soil processes not involving a living organism. Adsorption of the pesticides, soil pH, soil temperature and moisture influence the rate of degradation. Some pesticides are more rapidly degraded on low pH soils.

**Absorption** is the process by which plants and microorganisms take up chemicals. It is another process that can transfer pesticides in the environment. Once absorbed, most pesticides are degraded within plants. Residues may persist inside the plant or be released back into the environment as the plant decays.

**Runoff** moves pesticides in surface water, either mixed in the water or bound to soil particles. The amount of pesticide runoff depends on the grade or slope of the field, the type of soil, the amount of rainfall, (especially close to the time of application), and properties of the pesticide. For example, a pesticide applied to a saturated clay soil is highly susceptible to runoff. Established vegetation or plant residues reduce runoff.

Pesticide runoff is greatest when heavy rainfall occurs shortly after application. No-tillage, minimum-tillage, and soil incorporation reduce runoff. Surface grading, drainage ditches and dikes, and the use of border vegetation can help reduce pesticide movement into surface water.

**Leaching** is the movement of pesticides through the soil into groundwater. Several factors influence leaching including water solubility of the pesticide, soil structure and texture, and persistence of pesticide adsorption to soil particles. If a pesticide is strongly adsorbed to soil particles, it is less likely to leach, regardless of its solubility, unless the soil particles themselves move with the water flow.

**Keeping Pesticides Out of Groundwater and Surface Water**

It is very difficult to purify or clean contaminated groundwater or surface water. Management practices can be implemented to effectively reduce pesticide runoff and leaching and protect groundwater and surface water.

Use integrated crop management programs —Minimize pesticide use by combining chemical control with other pest management practices such as tillage, cultivation, crop rotation, and pest scouting.

- Reduce compaction—Surface water runoff increases when soils are compacted.
- Rotate crops —Crop rotations may provide more surface crop residue and may reduce the application of the same pesticides to a field.
- Use conservation tillage practices —Include no-till, minimum till, cover crops, grass waterways and buffer strips.
- Consider the geology of your area—When planning pesticide applications, be aware of the water table depth and the permeability of the geological layers between the surface soil and groundwater.
- Select pesticides carefully —Choose pesticides with the least potential for leaching into groundwater or for runoff into surface water.
- Transport pesticides safely —Have pesticides delivered directly to your pesticide storage facility to avoid liability and potential accidents and spills in transit whenever possible. DOT shipping rules must be followed for trans porting large quantities of pesticides, including proper placarding of the vehicle, liability insurance, special handling requirements, etc.
- Follow label directions —The label carries crucial information about the proper rate, timing, and placement of the pesticide.
- Calibrate accurately —Equipment should be calibrated carefully and often.
- Measure accurately —Concentrates need to be carefully measured before they are placed into the spray tank. Do not "add a little extra" to ensure the pesticide will do a better job.
- Avoid back-siphoning —The end of the fill hose should remain above the water level in the spray tank at all times to prevent back-siphoning of chemicals into the water supply. Use an anti-backflow device when siphoning water directly from a well, pond, or stream. These practices also reduce the likelihood of the hose becoming contaminated with pesticides.
- Consider weather and irrigation —If you suspect heavy or sustained rain, delay applying pesticides. Control the quantity of irrigation to minimize the potential for pesticide leaching and runoff.
- Avoid spray drift and volatilization —Do not spray when the wind is greater than 10 miles per hour and/or weather conditions (e.g. inversions) are conducive to pesticide drift from the target area. Make every effort to AVOID PESTICIDE DRIFT!
- Clean up spills —Avoid spills. When they do occur, contain and clean them up quickly with an absorbent material like cat litter. Chemicals spilled near wells and sinkholes can move directly and rapidly into ground-water. Chemicals spilled near ditches, streams or lakes can move rapidly into surface water.
- Change the location of mixing areas —Mix and load pesticides on an impervious pad, if possible. If mixing is done in the field, change the location of the mixing area regularly. Do not mix pesticides adjacent to the water source, and do
not let the water run inadvertently on the soil near the mixing area. This will increase pesticide leaching and/or runoff.

- Dispose of wastes and containers properly—All pesticide wastes must be disposed of in accordance with local, state, and federal laws. Pesticide containers are considered hazardous waste until they are cleaned or disposed of properly. When possible, reduce the number of pesticide containers by using bulk or returnable containers.

All pesticide containers can be rendered non-hazardous waste by triple rinsing (or equivalent). The rinsate should be added to the spray tank. After triple rinsing, perforate both ends so the container cannot be reused.

All metal and plastic triple-rinsed containers should be recycled, if possible. If this option is not available, dispose of them in a state licensed sanitary landfill. Dispose of all paper containers in a sanitary landfill or a municipal waste incinerator. Do not bury or burn any pesticide containers. Do not reuse any empty pesticide containers for any purpose.

Store pesticides away from water sources—pesticide storage facilities should be situated away from wells, cisterns, springs, and other water sources. Pesticides must be stored in a facility that will protect them from temperature extremes, high humidity, and direct sun light. The storage facility should be heated, dry and well ventilated. It should be designed for easy containment and cleanup of pesticide spills and made of materials that will not absorb any pesticide material that leaks out of a container. Store only pesticides in such a facility and always store them in their original containers.

Do not store any protective clothing or equipment in the pesticide storage facility. Store pesticides separately from insecticides and fungicides to avoid contamination of one material by another and accidental misuse.

Keep the facility locked at all times when not in use to prevent animals, children, and irresponsible adults from entering and becoming poisoned. Post the facility as a Pesticide Storage Facility to warn others that the area is off limits. Maintain an accurate inventory of the pesticides stored in the facility at all times in case of emergency.

Always read and follow the Storage and Disposal section of pesticide labels for specific storage and handling instructions.

For additional information on pesticide storage, refer to Mid-west Plan Service Bulletin 37, Designing Facilities for Pesticide and Fertilizer Containment, available from Agricultural and Biosystems Engineering Dept., 122 Davidson Hall, Iowa State University, Ames, IA 50011; and MSU Bulletin E-2335 On-Farm Agrichemical Storage and Handling. Your state’s water resources currently provide a vast supply of clean water for agriculture, homes, and industry. They can ensure high water quality for future needs only if they are protected now. Be sure to understand how your activities, including pesticide usage, can affect them.

Handling and Mixing Pesticides

Always wear protective clothing and equipment when handling, mixing, and applying pesticides and during the cleanup of application equipment. Protective clothing should include full coverage clothing, chemical resistant gloves and boots, eye protection, hard hat, and a MSHA/NIOSH approved respirator with a chemical absorbent material as specified on the pesticide label.

Mix pesticides downwind and below eye level. Avoid excessive splashing and sloshing. If pesticides are spilled on you, wash them off immediately with lots of water and change clothing. Resume spraying only after cleaning up any spills. Try to use closed handling/mixing systems when appropriate.

Mix only what is required for the area to be sprayed according to label directions. Avoid mixing excessive amounts. To do otherwise will create a hazardous waste which is difficult and expensive to dispose of. Keep unauthorized persons out of the area in which you handle pesticides.

Application Equipment

Efficient use of application machinery is very important to any pesticide application program. In many cases, improper use of machinery will result in poor pest control. With such occurrences, the grower may blame the efficacy of the pesticide for the failure of the control program when poor coverage is at fault.

Proper equipment and its maintenance are very important for any pesticide control program. Spray equipment should have the following features:

- The equipment should be made of non-corrodible materials.
- A tank with sufficient capacity so that the number of mixing and filling operations are minimized.
- A pump with a capacity of at least 5 gal/minute and pressure up to 100 psi.
- An agitation system from the pressure control to the bottom of the tank.
- A plumbing system with 50-mesh screens in the intake line and at each nozzle.
- A pressure gauge that accurately measures pressures up to 100 psi.
- A spray boom that can be adjusted for distance above application site and nozzle placement along the structure.
- Nozzles of the proper size, arrangement, airstream placement and dispersal pattern.

Pest control on vegetable crops has been applied successfully with standard low-pressure sprayers, air-blast sprayers, aircraft, irrigation systems and soil application equipment. Use the proper implements for the crop and soil situation. In the case of insect and disease control, the location of the pests on the plants determines how the machinery should be adjusted and used. For example, if the pests are on the underside of the leaves, adjust the implement so that the chemical is applied on those areas. A general rule to follow with application implements is that the best control results when the chemical treatments are aimed directly at the pests.

Cleaning and Care of Pesticide Application Equipment

It is important to clean pesticide application equipment, especially if it is used for more than one crop and for applying insecticides, fungicides and herbicides. The need for extensive cleaning can be minimized if one sprayer is only used to apply herbicides and another is used for insecticide and fungicide applications.

When cleaning a sprayer that is used for applying only one type of pesticide, a thorough water rinse is necessary. Rinse the entire sprayer, inside and out, including the boom, hoses and nozzles. Partially fill the spray tank with water and keep the pump run-
Other vegetables are less susceptible than the ones mentioned above but they are still hosts to this species of root-knot nematode.

1. In some cases, fallowing can be used to reduce nematode populations. Fallowed ground must be worked several times to keep it dry and free of weeds. Disturbance of the soil can provide good control of dagger and needle nematodes.

2. Growing monocots will reduce population densities of the northern root-knot nematode but not lesion nematodes. Pearl millet is a poor host for lesion nematodes.

3. Whenever necessary, use an appropriate nematicide. Specific nematicide recommendations for each crop are presented in this bulletin. Information about how to submit soil and root samples for nematode analysis is given in MSU Extension Bulletin E-2199, Detecting and Avoiding Nematode Problems. Use root and soil samples to identify nematode problem sites.

   Use chemical nematicides only when nematode population densities exceed specific nematode-crop action thresholds. The rate of nematicide selected for use should be based, in part, on the nematode type and population density present in a specific production site. The procedure for nematode analysis is presented in Appendix C.

For More Information

For more information on the use of pesticides, see the MSU Extension bulletins available through your local MSU Extension office or the MSU Extension Bookstore at www.shop.msu.edu. A complete listing of available publications is available on the Bookstore website at www.shop.msu.edu (click on MSU Extension Bookstore at the top of the page). To contact the Bookstore by phone, dial (517) 432-1859 or (800) 709-9195 toll free, or email shopmsu@msu.edu.

Useful Web Sites

Order E0312 online
http://shop.msu.edu

Michigan State University IPM Program:
http://www.ipm.msu.edu

Michigan State University Vegetable News and Resources
http://www.msue.msu.edu/topic/info/vegetables

Michigan Department of Agriculture and Rural Development
http://www.michigan.gov/mdard

Insecticide Registration, Product labels and MSDS Sheets:
http://www.cdms.net
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LIST OF INSECTICIDES AND NEMATICIDES USED ON COMMERCIAL VEGETABLES
## LIST OF INSECTICIDES AND NEMATICIDES USED ON COMMERCIAL VEGETABLES

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<th>Registrant</th>
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# LIST OF INSECTICIDES AND NEMATICIDES USED ON COMMERCIAL VEGETABLES

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**LIST OF INSECTICIDES AND NEMATICIDES USED ON COMMERCIAL VEGETABLES**

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<td>Makhtashim-Agan</td>
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1. Re-Entry Interval: SL=See Label. Read and follow the label directions. Post areas or give oral warnings that areas have been treated to warn workers not to enter until the REI has elapsed as required by the label.

2. Insecticide Resistance Action Committee Mode of Action Classification (http://www.irac-online.org/documents/moa-classification/?ext=pdf) or taken from the label

3. The LD50 is a standard toxicological term which indicates the number of milligrams (mg) of pesticide per kilogram (kg) of test animal body weight required to kill 50 percent of a test animal population. Values less than 10 indicate extremely high toxicity to mammals. The LD50 data have been obtained from Material Safety Data Sheets.

4. Leaching / Runoff Potential: 1=high, 2=intermediate, 3=low. These leaching/runoff potential ratings are from the NRCS WIN-PST Pesticide Properties Database at http://go.usa.gov/Kok

* = Restricted Use Pesticide. All or certain formulations of these toxicants have been classified Restricted Use Pesticides.
<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Common Name</th>
<th>EPA Reg No</th>
<th>Registrant</th>
<th>REI 1</th>
<th>LD50s 2</th>
<th>L/R 3</th>
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# LIST OF FUNGICIDES USED ON COMMERCIAL VEGETABLES

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## LIST OF FUNGICIDES USED ON COMMERCIAL VEGETABLES

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<th>Common Name</th>
<th>EPA Reg No</th>
<th>Registrant</th>
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# LIST OF FUNGICIDES USED ON COMMERCIAL VEGETABLES

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<th>Fungicide</th>
<th>Common Name</th>
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<td>Zing!</td>
<td>chlorothalonil / zoaxamide</td>
<td>10163-331</td>
<td>Gowan</td>
<td>12</td>
<td>1750-5000</td>
<td>&gt;5000</td>
<td>3/2</td>
<td>22 &amp; M5</td>
</tr>
<tr>
<td>Ziram 76DF</td>
<td>ziram</td>
<td>70506-173</td>
<td>United Phosphorus</td>
<td>48</td>
<td>1889</td>
<td>&gt;5000</td>
<td>2/3</td>
<td>M3</td>
</tr>
</tbody>
</table>

1. Re-Entry Interval: SL=See Label. Read and follow the label directions. Post areas or give oral warnings that areas have been treated to warn workers not to enter until the REI has elapsed as required by the label.

2. The LD50 is a standard toxicological term which indicates the number of milligrams (mg) of pesticide per kilogram (kg) of test animal body weight required to kill 50 percent of a test animal population. Values less than 10 indicate extremely high toxicity to mammals. The LD50 data have been obtained from Material Safety Data Sheets.

3. Leaching / Runoff Potential: 1=high, 2=intermediate, 3=low. These leaching/runoff potential ratings are from the NRCS WIN-PST Pesticide Properties Database at http://www.nrcs.usda.gov/Kok

4. FRAC codes are from the following website: www.frac.info, or taken from the label.

* = Restricted Use Pesticide. All or certain formulations of these toxicants have been classified as Restricted Use Pesticides.

NA = Not Applicable
### Conversion Equivalents and Abbreviations

#### Measurements
- 1 fluid ounce (fl oz) = 2 tablespoons (Tbsp) = 6 teaspoons
- 1 cup (c) = 8 fluid ounces (fl oz)
- 1 pint (pt) = 16 fluid ounces (fl oz) = 32 tablespoons (Tbsp)
- 1 quart (qt) = 2 pints (pts) = 32 fluid ounces (fl oz)
- 1 gallon (gal) = 4 quarts (qt) = 128 fluid ounces (fl oz)
- 1 pound (lb) = 16 ounces (oz)
- 1 Acre (A) = 43,560 square feet (sq ft) = 17,424 row feet (ft) for 30 in. rows

#### Label Key
- **B** means Bait
- **D** means Dust
- **DF** means Dry Flowable
- **DG** means Dispersable Granule
- **EC** means Emulsifiable Concentrate, or Emulsion
- **F** means Flowable
- **G** means Granule
- **L** or **LC** means Liquid Concentrate
- **LS** means Liquid Solution
- **S** means Sprayable
- **SC** means Suspension Concentrate
- **SP** means Soluble Powder
- **µ** means micro
- **µm** means micrometer
- **W** or **WP** means Wettable Powder
- **RUP** means Restricted Use Pesticide

#### Calculation of Banded Rates
To calculate a banded rate from a given broadcast rate, use the following formula:

\[
\text{Rate/A needed for banded application} = \frac{\text{Band width in inches} \times \text{Broadcast Rate/A}}{\text{Row spacing in inches}}
\]
Asparagus

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

INSECTS

FOLIAR TREATMENT:

CUTWORM: Apply if >5% of crowns are infested.

Carbaryl
- Carbaryl 4L, 1 qt. (spears); 2 qt. (fern) (1 day)
- Sevin 4 F (1 qt. (spears); 2 qt. (fern)) or Sevin 80 S (1.25 to 2.5 lb. (spears); 2.5 to 5 lb. (fern)) or Sevin XLR Plus (1 qt. (spears); 2 qt. (fern)) (1 day)
- Chlorpyrifos
- Chlorpyrifos 4E AG, 2 pt. (1 day) (RUP)
- Govern, 2 pt. (1 day) (RUP)
- Hatchet, 2 pt. (1 day) (RUP)
- Lorsban 4 E / Lorsban Advanced (2 pt.) or Lorsban 75 WG (1.33 lb.) (1 day) (RUP)
- Nufos 4E, 2 pt. (1 day) (RUP)
- Vulcan, 2 pt. (1 day) (RUP)
- Warhawk, 2 pt. (1 day) (RUP)
- Whirlwind, 2 pt. (1 day) (RUP)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Permethrin
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 4 to 8 fl oz. (60 days) Fern Treatment Only.
- Carbaryl 4L, 1 qt. (spears); 2 qt. (fern) (1 day)
- Sevin 4 F (1 qt. (spears); 2 qt. (fern)) or Sevin 80 S (1.25 to 2.5 lb. (spears); 2.5 to 5 lb. (fern)) or Sevin XLR Plus (1 qt. (spears); 2 qt. (fern)) (1 day)
- Spinosad
- Entrust (1.25 to 2 oz.) or Entrust SC (4 to 6 fl oz.) (60 days) Fern treatment only.

ASPARAGUS APHIDS: Apply if >5% of ferns show injury.

Assail 70WP, 2.3 oz/A. (1) Do not make more than 2 applications per growing season
Assail 70WP, 1.1 to 2.3 oz/A. (1)

Chlorpyrifos
- Chlorpyrifos 4E AG, 2 pt. (1 day) (RUP)
- Govern, 2 pt. (1 day) (RUP)
- Hatchet, 2 pt. (1 day) (RUP)
- Lorsban 4 E / Lorsban Advanced (2 pt.) or Lorsban 75 WG (1.33 lb.) (1 day) (RUP)
- Nufos 4E, 2 pt. (1 day) (RUP)
- Vulcan, 2 pt. (1 day) (RUP)
- Warhawk, 2 pt. (1 day) (RUP)
- Whirlwind, 2 pt. (1 day) (RUP)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Permethrin
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 4 to 8 fl oz. (60 days) Fern Treatment Only.
- Carbaryl 4L, 1 qt. (spears); 2 qt. (fern) (1 day)
- Sevin 4 F (1 qt. (spears); 2 qt. (fern)) or Sevin 80 S (1.25 to 2.5 lb. (spears); 2.5 to 5 lb. (fern)) or Sevin XLR Plus (1 qt. (spears); 2 qt. (fern)) (1 day)
- Spinosad
- Entrust (1.25 to 2 oz.) or Entrust SC (4 to 6 fl oz.) (60 days) Fern treatment only.

ASPARAGUS THrips: Apply if >5% of ferns show injury.

Assail 70WP, 2.3 oz/A. (1) Do not make more than 2 applications per growing season
Assail 70WP, 1.1 to 2.3 oz/A. (1)

Chlorpyrifos
- Chlorpyrifos 4E AG, 2 pt. (1 day) (RUP)
- Govern, 2 pt. (1 day) (RUP)
- Hatchet, 2 pt. (1 day) (RUP)
- Lorsban 4 E / Lorsban Advanced (2 pt.) or Lorsban 75 WG (1.33 lb.) (1 day) (RUP)
- Nufos 4E, 2 pt. (1 day) (RUP)
- Vulcan, 2 pt. (1 day) (RUP)
- Warhawk, 2 pt. (1 day) (RUP)
- Whirlwind, 2 pt. (1 day) (RUP)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Permethrin
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 4 to 8 fl oz. (60 days) Fern Treatment Only.
- Carbaryl 4L, 1 qt. (spears); 2 qt. (fern) (1 day)
- Sevin 4 F (1 qt. (spears); 2 qt. (fern)) or Sevin 80 S (1.25 to 2.5 lb. (spears); 2.5 to 5 lb. (fern)) or Sevin XLR Plus (1 qt. (spears); 2 qt. (fern)) (1 day)
- Spinosad
- Entrust (1.25 to 2 oz.) or Entrust SC (4 to 6 fl oz.) (60 days) Fern treatment only.

PLANT BUGS: Apply if >5% of new growth shows tip die-back injury.

Permethrin, Fern treatment only.
- Perm-UP 25DF (6.4 oz.) or Perm-UP 3.2 EC (4 oz.) (1 day) (RUP)
- Pounce 25 WP, 6.4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)

THrips:

Assail 70WP, 2.3 oz/A. (1) Do not make more than 2 applications per growing season

Malathion
- Malathion 57 EC (1.5 to 2 pt.) or Malathion 8 Aquamul (1.25 pt.) (1 day)
- Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Permethrin
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 4 to 8 fl oz. (60 days) Fern Treatment Only.
- Carbaryl 4L, 1 qt. (spears); 2 qt. (fern) (1 day)
- Sevin 4 F (1 qt. (spears); 2 qt. (fern)) or Sevin 80 S (1.25 to 2.5 lb. (spears); 2.5 to 5 lb. (fern)) or Sevin XLR Plus (1 qt. (spears); 2 qt. (fern)) (1 day)
- Spinosad
- Entrust (1.25 to 2 oz.) or Entrust SC (4 to 6 fl oz.) (60 days) Fern treatment only.

ARMYWORM:

Bacillus thuringiensis
- Biobit HP, 0.5 to 2 lb. (0 days)
- DiPel DF, 0.5 to 2 lb. (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- XenTari, 0.5 to 2 lb. (0 days)
Beans, Snap

**FOLIAR TREATMENT:**

- **CROWN SOAK:**
  - Lorsban 4E / Lorsban Advanced (2 pt.) or Lorsban 75 WG (1.33 lb.) (1 day) (RUP)
- **NUFOS 4E:** 2 pt. (1 day) (RUP)
- **Vulcan:** 2 pt. (1 day) (RUP)
- **Warhawk:** 2 pt. (1 day) (RUP)
- **Whirlwind:** 2 pt. (1 day) (RUP)
- **Coragen:** 3 to 5 fl oz. (1 day)
- **Methomyl:**
  - Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
  - Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
  - Pyrenone, 1 to 12 fl oz. (0 days)

**BROWN STINK BUG:**

**JAPANESE BEETLE, TARNISHED PLANT BUG:**

- Assail 70WP, 2.3 oz/A. (1) Do not make more than 2 applications per growing season

**ASPARAGUS MINER:** suppression

- Assail 70WP, 2.3 oz/A. (1) Do not make more than 2 applications per growing season

**LEAFHOPPERS:**

- Assail 70WP, 1.1 to 1.7 oz. (1) Do not make more than 2 applications per growing season

**ASPARAGUS BEETLE, SPOTTED ASPARAGUS BEETLE:**

- Assail 70WP, 1.1 to 2.3 oz/A. (1) Do not make more than 2 applications per growing season

**WHITEFLIES:**

- Movento, 4 to 5 fl oz. (1 day)

**DISEASES**

**PRE-PLANT FUMIGATION:** Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soilborne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

**CROWN NURSERY:**

- Fusarium CROWN ROT, ROOT ROT:
  - 1.3 Dichloropropene/chloropicrin
  - Telone C35, 13-35 gal. (RUP)
- Metam Potassium
- Sectagon-K54, 30-60 gal. (RUP)
- Metam Sodium
- Sectagon 42, 37.5-75 gal. (RUP)

**CROWN SOAK:**

- Fusarium CROWN ROT:
  - Fludioxonil
    - Cannonball, 0.5 oz/100 gal. (180 days)
  - Mancozeb
    - Dithane M-45, 1.0 lb/100 gal. (180 days)
    - Koverall, 1 lb/100 gal.
    - Manzate Max, 0.8 qt/100 gal. (180 days)
    - Penncozeb 75 DF, 1.0 lb/100 gal. (180 days)
    - Penncozeb 80WP, 1.0 lb/100 gal. (180 days)

**FOLIAR TREATMENT:**

**RUST (Puccinia asparagi):** Apply after harvest (fern growth only).

- Tebuconazole

**ORIUS 3.6F, Tebuzol 3.6, 4-6 fl oz. (180 days) Maximum 3 applications per season. Maximum 18 fl oz/acre/season. 12 hr REI.**

**Chlorothalonil:**

- Bravo Ultrex, Equus DF, 1.8 to 3.6 lb. (0 days) Every 14 to 28 days.
- Bravo Weather Stk, Echo 720, Equus 720 SST, 2 to 4 pt. (190 days)
- Echo Zn, 3.0 to 5.75 pts. (190)

**Mancozeb:**

- Dithane DF Rainshield, Dithane M-45, 2 lb. (180 days)
- Dithane F-45 Rainshield, 1.6 qt. (180 days)
- Koverall, 2 lb. (180 days)
- Manzate Max, 1.6 qt. (180 days)
- Manzate Pro-Stick, 2 lb. (180 days) Maximum 8 lb/season.
- Penncozeb 75 DF, 2 lb. (180 days) Maximum 8 lb/season.
- Penncozeb 80WP, 2.0 lb. (180 days)

**Sulfur:**

- Kumulus DF, Thioluox, 10 to 30 lb. (0 days)
- Microthiol Dispers, 10 to 30 lb. (0 days)
- Sulfur DF, 10 to 30 lb. (0 days)

**Note:** Control will be limited under heavy disease pressure.

**PHYTOPHTHORA SPEAR ROT, CROWN ROT:** Apply 30 to 60 days before first cutting, and another application just before harvest in a minimum of 10 gal of water.

**Mefenoxam:**

- Ridomil Gold SL, 1 pt. (1 day)
- Ultra Flourish, 2 pt. (1 day)
- Mono-, dibasic sodium salts of phosphorous acid
  - Fosphite, 1 to 3 qt per 20 gal (ground) or 10 gal (aerial) of water. (0 days)
- Mono-, dibasic sodium, potassium and ammonium phosphites
  - Phostrol, 2.5 to 5 pt. (0 days) Apply to full fern.
  - Prophyt, 2 to 4 pt. (0 days)

**PURPLE SPOT ( Stemphylium vesicarium):**

- Chlorothalonil
  - Bravo Ultrex, Equus DF, 1.8 to 3.6 lb. (190 days) Every 14 to 28 days.
  - Bravo Weather Stk, Echo 720, Equus 720 SST, 2 to 4 pt. (190 days)
- Trifloxystrobin
  - Flint, 3 to 4 oz. (180 days) No more than 12 oz year, rotate with other non-strobilurin products.

**Azoxystrobin:**

- Quadris, 6.0-15.0 fl oz every 7-14 days. (100 days)

**Note:** Products labeled for rust control may be helpful for purple spot control

**Beans, Snap**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.
NEMATODES

SOIL TREATMENT:
- Ethoprop
  - Mocap 15 G, 40 to 54 lb/A. Broadcast from 3 days prior to planting to at-planting time and incorporate to a depth of 4 inches. (RUP)

PLANTING TREATMENT:
- Ethoprop
  - Mocap 15 G, 13 to 20 lb. (36 inch row spacing) In a 12- to 15-inch band over the row. Do not allow spray or granules to contact the seed. (RUP)

INSECTS

SEED TREATMENT:
Treatments are applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions. Handle seed carefully to prevent cracking.
- MEXICAN BEAN BEETLE, APHIDS, SEED CORN MAGGOT, BEAN LEAF BEETLE, LEAFHOPPERS: Early season control.
- Cruiser 5 FS, 1.28 fl oz/100 lb seed.
- SEED CORN MAGGOT: Lorsban 50 W, 2 oz/100 lb seed. (RUP)

PLANTING TREATMENT:
LEAFHOPPERS, APHIDS:
- Imidacloprid
  - Admire Pro, 7 to 10.5 fl oz. (21 days) See label for application method.
  - Nuprid 2 F, 16 to 24 fl oz. (21 days) Apply preplant, in furrow, or as a post-planting drench.
  - Sivanto, 7 - 10.5 fl oz/A.
- CUTWORM:
  - Capture LFR, 3.4 to 6.8 fl oz. (RUP)
  - Diazinon 50 W, 4 to 8 lb. (RUP)
- APHIDS, LEAFHOPPERS, PLANT BUGS, SEEDCORN MAGGOT:
  - Thimet 20 G, 4.5 to 7.0 oz/1000 row ft. (RUP)
- MEXICAN BEAN BEETLE:
  - Thimet 20 G, 4.9 to 9.4 oz/1000 row ft. (RUP)
- SEEDCORN MAGGOT:
  - Bifenthrin
    - Brigade WSB, 8 to 16 oz. (RUP)
    - Capture LFR, 3.4 to 6.8 fl oz. (RUP)
  - Chlorpyrifos
    - Chlorpyrifos 4E AG, . (RUP)
    - Govern, . (RUP)
    - Hatchet, . (RUP)
    - Lorsban 4 E / Lorsban Advanced, Lorsban 75 WG, . (RUP)
  - Nufos 4E, . (RUP)
  - Vulcan, . (RUP)
  - Whirlwind, . (RUP)
- See labels for rates.
- WHITEFLIES:
  - Sivanto, 10.5 - 14 fl oz/A.

FOLIAR TREATMENT:
LEAFHOPPERS: Apply when 5 or more are seen per ft of row (2 ft for seedlings).
  - Lambda-cyhalothrin
    - Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
    - Warrior II with Zeon Technology (1.25 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)
  - Acephate
    - Acephate 90 WDG (0.55 to 1.11 lb.) or Acephate 90 WSP (0.5 to 1.1 lb.) or Acephate 97 (0.5 to 1 lb.) or Acephate 97 UP (0.5 to 1 lb.) (14 days)
    - Bracket 97, 8 to 16 oz. (14 days)
    - Orthene 97, 8 to 16 oz. (14 days)
  - Acetamiprid
    - Assail 30 SG (2.5 to 5.3 oz.) or Assail 70WP (1 to 2.3 oz.) (7 days)
  - Bifenthrin
    - Bifenthrin 10 DF, 4 to 16 oz/A. (3 days)
    - Bifenthrin EC, 1.6 to 6.4 fl oz. (3 days) (RUP)
    - Brigade @ 2EC (1.6 to 6.4 fl oz.) or Brigade WSB (4 to 16 oz.) (3 days) (RUP)
    - Capture 2 EC, 1.6 to 6.4 fl oz. (3 days) (RUP)
    - Discipline 2EC, 1.6 to 6.4 fl oz. (3 days) (RUP)
    - Fanfare 2EC, 1.6 to 6.4 fl oz. (3 days) (RUP)
    - Sniper, 1.6 to 6.4 fl oz. (3 days) (RUP)
    - Tundra EC, 1.6 to 6.4 fl oz. (3 days) (RUP)
  - Bifenthrin + Imidacloprid
    - Brigadier, 3.8 to 5.5 fl oz. (7 days) (RUP)
    - Swager, 7.6 to 11 fl oz. (7 days) (RUP)
  - Bifenthrin + Zeta-Cypermethrin
    - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
    - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - Carbaryl
    - Carbaryl 4L, 1 qt. (3 days)
    - Sevin 4 F, Sevin XLR Plus, 1 qt. (3 days)
  - Dimethoate
    - Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt. (0 days)
  - Esfenvalerate
    - Adjourn, 2.9 to 5.8 fl oz. (3 days) (RUP)
    - Asana XLR, 2.9 to 5.8 fl oz. (3 days) (RUP)
    - S-FenvalStar, 2.9 to 5.8 fl oz. (3 days) (RUP)
  - Note: Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder or hay.
  - Imidacloprid
    - Admire Pro, 1.2 fl oz. (7 days)
    - Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.
  - Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
  - Malathion
    - Malathion 5 (15.6 fl oz - aerial application only) or Malathion 5 EC (2 pt.) or Malathion 8 (1.5 pt.) (7 days for Malathion 5, 1 day for others)
  - Methomyl
    - Lannate LV (0.75 to 3 pt. (1.5 pt. or less, 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.25 to 1 lb. (0.5 lb. or less, 1 day; over 0.5 lb., 3 days)) (RUP)
    - Nudrin LV (0.75 to 3 pt. (1.5 pt or less, 1 day; over 1.5 pt, 3 days)) or Nudrin SP (0.25 to 1 lb. (0.5 lb or less, 1 day; over 0.5 lb, 3 days)) (RUP)
  - Mustang Max, 2.72 to 4 oz. (1 day) (RUP)
  - Proaxis, 2.56 to 3.84 fl oz. (7 days) (RUP)
  - Pyrenone, 1 to 12 fl oz. (0 days)
  - Carbaryl 4L, 1 qt. (3 days)
  - Sevin 4 F, Sevin XLR Plus, 1 qt. (3 days)
  - Sivanto, 7 - 10.5 fl oz/A.
  - Vetica, 13.6 to 17 fl oz/A. (14 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
EUROPEAN CORN BORER: Treat at bud-bloom stage. Use higher rates and/or more frequent application during periods of high adult activity and egg laying.

* Acephate
  - Acephate 90 WDG (0.83 to 1.11 lb.) or Acephate 90 WSP (0.8 to 1.1 lb.) or Acephate 97 (0.75 to 1 lb.) or Acephate 97 UP (0.75 to 1 lb.) (14 days)
  - Bracket 97, 12 to 16 oz. (14 days)
  - Orthene 97, 12 to 16 oz. (14 days)

* Bifenthrin
  - Bifenture 10 DF, 5.3 to 16 oz/A. (3 days)
  - Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Discience 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

Belt SC, 2 to 3 fl oz. (1 day)

Bifenthrin + Imidacloprid
  - Brigadier, 5.5 fl oz. (7 days) (RUP)
  - Swagger, 10.2 to 11 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

Carbaryl
  - Carbaryl 4L, 1 to 1.5 qt. (3 days)
  - Sevin 4 F, Sevin XLR Plus, 1 to 1.5 qt.. (3 days)
  - Coragen, 3.5 to 5 fl oz. (1 day)

Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder, or hay.

Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (7 days)

Javelin WG, 0.12 to 1.5 lb. (0 days)

Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

Malathion
  - Malathion 5 (15.6 fl oz - aerial application only) or Malathion 5 EC (2 pt.) or Malathion 8 (1.5 pt.) (7 days for Malathion 5, 1 day for others)

Mustang Max, 2.72 to 4 oz. (1 day) (RUP)

Proaxis, 2.56 to 3.84 fl oz. (7 days) (RUP)

Pyreneone, 1 to 12 fl oz. (0 days)

Rimon 0.83EC, 9 to 12 fl oz. (1 day)

Carbaryl 4L, 0.5 to 1 qt. (3 days)

Sevin 4 F, Sevin XLR Plus, 0.5 to 1 qt.. (3 days)

CORN EARWORM: Treat from bud stage to 7 days before harvest if significant numbers of adults are being trapped in pheromone traps.

* Acephate
  - Acephate 90 WDG (0.83 to 1.11 lb.) or Acephate 90 WSP (0.8 to 1.1 lb.) or Acephate 97 (0.75 to 1 lb.) or Acephate 97 UP (0.75 to 1 lb.) (14 days)
  - Bracket 97, 12 to 16 oz. (14 days)
  - Orthene 97, 12 to 16 oz. (14 days)

Bifenthrin
  - Bifenture 10 DF, 5.3 to 16 oz/A. (3 days)
  - Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

**Materials marked with an asterisk are particularly recommended for problem infestations.
Beans, Snap

- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

Bifenthrin + Imidacloprid
- Brigadier, 5.5 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 11 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

Carbaryl
- Carbaryl 4L, 0.5 to 1.5 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 0.5 to 1.5 qt.. (3 days)
- Coragen, 3.5 to 6 fl oz. (1 day)

Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

Note: Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder, or hay.

Javelin WG, 0.12 to 1.5 lb. (0 days)

Lambda-cyhalothrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

Methomyl
- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

Mustang Max, 2.72 to 4 oz. (1 day) (RUP)

Proxais, 2.56 to 3.84 fl oz. (7 days) (RUP)

Pyrenone, 1 to 2 oz. (0 days)

Radiant SC, 4 to 8 fl oz. (3 days) Minimum of 4 days between applications; do not apply more than 28 fl oz. per season.

Carbaryl 4L, 0.5 to 1.5 qt. (3 days)

Sevin 4 F, Sevin XLR Plus, 0.5 to 1.5 qt.. (3 days)

Spinosad
- Entrust (1.25 to 2 oz.) or Entrust SC (4 to 6 fl oz.) (3 days)
- Vetica, 12 to 17 fl oz. (14 days)

CUTWORM: Cutworm feed on plants close to soil surface. Control may be applied when the crop first comes up and as needed.

* Bifenthrin
- Bifenture 10 DF, 5.3 to 16 oz/A. (3 days)
- Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Empower, 3.5 to 8.7 lb. (3 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

Acetophate
- Acetophate 90 WDG (0.83 to 1.11 lb.) or Acetophate 90 WSP (0.5 to 1.1 lb.) or Acetophate 97 (0.5 to 1 lb.) or Acetophate 97 UP (0.5 to 1 lb.) (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene, 8 to 16 oz. (14 days)

Bel SC, 2 to 3 fl oz. (1 day)

Bifenthrin + Imidacloprid
- Brigadier, 5.5 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 11 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

Carbaryl
- Carbaryl 4L, 1 to 1.5 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 1 to 1.5 qt.. (3 days)

Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder, or hay.

Javelin WG, 0.12 to 1.5 lb. (0 days)

Lambda-cyhalothrin
- Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)

Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)

Methomyl
- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (1 day) Note: Do not graze or feed treated bean vines to livestock within 3 days nor bean hay within 7 days of last application. (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (1 day) (RUP)

Mustang Max, 1.28 to 4 oz. (1 day) (RUP)

Proxais, 1.92 to 3.2 fl oz. (7 days) (RUP)

Pyrenone, 1 to 12 fl oz. (0 days)

Carbaryl 4L, 1 to 1.5 qt. (3 days)

Sevin 4 F, Sevin XLR Plus, 1 to 1.5 qt.. (3 days)

Vetica, 12 to 17 fl oz. (14 days)

MEXICAN BEAN BEETLE: Apply if there is more than 1 adult/2 plants or 1 egg mass/fil. of row.

Acephate
- Also registered for bean leaf beetle.
- Acetophate 90 WDG (0.55 to 1.11 lb.) or Acetophate 90 WSP (0.5 to 1.1 lb.) or Acetophate 97 (0.5 to 1 lb.) or Acetophate 97 UP (0.5 to 1 lb.) (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene, 8 to 16 oz. (14 days)

Acephate 30 SG (2.5 to 5.3 oz.) or Assail 70WP (1 to 2.3 oz.) (7 days)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

Brigadier, 5.5 fl oz. (7 days) (RUP)

Carbaryl
- Also registered for bean leaf beetle.
- Carbaryl 4L, 0.5 to 1 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 0.5 to 1 qt.. (3 days)

Dimethoate
- Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt.. (0 days)

Esfenvalerate
- Adjourn, 2.9 to 5.8 fl oz. (3 days) (RUP)

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*Materials marked with an asterisk are particularly recommended for problem infestations.
**Beans, Snap**

- Asana XL, 2.9 to 5.8 fl oz. (3 days) (RUP)
- S-FenvalaStar, 2.9 to 5.8 fl oz. (3 days) (RUP)

**Note:** Do not allow livestock to graze treated fields. Do not harvest treated bean vines for livestock forage, fodder, or hay.

**Lambda-cyhalothrin**
- Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)

**Leverage 360**, 2.4 to 2.8 fl oz. (7 days) (RUP)

**Malathion**
- Malathion 5 (15.6 fl oz - aerial application only) or Malathion 5 EC (1.5 to 2 pt.) or Malathion 8 (1.5 pt.) (7 days for Malathion 5, 1 day for others)

**Methomyl**
- Lannate LV (0.75 to 3 pt. (1.5 pt. or less, 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.25 to 1 lb. (0.5 lb. or less, 1 day; over 0.5 lb., 3 days))
- Note: Do not graze or feed treated bean vines to livestock within 3 days, nor bean hay within 7 days of last application. (RUP)
- Nudrin LV (0.75 to 3 pt. (1.5 pt. or less, 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.25 to 1 lb. (0.5 lb. or less, 1 day; over 0.5 lb., 3 days)) (RUP)
- Mustang Max, 2.72 to 4 oz. (1 day) (RUP)
- Proaxis, 1.52 to 3.2 fl oz. (7 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Carbaryl 4L, 0.5 to 1 qt. (3 days)
- Sevin 4F, Sevin XLR Plus, 0.5 to 1 qt.. (3 days)

**TARNISHED PLANT BUG: Treat if numbers exceed 1 per 5ft of row.**

**Acephate**
- Acephate 90 WDG (0.55 to 1.11 lb.) or Acephate 90 WSP (0.5 to 1.1 lb.) or Acephate 97 (0.5 to 1 lb.) or Acephate 97 UP (0.5 to 1 lb.), (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene 97, 8 to 16 oz. (14 days)

**Bifenthrin**
- Bifenture 10 DF, 5.3 to 16 oz/A.. (3 days)
- Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

**Bifenthrin + Imidacloprid**
- Brigadier, 3.8 to 5.5 fl oz. (7 days) (RUP)
- Swagger, 7.6 to 11 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (10.3 oz.) or Hero EW (11.2 oz.) (3 days) (RUP)

**Carbaryl**
- Carbaryl 4L, 1 to 1.5 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 1 to 1.5 qt.. (3 days)

**Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)**

**Dimethoate**
- Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt.. (0 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

**Leverage 360**, 2.4 to 2.8 fl oz. (7 days) (RUP)

**Methomyl**
- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (1 day)
- Note: Do not graze or feed treated bean vines to livestock within 3 days, nor bean hay within 7 days of last application. (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Rimon 0.83EC, 12 fl oz. (1 day)
- Carbaryl 4L, 1 to 1.5 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 1 to 1.5 qt.. (3 days)

**GREEN CLOVERWORM: Apply when damage to leaves is seen.**

**Acephate**
- Acephate 90 WDG (0.55 to 1.11 lb.) or Acephate 90 WSP (0.5 to 1.1 lb.) or Acephate 97 (0.5 to 1 lb.) or Acephate 97 UP (0.5 to 1 lb.), (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene 97, 8 to 16 oz. (14 days)

**Bacillus thuringiensis**
- Agree WG, 0.5 to 2 lb. (0 days)
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF (0.25 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- XenTan, 0.5 to 1.5 lb. (0 days)

**Belt SC, 2 to 3 fl oz. (1 day)**

**Bifenthrin**
- Bifenture 10 DF, 5.3 to 16 oz/A. (1 day)
- Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)

**Bifenthrin + Imidacloprid**
- Brigadier, 5.5 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 11 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Carbaryl**
- Carbaryl 4L, 0.5 to 1 qt. (3 days)
- Sevin 4 F, Sevin XLR Plus, 0.5 to 1 qt.. (3 days)

**Estrenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvalaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

**Note:** Do not allow livestock to graze treated fields. Do not allow harvest treated bean vines for livestock forage, fodder, or hay.

**Lambda-cyhalothrin**
- Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)

**Leverage 360**, 2.4 to 2.8 fl oz. (7 days) (RUP)
- Mustang Max, 2.72 to 4 oz. (1 day) (RUP)

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*Materials marked with an asterisk are particularly recommended for problem infestations.*

**Always read and follow label Instructions carefully.**
Proaxis, 1.92 to 3.2 fl oz. (7 days) (RUP)
Pyrenone, 1 to 12 fl oz. (0 days)
Carbaryl 4L, 0.5 to 1 qt. (3 days)
Sevin 4F, Sevin XLR Plus, 0.5 to 1 qt.. (3 days)
Vetrica, 12 to 17 fl oz. (14 days)
APHIDS: Apply if numbers exceed 1 per leaf.
  * Acetate
    - Acetate 90 WDG (0.55 to 1.11 lb.) or Acetate 90 WSP (0.5 to 1.1 lb.) or Acetate 97 (0.5 to 1 lb.) or Acetate 97 UP (0.5 to 1 lb.) (14 days)
    - Bracket 97, 8 to 16 oz. (14 days)
    - Orthene 97, 8 to 16 oz. (14 days)
  * Dimethoate
    - Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt.. (0 days)
  * Imidacloprid
    - Admire Pro, 1.2 fl oz. (7 days)
    - Nupur 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.
Acartamidopride
  - Assail 30 SG (2.5 to 5.3 oz.) or Assail 70WP (1 to 2.3 oz.) (7 days)
Bifenthrin
  - Bifenture 10 DF, 5.3 to 16 oz/A. (3 days)
  - Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
Bifenthrin + Imidacloprid
  - Brigadier, 3.8 to 5.5 fl oz. (7 days) (RUP)
  - Swaggery, 7 to 11 fl oz. (7 days) (RUP)
Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - Dibron 8 Emulsive, 1 pt. (1 day) (RUP)
Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
Note: Do not allow livestock to graze treated fields. Do not allow harvest treated bean vines for livestock forage, foder, or hay.
Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)
Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
Malathion
  - Malathion 5 (15.6 fl oz - aerial application only) or Malathion 5 EC (2 pt.) or Malathion 8 (1.5 pt.) (7 days for Malathion 5, 1 day for Malathion 8)
  - Assail 30 SG (2.5 to 5.3 oz.) or Assail 70WP (1 to 2.3 oz.) (7 days)
  - Sivanto, 7 - 10.5 oz/A.
WHITEFLIES:
  - Sivanto, 10.5 - 14 fl oz/A.

MITES
Apply to underside of leaves as needed. Most serious in dry years.
Bifenizate
  - Acramite 4SC (16 to 24 fl oz.) or Acramite 50WS (1 to 1.5 lbs.) (3 days)
Bifenthrin
  - Bifenture EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Bifenture 10 DF, 12.8 to 16 oz/A. (3 days)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
Bifenthrin + Zeta-Cypermethrin
  - Hero (10.3 oz.) or Hero EW (11.2 oz.) (21 days) (RUP)
Dimethoate
  - Dimethoate 4 EC, 1 pt. (7 days) Note: Do not feed treated forage to livestock.
Malathion
  - Malathion 5 (15.6 fl oz - aerial application only) or Malathion 8 (1.5 pt.) (7 days for Malathion 5, 1 day for Malathion 8)
Naled
  - Dibron 8 Emulsive, 1 pt. (1 day) (RUP)
Phorate
  - Thimet 20 G, 4.5 to 7.0 oz/1000 row ft. (60 days) Planting treatment. (RUP)

DISEASES
SEED TREATMENT:
DAMPING OFF (Pythium spp., Rhizoctonia solani, early season Phytophthora, Fusarium spp.):
Captain
  - Captain 4 Flowable, 2.6 fl oz/100 lb seed.
Fludioxonil
  - Maxic 4 FS, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only. (Fusarium,Rhizoctonia).
Fludioxonil + mefenoxam
  - Apron Maxx RFC (1.5 fl oz/100 lb seed) or Apron Maxx RTA (5 fl oz/100 lb seed) or Apron Maxx 4E (0.32 to 0.64 fl oz/100 lb seed)
Mefenoxam
  - Apron XL LS, 0.32 to 0.64 fl oz/100 lb seed. Pythium and Phytophthora only.
Metalaxyl
  - Allegiance-FL, 0.75 to 1.5 oz/100 lb seed. Pythium and Phytophthora.
  - Apron 50 W, 1/2 to 1 oz/100 lb seed. Phytophthora.
Thiram
  - 42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 2 oz/100 lb seed.
PREPLANT INCORPORATED:
DAMPING OFF (Pythium and Phytophthora spp. and Rhizoctonia solani):
Mefenoxam + PCNB
  - Ridomil Gold PC, 3/4 lb/1,000 linear feet of row. Apply at the time of planting (Pythium and Rhizoctonia only). Note: Do not feed treated vines to livestock.

*Materials marked with an asterisk are particularly recommended for problem infestations.
Beans, Snap

FOLIAR TREATMENT:

ANTHRACNOSE (Colletotrichum lindemuthianum):
* Fluxapyroxad + Pyraclostrobin
  * Priaxor Xemium Brand Fungicide, 4 - 8 fl oz. (7 days)
* Thiofanate-Methyl
  * Cercobin 4.1F, 21.8 - 31.7 fl oz. (14 days)
  * Topsin 4.5 FL, 20-40 fl oz. (14 days) Apply at 10 to 30% bloom, repeat once 4 to 7 days or at peak bloom.
  * Topsin M 70 WSB, 1 to 1/2 lb. (14 days) Apply at 10 to 30% bloom, repeat once 4 to 7 days or at peak bloom.

AZOXystrobin
* Quadris, 6.2 - 15.4 fl oz. (0 days)
Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

Copper Hydroxide + Copper Oxchloride
* Badge SC, 1 to 2 pt. (0 days)

Copper Oxchloride + Copper Sulfate
* C-O-C-S WDG, 1.0 to 1.5 lbs. (0 days)

Copper Sulfate
* Basic Copper 53 (1.5 lb) or Basicop (2 lb) (0 days) Apply at 7 to 10 day intervals when plants are 5 inches.

Neem Oil
* Trilogy, 2 pt. (0 days)

Penthiopyrad
* Fontelis, 14 - 30 fl oz. (3 days)

BACTERIAL BLIGHT (Pseudomonas phaseolicola): Apply as a protective spray and continue at 7- to 14-day intervals through harvest. The treatment is particularly important during wet weather.

Copper Ammonium Carbonate
* Copper Count N, 1 to 3 qt. (0 days)

Copper Oxchloride
* Champ DP Dry Prill, 0.67 to 2 lb. (0 days)
  * Champ Form 2 F, 2/3 to 2 pt. (0 days)
  * Champion 0.5 (0.75 to 1.25 lb) or Champion WP (1 to 3 lb) or NuCop 50 DF (1 to 1.5 lb) or NuCop HB (0.5 to 1.5 lb) (0 days)
* Kocide 2000, 3/4 to 2 1/4 lb. (0 days)
* Kocide 3000, 0.5-1.25 lb. (0 day)
* NuCop 3 L, 2/3 to 2 pt. (0 days)

Copper Hydroxide + Copper Oxchloride
* Badge SC, 1 to 2 pt. (0 days)

Copper Oxchloride + Copper Sulfate
* C-O-C-S WDG, 1.5 lb. (0 days)

Copper Sulfate
* Basic Copper 53 (1.5 lb) or Basicop (4 lb) (0 days)
  * Cuprofix Ultra 40 Dispers, 3/4 to 2 lb. (0 days)

RUST (Uromyces phaseoli typica): Apply when there are fewer than 10 pustules per plant and repeat every 7 days.
* Fluxapyroxad + Pyraclostrobin
  * Priaxor Xemium Brand Fungicide, 4 - 8 fl oz. (7 days)

Chlorothalonil
* Bravo Ultrex, Equus DF, 1.25 to 2.7 lb. (7 days)
  * Bravo Weather Stik, 1 3/8 to 3 pt. (7 days) Note: Do not feed treated tops to livestock.
  * Echo 720, Equus 720 SST, 1.375 to 3 pt/A. (7 days)
  * Echo 90 DF, 1.2 to 2.4 lb. (7 days)

Mylobutanil
* Rally 40 WSP, 4 to 5 oz. (0 days) Note: Do not apply more than 1.25 lb/acre/crop.

Neem Oil
* Trilogy, 2 pt. (0 days)

Penthiopyrad
* Fontelis, 14 - 30 fl oz. (3 days)

Potassium phosphate/chlorothalonil
* Catamaran, 4 pt. (7 days)

Sulfur
* Microthiol Dispers, 3 to 10 lb. (0 days)
* Thioulex, 3 to 10 lb. (0 days)

Tebuconazole
* Orius 3.6F, Tebuzol 3.6, 4-6 fl oz. (7 days) Maximum 24 fl oz/acre/season. 12 hr REI.

GRAY MOLD (Botrytis cinerea):
* Chlorothalonil. Begin applications during early bloom stage and repeat every 7 days. Note: Observe restrictions on feeding of forage.
  * Bravo Ultrex, Equus DF, 2.7 lb.
  * Bravo Weather Stik, 3 pt.
  * Echo 720, Equus 720 SST, 3 pt. (7 days)
  * Echo 90 DF, 2.4 lb. (7 days) Every 7-10 days.
* Fluxapyroxad + Pyraclostrobin
  * Priaxor Xemium Brand Fungicide, 4 - 8 fl oz. (7 days)
  * Iprodione. Apply at early bloom and again at peak bloom if conditions are favorable for disease development. Note: Observe restrictions on feeding of forage. See label for permissible crop rotations.
    * Iprodione 4L AG, 1.5 to 2 pt.
    * Meteor, 1.5 - 2.0 pt. (14 days)
    * Rovral, 1 1/2 to 2 lb. (14 days)
    * Rovral 4 Flowable, 1/2 to 2 pt. (14 days)
* Thiofanate-Methyl
  * Cercobin 4.1F, 21.8 - 31.7 fl oz. (14 days)
  * Topsin 4.5 FL, 20-30 fl oz (2 applications), 30-40 fl oz (1 application). (14 days)
  * Topsin M 70 WSB, 1 1/2 to 2 lb. (14 days) Apply once using the higher rate at 50-70% of full bloom or apply twice using the lower rate with first application at 10 to 30% of full bloom and a second application 4 to 7 days later or at peak bloom. Note: Observe restrictions on feeding of forage.

Boscalid
* Endura, 8 to 11 oz. (7 days)

Neem Oil
* Trilogy, 2 pt. (0 days)

Penthiopyrad
* Fontelis, 14 - 30 fl oz. (3 days)

WHITE MOLD (Sclerotinia sclerotiorum):
Boscalid
* Endura, 8 to 11 oz. (7 days)

Fluxapyroxad + Pyraclostrobin
* Priaxor Xemium Brand Fungicide, 6 - 8 fl oz. (7 days) Suppression only

Iprodione. See label for permissible crop rotations. Note: Observe restrictions on feeding of forage.
  * Iprodione 4L AG, 1.5 to 2 pt. (0 days)
  * Meteor, 1.5 - 2.0 pt. (14 days)
  * Rovral, 1 1/2 to 2 lb. (14 days)
  * Rovral 4 Flowable, 1/2 to 2 pt. (14 days) Apply at early bloom and again at peak bloom if conditions are favorable for disease development.

Neem Oil
* Trilogy, 2 pt. (0 days)

Penthiopyrad
* Fontelis, 16 - 30 fl oz. (3 days)

Thiofanate-Methyl
* Cercobin 4.1F, 32.7 - 43.6. (14 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
**Materials marked with an asterisk are particularly recommended for problem infestations.**

**Beets**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Sugar beet cyst and northern root-knot nematodes can reduce red beet yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for red beets, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of sugar beet cyst and northern root-knot nematodes in red beet production.

**FALL SOIL FUMIGATION (BROADCAST):**

1.3-D
- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).
1.3-D and chloropicrin
- Telone C-17, 27-30 gal/A (muck soil), 10-21 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8-inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations, soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping. (RUP)

**INSECTS**

**SOIL TREATMENT:**

LEAFHOPPERS, APHIDS, FLEA BEETLE:

Imidacloprid
- Admire Pro, 4.4 to 10.5 fl oz. (21 days) See label for application method.
- Nuprid 2 F, 10 to 24 fl oz. (21 days) Apply preplant or in furrow.

Thiamethoxam
- Platinum (5 to 12 fl oz.) or Platinum 75 SG (1.7 to 4.01 oz.) See label for application methods.

CUTWORM:

Diazinon
- Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) (RUP)

APHIDS, LEAFHOPPERS:

Sivanto, 7 - 10.5 fl oz/A.

WHITEFLIES:

Sivanto, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

FLEA BEETLE: Apply if damage is noted on leaves.

Actara, 1.5 to 3 oz. (7 days)

* Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
* Bifenthrin
  - Bifenture 10 DF, 12.8 to 16 oz/A. (1 day)
  - Bifenture EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (1 day) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (1 day) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
  - Bifenthrin + Zeta-Cypermethrin
    - Hero (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)
    - Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)

Carbaryl
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

Imidacloprid
- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

Malathion 8, 2.5 pt. (7 days)
- Mustang Max, 1.76 to 4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

**APHIDS:** Apply as soon as they appear.

Actara, 1.5 to 3 oz. (7 days)

Bifenthrin
- Bifenture 10 DF, 12.8 to 16 oz/A. (1 day)
- Bifenture EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
- Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (1 day) (RUP)
- Fanfare 2EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (1 day) (RUP)
- Tundra EC, 5.12 to 6.4 fl oz. (1 day) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)
- Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)

Carbaryl
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

Malathion 5, Malathion 5 EC, or Malathion 57 EC (1.5 to 2 pt.) or Malathion 8 (2.5 pt.) or Malathion 8 Aquamul (1 to 1.25 pt.) (7 days)

Pyreneone, 1 to 12 fl oz. (0 days)

Sivanto, 7 - 10.5 fl oz/A.

**LEAFHOPPER:**

Actara, 1.5 to 3 oz. (7 days)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

Diazinon AG 500, 1 pt. (14 days) (RUP)

Imidacloprid
- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

Malathion 8, 2.5 pt. (7 days)
- Mustang Max, 1.76 to 4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

Always read and follow label instructions carefully.
Beets

Sevin 4 F (1 to 2 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (1 to 2 qt.) (7 days)
Sivanto, 7 - 10.5 fl oz/A.

ARMYWORM:
Avaunt, 3.5 to 6 oz. (7 days)

Bacillus thuringiensis
• Biobit HP, 0.5 to 2 lb. (0 days)
• DiPel DF, 1 to 2 lb. (0 days)
• XenTari, 0.5 to 2 lb. (0 days)

Bifenthrin + Zeta-Cypermethrin
• Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
• Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)
Coragen, 3.5 to 5 fl oz. (1 day)
Intrepid 2F, 6 to 16 fl oz. (14 days) 4 to 10 fl oz with PHI of 1 day when harvesting leaves.
Malathion 8, 2.5 pt. (7 days)

Methomyl
• Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (0 days, roots; 10 days, tops) (RUP)
• Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (0 days, roots; 10 days, tops) (RUP)
Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
Radiant SC, 6 to 8 fl oz. (7 days) See label for treating and harvesting of leaves.

Spinosad
• Entrust (1.5 to 3 oz.) or Entrust SC (4.5 to 10 fl oz.) (3 days)

CUTWORM:
Bacillus thuringiensis
• Biobit HP, 0.5 to 1 lb. (0 days)
• DiPel DF, 0.5 to 1 lb. (0 days)
• XenTari, 0.5 to 1.5 lb. (0 days)

Bifenthrin + Zeta-Cypermethrin
• Hero (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)
• Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)

Methomyl
• Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (0 days, roots; 10 days, tops) (RUP)
• Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (0 days, roots; 10 days, tops) (RUP)
Mustang Max, 1.28 to 4 oz. (1 day) (RUP)

WHITEFLIES:
Bifenture 10 DF, 12.8 to 16 oz/A. (1 day)
Sivanto, 10.5 - 14 fl oz/A.

MITES
Bifenthrin
• Bifenture EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
• Bifenture 10 DF, 12.8 to 16 oz/A. (1 day)
• Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (1 day) (RUP)
• Fanfare 2EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
• Sniper, 5.12 to 6.4 fl oz. (1 day) (RUP)
Bifenthrin + Zeta-Cypermethrin
• Hero (10.3 oz.) or Hero EW (11.2 oz.) (21 days) (RUP)

DISEASES
SEED TREATMENT:
DAMPING OFF (Pythium spp., Rhizoctonia solani): Treatments are applied to seed prior to planting. Use Thiram and Captan as seed treatments only. Use only as directed; over-treatment may cause injury.
Fludioxonil
• Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia). Commercial seed treatment plants only.
Fludioxonil + mefenoxam
• Maxim XL, 0.167 to 0.334 fl oz/100 lb seed (Pythium + Rhizoctonia).
Mefenoxam
• Apron XL LS, 0.085 fl oz/100 lb seed (Pythium).
Metalaxyl
• Allegiance-FL, 0.75 fl oz/100 lb seed (Pythium).
Thiram
• 42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 8 oz.

PREPLANT INCORPORATED:
DAMPING OFF (Pythium and Phytophthora spp.):
Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 2 in. of sprinkler irrigation.
• Ridomil Gold WSP, 1 to 2 lb.

FOLIAR TREATMENT:
CERCOSPORA LEAF SPOT (Cercospora beticola): Apply every 7 to 10 days.
• Azoxystrobin
•Quadris, 9.2 to 15.4 fl oz. (0 days)
Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
• Trifloxystrobin
•Flint, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

Copper Hydroxide
• Champ DP Dry Prill, 1 1/3 to 2 2/3 lb. (0 days)
• Champ Formula 2 Flowable, 1 1/3 to 2 2/3 pt. (0 days)
• Champ WG, 2.02 lb. (0 days)
• Champ WP, 2 to 5 lb. (0 days)
• Kocide 2000, 1 1/2 to 3 3/4 lb. (0 days)
• Kocide 3000, 1.5 to 3.74 lb. (0 day)
• Nu-Cop 3 L, 1 1/3 to 3 1/3 pt. (0 days)

Copper Hydroxide + Copper Oxychloride
• Badge SC, 1 to 2 pt. (0 days)

Copper Sulfate
• Cuprozine Ultra 40, 1.25 to 3 lb. (0 days)

Fluxapyroxad + Pyraclostrobin
• Merivon Xemium Brand Fungicide, 5.5 fl oz. (7 days)

Penthiopyrad
• Fontelis, 16 - 30 fl oz. (0 days)

Tebuconazole
• Orgis 3.6F, Tebucon 3.6, 3-7.2 fl oz. (7 days) Maximum 28.8 fl oz/acre/season. 12 hr REI.

RUST:
Penthiopyrad
• Fontelis, 16 - 30 fl oz. (0 days)

POWDERY MILDEW:
• Penthiopyrad
• Fontelis, 16 - 30 fl oz. (0 days)

Fluxapyroxad + Pyraclostrobin
• Merivon Xemium Brand Fungicide, 4 - 5.5 fl oz. (7 days)

Sulfur
• Microthiol Dispers, 3 to 5 lb. (0 days) 24 hr REI.

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label Instructions carefully.
Broccoli

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES
Sugar beet cyst, root-knot and lesion nematodes can reduce broccoli yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for broccoli, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of sugar beet cyst, root-knot and lesion nematodes in broccoli production.

FALL SOIL FUMIGATION (BROADCAST):

1.3-D

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).
Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

INSECTS

SEEDBED TREATMENT: Apply treatments to soil according to directions to protect young seedlings in the seedbed before transplanting in field.

CABBAGE MAGGOT: Apply to seedbed surface and incorporate to 3 to 4 inches.
- Diazinon
  - Diazinon 50 W (4 to 6 lb.) or Diazinon AG 500 (2 to 3 qt.) or Diazinon AG600 (51 to 76.5 fl oz.) Apply only as directed. (RUP)

CUTWORM:
- Diazinon
  - Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) Apply only as directed. (RUP)

SOIL TREATMENT:

FLEA BEETLE, THRIPS:
- Scorpion 35SL, 9 to 10.5 fl oz. (21 days) See label for application method.
- Vermark, 6.75-13.5 oz/A. (0 days)

APHIDS AND THRIPS:
- Imidacloprid
  - Admire Pro, 4.4 to 10.5 fl oz. (21 days)
  - Nuprid 2 F, 10 to 24 fl oz. (21 days)
  - Vermark, 6.75-13.5 oz/A.

Admire Pro, 4.4 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 10 to 24 fl oz. (21 days)
- Vermark, 6.75-13.5 oz/A.

LEAFHOPPERS:
- Sivanto, 7 - 10.5 fl oz/A.

WHITEFLIES:
- Sivanto, 10.5 - 14 fl oz/A.

APHIDS:
- Sivanto, 7 - 12 fl oz/A.

TRANSPLANT WATER TREATMENT:

CABBAGE MAGGOT:
- Diazinon
  - Diazinon 50 W (1 to 2 lb/200 gal) or Diazinon AG 500 (4 to 8 oz/50 gal) or Diazinon AG600 (3.25 to 6.5 fl oz/50 gal) Use only as directed. (RUP)
  - Vermark, 10-13.5 oz/A. (0 days)

ARMYWORM, DIAMONDBACK MOTH, CABBAGE LOOPERS, IMPORTED CABBAGE WORM:
- Coragen, 3.5 to 5 fl oz. (3 days) See label for application methods.
- Vermark, 5-10 oz/A. (0 days)

PLANTING TREATMENT: Treatments applied at seeding.

CABBAGE MAGGOT:
- Bifenthrin
  - Bifenture 10 DF, 8 to 16 oz/A.
  - Brigade WSB, 8 to 16 oz. (RUP)

Chlorpyrifos
- Chlorpyrifos 15G (4.6 to 9.3 oz/1000 row ft.) or Chlorpyrifos 4E AG (1.6 to 2.75 fl oz/1000 row ft.) (30 days) (RUP)
  - Govern, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)
  - Hatchet, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)
  - Lorsban 15 G (4.6 to 9.2 oz/1,000 row ft.) or Lorsban 4 E / Lorsban Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) or Lorsban 75 WG (1.1 to 1.8 oz/1000 row ft.) (30 days) Apply in a 4-inch band over row at time of seeding. Use only as directed. (RUP)
  - Nufox 4E, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)
  - Searus, 4.6 to 9.2 oz/1000 row ft. (30 days)
  - Vulcan, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)
  - Whirlwind, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)
  - Vermark, 10-13.5 oz/A. (0 days)

ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:

CABBAGE MAGGOT:
- Coragen, 3.5 to 5 fl oz. (3 days) See label for application methods.
- Durivo, 10 to 13 fl oz. (30 days)
- Vermark, 5-10 oz/A. (0 days)

APHIDS, FLEA BEETLE, THRIPS:
- Belay 50 WDG, 4.8 to 6.4 oz.
- Durivo, 10 to 13 fl oz. (30 days)

Thiameathoxam
- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days)
  - Vermark, 6.75-13.5 oz/A. (0 days)

ARMYWORM, CABBAGE MAGGOT, CUTWORM:
- Capture LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

APHIDS: Root aphids.
- Chlorpyrifos
  - Chlorpyrifos 4E AG, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Govern, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Hatchet, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Nufox 4E, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Vulcan, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Whirlwind, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Sivanto, 7 - 12 fl oz/A.

GRUBS, WIREWORMS:
- Bifenture 10 DF, 8 to 16 oz/A.

LEAFHOPPERS:
- Sivanto, 7 - 10.5 fl oz/A.

WHITEFLIES:
- Sivanto, 10.5 - 14 fl oz/A.

*Materials marked with an asterisk are particularly recommended for problem infestations.
**SOIL TREATMENT AFTER TRANSPLANTING:** Apply to the soil at the base of plants after transplanting. Adequate water is needed to wet the soil surface.

APHIDS: Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.

- **Imidacloprid.** Additional generic brands available.
  - Admire Pro, 4.4 to 10.5 fl oz. (21 days)
  - Nuprid 2 F, 10 to 24 oz. (21 days)

**Sivanto,** 7 - 12 fl oz/A.

**Vertimark,** 6.75-13.5 oz/A. (0 days)

**CABBAGE MAGGOT:**

- **Lorsban 4 E, Lorsban Advanced,** 1.6 to 2.75 fl oz / 1.00 row ft. (RUP)
- **Vertimark,** 10-13.5 oz/A. (0 days)

**ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH,**

**IMPORTED CABBAGE WORM:**

- Coragen, 3.5 to 5 fl oz. (3 days)
- Dunvo, 10 to 13 fl oz. (30 days)
- Verimark, 5-10 oz/A. (0 days)

**APHIDS, FLEA BEETLE, THRIPS:**

- Dunvo, 10 to 13 fl oz. (30 days)

**Thiamethoxam:**

- **Platinum (5 to 11 fl oz.)** or **Platinum 75 SG (1.66 to 3.67 oz.)** (30 days)
- **Vertimark,** 6.75-13.5 oz/A. (0 days)

**LEAFHOPPERS:**

- **Sivanto,** 7 - 10.5 fl oz/A.

**WHITEFLIES:**

- **Sivanto,** 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

**FLEA BEETLE:** Apply as needed soon after plants come up.

- Actara, 1.5 to 3 oz. (0 days)
- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)

**Bifenthrin:**

- **Bifenture 10 DF,** 5.3 to 16 oz/A. (7 days)
- **Bifenture EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Brigade @ 2EC** (2.1 to 6.4 fl oz.), or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- **Capture 2 EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Discipline 2EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Fanfare 2EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Sniper,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Tundra EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin:**

- **Hero** (4 to 10.3 oz.) or **Hero EW** (4.5 to 11.2 oz.) (7 days) (RUP)
- **Steed,** 3.5 to 4.7 fl oz. (7 days) (RUP)
- **Brigadier,** 3.8 to 6.1 fl oz. (7 days) (RUP)

**Carbaryl:**

- **Carbaryl 4L,** 0.5 to 1 qt. (3 days)
- **Sevin 4 F** (0.5 to 1 qt.) or **Sevin 80 S** (0.63 to 1.25 lb.) or **Sevin 80 WSP** (0.67 to 1.25 lb.) or **Sevin XLR Plus** (0.5 to 1 qt.) (3 days)

**Chlorpyrifos:**

- **Hatchet,** 1 to 2 pt. (21 days) (RUP)
- **Lorsban 4 E, Lorsban Advanced** (1 to 2 pt.) or **Lorsban 75 WG** (0.67 to 1.33 lb.) (21 days) (RUP)
- **Whirlwind,** 1 to 2 pt. (21 days) (RUP)

**Cypermethrin:**

- **Ammo 2.5 EC,** 2.5 to 5 fl oz. (1 day) (RUP)
- **Cypermethrin,** 2.5 to 5 fl oz. (1 day) (RUP)
- **Holster,** 2.5 to 5 fl oz. (1 day) (RUP)

**UP-Cyde 2.5 EC,** 2.5 to 5 fl oz. (1 day) (RUP)

**Esfenvalerate:**

- **Adjoum,** 5.8 to 9.6 fl oz. (3 days) (RUP)
- **Asana XL,** 5.8 to 9.6 fl oz. (3 days) (RUP)
- **S-Fenvalstar,** 5.8 to 9.6 fl oz. (3 days) (RUP)
- **Exirel,** 13.5-20.5 oz/A. (1)

**Imidacloprid.** Additional generic brands available.

- **Admire Pro,** 1.3 fl oz. (7 days)
- **Nuprid 1.6 F,** 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.

**Kryocide,** 8 to 16 lb. (7 days)

**Lambda-cyhalothrin:**

- **Lambda-Cy,** 2.56 to 3.84 fl oz. (1 day) (RUP)
- **Warior II** with Zeon Technology (1.28 to 1.92 fl oz.) or **Warior** with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- **Larvin 3.2,** 16 to 32 fl oz. (7 days) (RUP)
- **Leverage 360,** 3 fl oz. (7 days) (RUP)

**Malathion:**

- **Malathion 8** (1.5 to 2.5 pt.) or **Malathion 8 Aquamul** (1.25 pt.) (3 days)
- **Mustang Max,** 2.24 to 4 oz. (1 day) (RUP)
- **Proaxis,** 2.56 to 3.84 fl oz. (1 day) (RUP)
- **Pyreneone,** 1 to 12 fl oz. (0 days)
- **Scorpion 35SL,** 2 to 7 fl oz. (1 day)
- **Carbaryl 4L,** 0.5 to 1 qt. (3 days)
- **Sevin 4 F** (0.5 to 1 qt.) or **Sevin 80 S** (0.63 to 1.25 lb.) or **Sevin 80 WSP** (0.67 to 1.25 lb.) or **Sevin XLR Plus** (0.5 to 1 qt.) (3 days)
- **Voliam Flexi,** 4 to 7 oz. (3 days)

**IMPORTED CABBAGE WORM:** Apply if: 1) >10% of transplants are infested with any type of cabbage "worm" or 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested at or after first flowering.

**Avaint,** 2.5 to 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.

**Bacillus thuringiensis:**

- **Agree WG,** 0.5 to 2 lb. (0 days)
- **Biopt HP,** 0.5 to 1 lb. (0 days)
- **DiPel DF** (0.25 to 1 lb.) or **DiPel ES** (1 to 2 pt.) (0 days)
- **Javelin WG,** 0.12 to 1.5 lb. (0 days)
- **XenTari,** 0.5 to 1.5 lb. (0 days)
- **Baythroid XL,** 1.8 to 2.4 fl oz. (0 days) (RUP)

**Bifenthrin:**

- **Bifenture 10 DF,** 5.3 to 16 oz/A. (7 days)
- **Bifenture EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Brigade @ 2EC** (2.1 to 6.4 fl oz.), or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- **Capture 2 EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Discipline 2EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Fanfare 2EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Sniper,** 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Tundra EC,** 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin:**

- **Brigadier,** 3.8 to 6.1 fl oz. (7 days) (RUP)
- **Sevin 4 F** (1 to 2 qt.) or **Sevin 80 S** (1.25 to 2.5 lb.) or **Sevin 80 WSP** (1.25 to 2.5 lb.) or **Sevin XLR Plus** (1 to 2 qt.) (3 days)

**Carbaryl:**

- **Carbaryl 4L,** 1 to 2 qt. (3 days)
- **Sevin 4 F** (1 to 2 qt.) or **Sevin 80 S** (1.25 to 2.5 lb.) or **Sevin 80 WSP** (1.25 to 2.5 lb.) or **Sevin XLR Plus** (1 to 2 qt.) (3 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.*
### Diamondback Moth

Apply treatments if:
- >10% of transplants are infested with any type of cabbage "worm",
- >50% of plants are infested before flowering, or
- >10% of plants are infested at or after 1st flowering.

Use Bacillus thuringiensis to avoid killing important natural enemies of diamondback moth.

#### Materials marked with an asterisk are particularly recommended for problem infestations.

- *Bacillus thuringiensis*
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biobit HP, 0.5 to 1 lb. (0 days)
  - DiPel DF (0.25 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - XenTari, 0.5 to 1.5 lb. (0 days)

#### Spinosad
- Entrust (0.5 to 1.25 oz.) or Entrust SC (1.5 to 4 fl oz.) (1 day)

#### Acetamiprid
- Assail 30 SG, 4 oz. (7 days) suppression only
- Assail 70WP, 1 oz. (3 days) Suppression only

#### Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)

#### Bifenthrin
- Bifenture 10 DF, 5.3 to 16 oz/A (7 days)
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Disciplin 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

#### Bifenthrin + Imidacloprid
- Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 8.4 to 12.2 fl oz. (7 days) (RUP)

#### Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)

#### Carbaryl
- Carbaryl 4L, 1 to 2 qt. (3 days)

#### Malathion 5 EC (1 to 2 pt.) or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion 8 Aquamul (1.25 pt.) (3 days for Malathion 5 EC & 8; 2 days for all others)

#### Methomyl
- Lannate LV (0.75 to 3 pt.) or Lannate SP (0.25 to 1 lb.) (3 days) (RUP)
- Nudrin LV (0.75 to 3 pt.) or Nudrin SP (0.25 to 1 lb.) (3 days) (RUP)

#### Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

#### Permethrin
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)

#### Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)

#### Pyrethrum, 1 to 2 fl oz. (0 days)

#### Radiant SC, 5 to 10 fl oz. (1 day)

#### Rimon 0.83EC, 6 to 12 fl oz. (7 days)

#### Carbaryl 4L, 1 to 2 qt. (3 days)

#### Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

#### Spinosad
- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)

#### Vetica, 10 to 20 oz fl. (1 day)

#### Volarim Flexi, 4 to 7 oz. (3 days)

#### DIAMONDBACK MOTH: Apply treatments if: 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested at or after 1st flowering.

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*Materials marked with an asterisk are particularly recommended for problem infestations.*

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#### Broccoli

- Hatchet, 1 to 2 pt. (21 days) (RUP)
- Lorban 4 E / Lorban Advanced (1 to 2 pt.) or Lorban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- Whirlwind, 1 to 2 pt. (21 days) (RUP)
- Confirm 2F, 6 to 8 fl oz. (7 days)
- Coragen, 3.5 to 5 fl oz. (3 days)

#### Cypermethrin
- Ammo 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- Cypermethrin, 2.5 to 5 fl oz. (1 day) (RUP)
- Holster, 2.5 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)
- Diazinon AG 500, 0.5 to 1 pt. (7 days) (RUP)

#### Permethrin
- Mustang, 3.2 to 12.8 oz. (1 day) (RUP)

#### Malathion
- Entries, 1.25 to 2.5 lb. (7 days) (RUP)
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- Coragen, 3.5 to 5 fl oz. (3 days)

#### Diazinon AG 500, 0.5 to 1 pt. (7 days) (RUP)

#### Carbaryl
- Carbaryl 4L, 1 to 2 qt. (3 days)

#### Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

#### Carbaryl 4L, 1 to 2 qt. (3 days)

#### Larvin
- Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)

#### Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

#### Leveraj 3.2, 16 to 32 fl oz. (7 days) (RUP)

#### Malathion
- Malathion 5 (2 pt.) or Malathion 5 EC (1 to 2 pt.) or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion 8 Aquamul (1.25 pt.) (3 days for Malathion 5 EC & 8; 2 days for all others)

#### Methomyl
- Lannate LV (0.75 to 3 pt.) or Lannate SP (0.25 to 1 lb.) (3 days) (RUP)
- Nudrin LV (0.75 to 3 pt.) or Nudrin SP (0.25 to 1 lb.) (3 days) (RUP)

#### Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

#### Permethrin
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)

#### Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)

#### Pyrethrum, 1 to 2 fl oz. (0 days)

#### Radiant SC, 5 to 10 fl oz. (1 day)

#### Rimon 0.83EC, 6 to 12 fl oz. (7 days)

#### Carbaryl 4L, 1 to 2 qt. (3 days)

#### Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

#### Spinosad
- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)

#### Vetica, 10 to 20 oz fl. (1 day)

#### Volarim Flexi, 4 to 7 oz. (3 days)
Broccoli

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Description</th>
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| Permethrin | • Ambush 25 W, 3.2 to 4.6 oz. (1 day) (RUP)  
• Perm-UP 25DF (3.2 to 4.6 oz.) or Perm-UP 3 EC (2 to 4 oz.) (1 day) (RUP)  
• Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)  
• Proxix, 2.56 to 3.84 fl oz. (1 day) (RUP)  
• Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)  
• Pyrene, 1 to 12 fl oz. (0 days)  
• Radiant SC, 5 to 10 fl oz. (1 day)  
• Rimon 0.83EC, 6 to 12 fl oz. (7 days)  
• Carbaryl 4L, 1 to 2 qt. (3 days)  
• Xentari, 0.5 to 1.5 lb. (0 days)  
• Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP) |
| Lambda-cyhalothrin | • Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)  
• Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)  
• Larvin 3.2, 24 to 40 fl oz. (7 days) (RUP)  
• Leverage 360, 3 fl oz. (7 days) (RUP) |
| Malathion | • Malathion 5, Malathion 5 EC, or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion 8 Aquamul (1.25 pt.) (3 days for Malathion 5 EC & 8; 2 days for all others) |
| Methomyl | • Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (3 days) (RUP)  
• Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (3 days) (RUP)  
• Mustang Max, 3 to 4 oz. (1 day) (RUP) |
| Bifenilthrin | • Bifenilthrin 10 DF, 5.3 to 16 oz/A. (7 days)  
• Bifenilthrin EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
• Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)  
• Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)  
• Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
• Fanfare 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)  
• Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)  
• Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP) |
| Bifenthrin | • Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)  
• Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)  
• Bifenthrin + Zeta-Cypermethrin  
• Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)  
• Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)  
• Confirm 2F, 6 to 8 fl oz. (7 days)  
• Coragen, 3.5 to 4 fl oz. (3 days) |
| Bifenthrin + Imidacloprid | • Brigadier, 3.8 to 8.1 fl oz. (7 days) (RUP)  
• Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)  
• Bifenthrin + Zeta-Cypermethrin  
• Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)  
• Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)  
• Confirm 2F, 6 to 8 fl oz. (7 days)  
• Coragen, 3.5 to 4 fl oz. (3 days) |
| Cypermethrin | • Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)  
• Cypermethrin, 3.75 to 5 oz. (1 day) (RUP)  
• Hoisler, 3.75 to 5 fl oz. (1 day) (RUP)  
• UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)  
• Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)  
• Dibrom 8 Emulsive, 2 pt. (1 day) (RUP)  
• Endigo ZC, 4 fl oz. (1 day) (RUP) |
| Chlorpyrifos | • Hatchet, 1 to 2 pt. (21 days) (RUP)  
• Lorsban 4E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)  
• Whirlwind, 1 to 2 pt. (21 days) (RUP)  
• Diazinon AG 500, 0.5 to 1 pt. (7 days) (RUP)  
• Dibrom 8 Emulsive, 1 pt. (1 day) (RUP) |
| Dimethoate | • Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt., (7 days)  
• Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP) |

*Materials marked with an asterisk are particularly recommended for problem infestations.*
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**CUTWORM:**
- Fulfill, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.
- Imidacloprid, Additional generic brands available.
  - Admire Pro, 1.3 fl oz. (7 days)
  - Nuprid 16 F, 3.8 fl oz. (7 days)
  - Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.
  - Leverage 360, 3 fl oz. (7 days) (RUP)
- Malathion
  - Malathion 5 (1.5 to 2 pt.) or Malathion 5 EC (1 to 2 pt.) or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion 8 Aquamul (1.25 pt.) (3 days for Malathion 5 EC & 8; 2 days for all others)
- Movento, 4 to 5 fl oz. (1 day) Must be tank mixed with adjuvant having spreading and penetrating properties.
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Sivanto, 7 - 12 fl oz/A.
- Voliam Flexi, 4 to 7 oz. (3 days)

**CUTWORM:**
- *Cypermethrin
  - Ammo 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
  - Cypermethrin, 2.5 to 5 fl oz. (1 day) (RUP)
  - Holster, 2.5 to 5 fl oz. (1 day) (RUP)
  - UP-Cyte 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- *Empower, 3.5 to 8.7 lb. (7 days) (RUP)
- Bacillus thuringiensis
  - Biopt HP, 0.5 to 1 lb. (0 days)
  - DiPel DF, 0.5 to 1 lb. (0 days)
  - XenTari, 0.5 to 1.5 lb. (0 days)
  - Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-FenvalaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Lambda-cyhalothrin
  - Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Streel, 3.5 to 4.7 fl oz. (7 days) (RUP)

**THRIPS:**
- Acetamiprid
  - Assail 30 SG (4 oz.), or Assail 70WP (1.7 oz.) (7 days)
  - Actara, 3 to 5.5 oz. (0 days)
  - Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
- Bifenthrin
  - Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
  - Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Brigade @ 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Bifenthrin + Imidacloprid
  - Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
  - Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)
- Cypermethrin
  - Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
  - Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
  - Holster, 3.75 to 5 fl oz. (1 day) (RUP)
  - UP-Cyte 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
  - Leverage 360, 3 fl oz. (7 days) (RUP)
- Permethrin
  - Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
  - Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)
  - Pyreneone, 1 to 12 fl oz. (0 days)
  - Radiant SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between applications; do not apply more than 34 fl oz. per season.
  - Rimon 0.83EC, 12 fl oz. (7 days)
  - Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Spinosad
  - Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (1 day)
  - Voliam Flexi, 4 to 7 oz. (3 days)

**ARMYWORM:**
- *Cypermethrin
  - Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
  - Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
  - Holster, 3.75 to 5 fl oz. (1 day) (RUP)
  - UP-Cyte 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- Aavaunt, 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.
- Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biopt HP, 0.5 to 2 lb. (0 days)
  - DiPel DF (1 to 2 lb.), or DiPel ES (2 to 4 pt.) (0 days)
  - XenTari, 0.5 to 2 lb. (0 days)
- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
- Carbaryl
  - Carbaryl 4L, 1 to 2 qt. (3 days)
  - Sevin 4 F (1 to 2 qt.), or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- Confirm 2F, 8 to 8 fl oz. (7 days)
- Coragen, 3.5 to 5 fl oz. (3 days)
- Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- Larvin 3.2, 16 to 32 fl oz. (7 days) (RUP)
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
- Permethrin
  - Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 oz.) (1 day) (RUP)
  - Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)
  - Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
  - Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
  - Radiant SC, 5 to 10 fl oz. (1 day)
  - Rimon 0.83EC, 6 to 12 fl oz. (7 days) (RUP)
  - Carbaryl 4L, 1 to 2 qt. (3 days)
  - Sevin 4 F (1 to 2 qt.), or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
  - Spinosad
  - *Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (1 day)
  - Voliam Flexi, 4 to 7 oz. (3 days)

**WHITEFLIES:**
- Acetamiprid
  - Assail 30 SG (2.5 to 4 oz/A.) or Assail 70WP (1.1 to 1.7 oz/A) (7 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.*
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Broccoli

Exirel, 13.5-20.5 oz/A. (1)
Movento, 4.0 to 5.0 fl oz. (1 day) Due to the wide variety and composition of spray adjuvants that may be used in combination with MOVENTO, only use a spreading-penetrating adjuvant that is known to be safe to the target crop.
Sivanto, 10.5 - 14 fl oz/A.

LEAFHOPPERS:
Sivanto, 7 - 10.5 fl oz/A.

MITES
Bifenthrin
- Bifenture EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Bifenture 10 DF, 12.8 to 16 oz/A. (7 days)
- Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (10.3 oz.) or Hero EW (11.2 oz.) (7 days) (RUP)

DISEASES
SEED TREATMENT:
BLACK LEG (Phoma lingam), DAMPING OFF, WIRE STEM (Pythium spp., Rhizoctonia spp.):
- Captan 4 Flowable, 2.2 fl oz/100 lb seed.
- Fludioxinal
- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only (Rhizoctonia).
- Thiram
  - 42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 8 oz/100 lb seed.

SEEDBED TREATMENT:
CLUBROOT (Plasmodiophora brassicae):
- Fluazinam
  - Omega 500 F, 2.6 pt. (50 days)

DAMPING OFF (Pythium spp.), BASAL ROT (Phytophthora spp.):
- Mefenoxam. Apply as a broadcast preplant incorporation or surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.
- Ridomil Gold SL, 0.25-0.5 pt (Pythium) 1-2 pt (Phytophthora).
- Ultra Flurish, 0.5 to 1.0 pt (Pythium), 2 to 4 pt (Phytophthora).

GREENHOUSE PREPLANT INCORPORATION:
DAMPING OFF (Pythium spp.), ROOT ROT (Rhizoctonia spp.):
- Gliocladium virens GL-21
  - SoilGard 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

TRANSPLANT DRENCH:
CLUBROOT (Plasmodiophora brassicae):
- Fluazinam
  - Omega 500 F, 6.4 fl oz. (50 days)

FOLIAR TREATMENT:
BLACK ROT (Xanthomonas campestris): Apply treatment (lowest rates) in fields as soon as transplants are established.
- Actibenzer-S-methyl
  - Actigard, 0.5 to 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.
- Copper Ammonium Carbonate
  - Copper Count N, 1 to 2 qt. (0 days) Note: Reddening of older leaves may occur.
- Copper Hydroxide
  - Champ DP Dry Prill, 1/3 to 3/2 lb. (0 days)
  - Champ Formula 2 F, 1/3 to 3/4 pt. (0 days)
  - Champ WG, 1.06 lb. (0 days)
  - ChampION, 0.5 to 0.75 lb. (0 days)
  - Champion WP, 1 to 2 lb. (0 days)
  - Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
  - Kocide 3000, 0.5-0.75 lb. (0 day)
  - Nu-Cop 50 DF, 1 lb. (0 days)
- Copper Hydroxide + Copper Ox chloride
  - Badge SC, 1 to 1.8 pt. (0 days)
  - Badge X2, 0.5 to 1.8 lb. (0 days)
- Copper Ox chloride + Copper Sulfate
  - C-O-C-S WDG, 0.5 to 1.0 lb. (0 days)
- Copper Sulfate
  - Cuproutix Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)
- Alternaria LEAF SPOT (Alternaria brassicaceae): Apply when conditions favor disease and repeat every 7 to 10 days.
- Azoxystrobin
  - Quadris, 6.2 to 15.4 fl oz. (0 days)
- Atoxystrobin + Difenoconazole
  - Quadris Top, 12 to 14 fl oz. (1 day)
- Chlorothalonil
  - Bravo Utrex, 1.4 lb. (7 days)
  - Bravo Weather Stik, Equus 720 SST, 1 to 1.5 pt. (7 days)
  - Echo 720, 1.5 pt. (7 days)
  - Echo 90 DF, 1.25 lb. (7 days)
  - Equus DS, 1.4 to 1.8 lb. (7 days)
- Difenoconazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)
- Boscalid
  - Endura, 6 to 9 oz. (0 days)
- Copper Ammonium Carbonate
  - Copper Count N, 1 to 2 qt. (0 days) Note: Reddening of older leaves may occur.
- Copper Hydroxide
  - Champ DP Dry Prill, 1/3 to 3/2 lb. (0 days)
  - Champ Formula 2 F, 1/3 to 3/4 pt. (0 days)
  - Champ WG, 1.06 lb. (0 days)
  - Champion WP, 1 to 2 lb. (0 days)
  - Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
  - Copper Hydroxide + Copper Ox chloride
  - Badge SC, 1 to 1.8 pt. (0 days)
  - Badge X2, 0.5 to 1.8 lb. (0 days)
- Copper Sulfate
  - Basicop, 1 to 3 lb. (0 days)
  - Cuproutix Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)
**Brussels Sprouts**

**SOIL TREATMENT:**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Amount of chemical formulation to apply per acre (unless otherwise directed)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prophos AB</td>
<td>4 fl oz. (2 days)</td>
<td></td>
</tr>
<tr>
<td>Peronospora parasitica:</td>
<td>5.5 to 7.5 fl oz. (4 days)</td>
<td></td>
</tr>
<tr>
<td>White rust</td>
<td>10 fl oz. (4 days)</td>
<td></td>
</tr>
</tbody>
</table>

**FLEA BEETLE:**

- Diazinon: 4 oz. (2 days)
- Verimark: 8 oz. (2 days)
- Platinum: 8 oz. (2 days)

**CABBY MADDEN:**

- Diazinon: 5 oz. (4 days)
- Verimark: 2.5 oz. (4 days)
- Platinum: 2.5 oz. (4 days)

**APHIDS:**

- Imidacloprid: 0.5 to 1 pt. (0 days)
- Admire: 0.5 to 1 pt. (0 days)
- Sivanto: 0.5 to 1 pt. (0 days)

**MULCH:**

- Prophostil: 4 fl oz. (2 days)
- Mancozeb: 2 fl oz. (2 days)

**BLACK LEG (Phoma lingam):**

- Iprodione: Apply immediately after thinning (2 to 4 leaf stage) as a directed spray to the base of the plant and adjacent soil surface. If disease persists or recurs a second application may be made up to 35 days after the first application. *Note: Use only on kale.*

**SOIL TREATMENT:**

- Mancozeb: 2 fl oz. (2 days)
- Manzate: 1.6 to 2.1 lb. (7 days)

**DOWNY MILDEW (Peronospora parasitica):** Begin applications when conditions are favorable for disease but before infection.

- *Ametoctradin + Dimethomorph:
- *Zampro:
- *Flupicicloide:

**COPPER HYDROXIDE + COPPER OXYCHLORIDE:**

- *Presidio:
- *Fosetyl-Aluminum:
- *Aliette WDG:

**DIMETHOMORPH:**

- *Forum:
- *Fenamidone:

**NEEM OIL:**

- *Trilogy:
- Plantaril:

**CUTWORM:**

- Diazinon: 5 oz. (4 days)
- Verimark: 8 oz. (4 days)
- Platinum: 8 oz. (4 days)

**NEMATODES**

Sugar beet cyst, root-knot and lesion nematodes can reduce Brussels sprouts yield. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for Brussels sprouts, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of sugar beet cyst, root-knot and lesion nematodes in Brussels sprouts production.

**FALL SOIL FUMIGATION (BROADCAST):**

- Telone II: 25 gal/A (muck soil), 9-18 gal/A (mineral soil).
- Fumigate in the fall when soil temperatures are above 50°F. Inject fumigant to a soil depth of 6 to 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants may be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**INSECTS**

**SOIL TREATMENT:**

- Imidacloprid: 0.5 to 1 pt. (0 days)
- Admire: 0.5 to 1 pt. (0 days)
- Sivanto: 0.5 to 1 pt. (0 days)

**CABBY MADDEN:**

- Diazinon: 5 oz. (4 days)
- Verimark: 2.5 oz. (4 days)
- Platinum: 2.5 oz. (4 days)

**FLEA BEETLE:**

- Diazinon: 5 oz. (4 days)
- Verimark: 2.5 oz. (4 days)
- Platinum: 2.5 oz. (4 days)

**CABBY MADDEN:**

- Diazinon: 5 oz. (4 days)
- Verimark: 2.5 oz. (4 days)
- Platinum: 2.5 oz. (4 days)

**NEEM OIL:**

- *Trilogy:
- *Plantaril:
LEAFHOPPERS:
Sivanto, 7 - 10.5 fl oz/A.

WHITEFLIES:
Sivanto, 10.5 - 14 fl oz/A.

**MATERIALS MENTIONED:**

Brussels Sprouts

**LEAFHOPPERS:**
Sivanto, 7 - 10.5 fl oz/A.

**WHITEFLIES:**
Sivanto, 10.5 - 14 fl oz/A.

**TRANSPLANT WATER TREATMENT:** Treatments applied in water around roots at time plants are set in the field.

**CABBAGE MAGGOT:**
Diazinon

- Diazinon 50 W (1 to 2 lb/200 gal.) or Diazinon AG 500 (4 to 8 oz/50 gal.) or Diazinon AG600 (3.25 to 6.5 fl oz/50 gal.) Use only as directed. (RUP)

- Treatment rates are given in amount of formulation per 100 gal of water. Apply at rate of 1 cup of solution per plant. Frequent agitation is needed with wettable powders.

- Vermark, 10-13.5 oz/A. (0 days)

**ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, IMPORTED CABBAGE WORM:**

**CABBAGE MAGGOT:**
Coragen, 3.5 to 5 fl oz. (3 days) See label for application methods.

- Vermark, 5-10 oz/A. (0 days)

**APHIDS, FLEA BEETLE, THRIPS:**
Thiamethoxam

- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

- Vermark, 6.75-13.5 oz/A. (0 days)

**PLANTING TREATMENT:** Treatments are applied at seeding.

**CABBAGE MAGGOT:**
Bifenthrin

- Bifenture 10 DF, 8 to 16 oz/A.

- Brigade WSB, 8 to 16 oz. (RUP)

- Capture LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

**Chlorpyrifos**

- Chlorpyrifos 15G (4.6 to 9.3 oz/1000 row ft.) or Chlorpyrifos 4E AG (1.6 to 2.75 fl oz/1000 row ft.) (30 days) (RUP)

- Gover, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)

- Hatchet, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)

- Lorsban 15 G (4.6 to 9.2 oz/1000 row ft.) or Lorsban 4 E / Lorsban Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) or Lorsban 75 WG (1.1 to 1.8 oz/1000 row ft.) Use only as directed. Apply in a 4-inch band over row at time of seeding. (RUP)

- Nufos 4E, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)

- Saurus, 4.6 to 9.2 oz/1000 row ft. (30 days)

- Vulcan, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)

- Warhawk, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)

- Whirlwind, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)

- Vermark, 10-13.5 oz/A. (0 days)

**APHIDS, FLEA BEETLE, THRIPS:**

- Bifenture 50 WDG, 4.8 to 6.4 oz.

- Scorpion 35SL, 9 to 10.5 fl oz. (21 days)

- Thiamethoxam

- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application method.

- Vermark, 6.75-13.5 oz/A. (0 days)

**ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:**

**CABBAGE MAGGOT:**
Coragen, 3.5 to 5.0 fl oz. (3 days) See label for application methods.

- Durivo, 10 to 13 fl oz (30 days)

- Vermark, 5-10 oz/A. (0 days)

**ARMYWORM, CUTWORMS:**
Capture LFR, 3.4 to 6.8 fl oz. (RUP)

**GRUBS, WIREFORMS:**

- Bifenture 10 DF, 8 to 16 oz/A.

**SOIL TREATMENT AFTER TRANSPLANTING:** Apply to the soil at base of plants after transplanting. Apply water to wet soil surface.

**APHIDS:** Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.

- Imidacloprid

- Admire Pro, 4.4 to 10.5 fl oz. (21 days)

- Nuprid 2 F, 10 to 24 oz. (21 days)

- Sivanto, 7 - 12 fl oz/A.

**CABBAGE MAGGOT:**

- Chlorpyrifos

- Lorsban 15 G (4.6 to 9.2 oz/1000 row ft.) or Lorsban 4 E / Lorsban Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) Apply in a 4-inch band over row at time of seeding. Use only as directed. (RUP)

**ARMYWORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, IMPORTED CABBAGE WORM:**

**CABBAGE MAGGOT:**

- Chlorpyrifos

- Lorsban 15 G (4.6 to 9.2 oz/1000 row ft.) or Lorsban 4 E / Lorsban Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) Apply in a 4-inch band over row at time of seeding. Use only as directed. (RUP)

- Coragen, 3.5 to 5 fl oz. (3 days)

- Dunivo, 10 to 13 fl oz. (30 days)

**APHIDS, FLEA BEETLE, THRIPS:**

- Dunivo, 10 to 13 fl oz. (30 days)

- Thiamethoxam

- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

**LEAFHOPPERS:**
Sivanto, 7 - 10.5 fl oz/A.

**WHITEFLIES:**
Sivanto, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

**FLEA BEETLE:** Apply as needed soon after plants come up when field seeded.

- Actara, 1.5 to 3 oz. (0 days) Do not exceed 11.0 oz/Acre per season.

- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)

- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)

- Bifenthrin

- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)

- Bifenture EC, 2.1 to 6.4 oz. (7 days) (RUP)

- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)

- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)

- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

- Bifenthrin + Zeta-Cypermethrin

- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)

- Sleed, 3.5 to 4.7 fl oz. (7 days) (RUP)

- Bigadder, 3.8 to 6.1 fl oz. (7 days) (RUP)

- Carbaryl

- Carbaryl 4L, 0.5 to 1 qt. (3 days)

- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)

- Chlorpyrifos

- Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)

- Gover, 1 to 2 pt. (21 days) (RUP)

- Hatchet, 1 to 2 pt. (21 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.*
Materials marked with an asterisk are particularly recommended for problem infestations.

- **Bifenthrin + Zeta-cyhalothrin**
  - Bolton, 13 to 23 fl oz. (21 days) (RUP)
  - Cobalt, 19 to 38 fl oz. (21 days) (RUP)
- **Cypermethrin**
  - Amмо 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
  - Cypermethrin, 2.5 to 5 fl oz. (1 day) (RUP)
  - Holster, 2.5 to 5 fl oz. (1 day) (RUP)
  - UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- **Dinotefuran**
  - Scorpion 35SL, 2 to 7 fl oz. or Venom 3 to 4 oz. (1 day)
  - Exirel, 13.5-20.5 oz/A, (1)
- **Imidacloprid**
  - Admire Pro, 1.3 fl oz. (7 days)
  - Nuprid 1.6 F, 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.
- **Kryocide**, 8 to 16 lb. (7 days)
- **Lambda-cyhalothrin**
  - Lambda-Cy, 2.56 to 3.84 fl oz. (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- **Leverage 360**, 3 fl oz. (7 days) (RUP)
- **Malathion**
  - Malathion 8 (1.5 to 2.5 pt.) or Malathion 3 Aquamul (1.25 pt.) (7 days for Malathion 8; 2 days for Malathion 3 Aquamul)
  - Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
  - Perm-UP 3.2 EC, 2 to 4 oz. (1 day) (RUP)
  - Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Pyrenone, 1 to 12 fl oz. (0 days)
  - Carbaryl 4L, 0.5 to 1 qt. (3 days)
  - Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)
  - Volam Flexi, 4 to 7 oz. (3 days)
- CUTWORM, ARMYWORM: Apply when damage is first seen. Repeat as needed.
- **Bifenthrin**
  - Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
  - Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Bifenthrin + Imidacloprid**
  - Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
  - Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)
- **Bifenthrin + Zeta-Cypermethrin**
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)
- **Chlorpyrifos**
  - Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
  - Goverm, 1 to 2 pt. (21 days) (RUP)
  - Hatchet, 1 to 2 pt. (21 days) (RUP)
- **Chlorpyrifos**
  - Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
  - Goverm, 1 to 2 pt. (21 days) (RUP)
  - Hatchet, 1 to 2 pt. (21 days) (RUP)

- **Lorsban 4 E / Lorsban Advanced** (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- **Nufos 4E**, 1 to 2 pt. (21 days) (RUP)
- **Stallion**, 6.5 to 11.75 oz. (21 days) (RUP)
- **Vulcan**, 1 to 2 pt. (21 days) (RUP)
- **Warhawk**, 1 to 2 pt. (21 days) (RUP)
- **Whirlwind**, 1 to 2 pt. (21 days) (RUP)
- **Javelin** WG, 0.12 to 1.5 lb. (0 days)
- **Kryocide**, 8 to 16 lb. (7 days)
- **Leverage 360**, 3 fl oz. (7 days) (RUP)
- **Permethrin**
  - Ambush W, 6.4 oz. (1 day) (RUP)
  - Perm-UP 3.2 EC, Pounce W, 4 oz. (1 day) (RUP)
- **Pyrene, 1 to 12 fl oz. (0 days)
  - Venxin, 10 to 20 fl oz. (1 day)
- IMPORTED CABBAGE WORM: Apply treatments if >10% of plants are infested with any cabbage "worm".
- **Acephate**
  - Acephate 90 WDG (1.11 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (14 days)
  - Bracket 97, 16 oz. (14 days)
  - Orthene, 16 oz. (14 days)
- **Avantage**, 2.5 to 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.
- **Bacillus thuringiensis**
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biobit HP, 0.5 to 1 lb. (0 days)
  - DiPel DF (0.25 to 1 lb.) or DiPel (1 to 2 pt.) (0 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - XenTari, 0.5 to 1.5 lb. (0 days)
  - Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
- **Bifenthrin**
  - Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
  - Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Bifenthrin + Imidacloprid**
  - Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
  - Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)
- **Bifenthrin + Zeta-Cypermethrin**
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)
- **Carbaryl**
  - Carbaryl 4L, 1 to 2 qt. (3 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- **Chlorpyrifos**
  - Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
  - Goverm, 1 to 2 pt. (21 days) (RUP)
  - Hatchet, 1 to 2 pt. (21 days) (RUP)
  - Lorsban 4 E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)

*Always read and follow label instructions carefully.*
Brussels Sprouts

**Recommended for problem infestations.**

Many of the natural enemies of the diamondback moth are found in Brussels Sprouts, including parasitoids, predators, and fungivorous nematodes. These natural enemies can be supplemented with the use of biological control agents to manage pest populations. Biological control agents can be used in combination with chemical control measures to effectively manage pest populations without harming beneficial insects.

**DIAMONDBACK MOTH**

Apply if >10% of plants are infested with any of the following chemical control agents:

- **Carbaryl**
- **Rimon**
- **Pyrenone**
- **Cypermethrin**
- **Coragen**
- **Confirm**
- **Chlorpyrifos + Gamma**
- **Spinosad**
- **Agree**
- **Pounce**
- **Malathion 8; 2 days for Malathion 5)**
- **Warrior II with Zeon Technology**
- **Lorsban**
- **Orthene**
- **Avaunt**

**Apply if >20% of plants are infested with any of the following chemical control agents:**

- **Cypermethrin**
- **Spectrum**
- **Lannate LV**
- **Lannate SP**
- **Nudrin LV**
- **Nudrin SP**
- **Mustang Max**
- **Ambush 25 W**
- **Perm-UP 25DF**
- **Perm-UP 3.2 EC**
- **Pounce 25 WP**
- **Proxais, 1.92 to 3.2 fl oz.**
- **Proclaim, 2.4 to 4.8 oz.**
- **Pyranone, 1 to 2 fl oz.**
- **Radiant SC, 5 to 10 fl oz.**
- **Rimon 0.83EC, 6 to 12 fl oz.**
- **Carbaryl 4L, 1 to 2 qt.**
- **Sevin 4 F (1 to 2 qt.)**
- **Sevin 80 S (1.25 to 2.5 lb.)**
- **Sevin WSP (1.25 to 2.5 lb.)**
- **Sevin XLR Plus (1 to 2 qt.)**
- **Entrust SC (3 to 6 fl oz.)**
- **Vetica, 10 to 20 oz.**
- **Voliam Flexi, 4 to 7 oz.**

**DIAMONDBACK MOTH: Apply if >10% of plants are infested with any of the following chemical control agents:**

- **Carbaryl 4L, 1 to 2 qt.**
- **Sevin 4 F (1 to 2 qt.)**
- **Sevin 80 S (1.25 to 2.5 lb.)**
- **Sevin WSP (1.25 to 2.5 lb.)**
- **Sevin XLR Plus (1 to 2 qt.)**
- **Entrust SC (3 to 6 fl oz.)**
- **Vetica, 10 to 20 oz.**
- **Voliam Flexi, 4 to 7 oz.**

**DIAMONDBACK MOTH: Apply if >20% of plants are infested with any of the following chemical control agents:**

- **Cypermethrin**
- **Spectrum**
- **Lannate LV**
- **Lannate SP**
- **Nudrin LV**
- **Nudrin SP**
- **Mustang Max**
- **Ambush 25 W**
- **Perm-UP 25DF**
- **Perm-UP 3.2 EC**
- **Pounce 25 WP**
- **Proxais, 1.92 to 3.2 fl oz.**
- **Proclaim, 2.4 to 4.8 oz.**
- **Pyranone, 1 to 2 fl oz.**
- **Radiant SC, 5 to 10 fl oz.**
- **Rimon 0.83EC, 6 to 12 fl oz.**
- **Carbaryl 4L, 1 to 2 qt.**
- **Sevin 4 F (1 to 2 qt.)**
- **Sevin 80 S (1.25 to 2.5 lb.)**
- **Sevin WSP (1.25 to 2.5 lb.)**
- **Sevin XLR Plus (1 to 2 qt.)**
- **Entrust SC (3 to 6 fl oz.)**
- **Vetica, 10 to 20 oz.**
- **Voliam Flexi, 4 to 7 oz.**

**Always read and follow label instructions carefully.**

*Materials marked with an asterisk are particularly recommended for problem infestations.*
CABBAGE LOOPERS: Apply if >10% of plants are infested with any cabbage "worm". Most controls are less effective on larger worms.

**Acetate**
- Acetate 90 WDG (1.1 lb.) or Acetate 90 WSP (1.1 lb.) or Acetate 97 (1 lb.) or Acetate 97 UP (1 lb.) (14 days)
- Bracket 97, 16 oz. (14 days)
- Orthene 97, 16 oz. (14 days)
- Avent, 2.5 to 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.

**Bacillus thuringiensis**
- Agree WG, 0.5 to 2 lb. (0 days)
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- XenTari, 0.5 to 1.5 lb. (0 days)
- Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)

**Bifenthrin**
- Bifenthrin 10 DF, 5.3 to 16 oz/A. (7 days)
- Bifenthrin EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Funfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Imidacloprid**
- Bifenthrin, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

**Chlorpyrifos + Gamma-cyhalothrin**
- Bolton, 13 to 23 oz. (21 days) (RUP)
- Cobalt, 19 to 38 oz. (21 days) (RUP)
- Confirm 2F, 6 to 8 fl oz. (7 days)
- Coragen, 3.5 to 5 fl oz. (3 days)

**Cypermethrin**
- Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
- Holster, 3.75 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- Danitol 2.4 EC, 10 2/3 to 16 fl oz. (7 days) (RUP)
- Dibrom 8 Emulsive, 2 pt. (1 day) (RUP)
- Endigo ZC, 4 fl oz. (1 day) (RUP)
- Exirel, 10-17 oz/A. (1)
- Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Kryocide, 8 to 16 lb. (7 days)

**Lambda-cyhalothrin**
- Lambda-Cy, 1.92 to 3.2 fl oz. (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
- Leverage 360, 3 fl oz. (7 days) (RUP)

**Malathion**
- Malathion 5, or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion 8 Aquamul (1.25 pt.) (7 days for Malathion 8; 2 days for others)

**Methomyl**
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (3 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (3 days) (RUP)

**Mustard Max.** 3.2 to 4 oz. (1 day) (RUP)

**Permethrin**
- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3.2 EC (2 to 4 fl oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Proclaim, 3.2 to 4.8 oz. (7 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 6 to 12 fl oz. (7 days)

**Spinosad**
- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
- Stallion, 9.5 to 11.75 oz. (21 days) (RUP)
- Vetica, 10 to 20 fl oz. (1 day)
- Voltiam Flexi, 4 to 7 oz. (3 days)

**APHIDS:** Apply if needed to prevent infestations on edible parts.

**Acetate**
- Acetate 90 WDG (0.55 to 1.11 lb.) or Acetate 90 WSP (0.5 to 1.1 lb.) or Acetate 97 (0.5 to 1 lb.) or Acetate 97 UP (0.5 to 1 lb.) (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene 97, 8 to 16 oz. (14 days)

**Acelbamid**
- Assail 30 SG (2 to 4 oz.) or Assail 70WP (0.8 to 1.7 oz.) (7 days)
- Actara, 1.5 to 3 oz. (0 days)
- Belay 90 WDG, 1.6 to 2.1 oz. (7 days)
- Beleaf 50 SG, 2 to 2.8 oz. (0 days)

**Bifenthrin**
- Bifenthrin 10 DF, 5.3 to 16 oz/A. (7 days)
- Bifenthrin EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Funfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Imidacloprid**
- Bifenthrin, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 8.48 to 12.2 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

**Chlorpyrifos**
- Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
- Goverm, 1 to 2 pt. (21 days) (RUP)
- Hatchet, 1 to 2 pt. (21 days) (RUP)
- Lorsban 4E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- Nufos 4E, 1 to 2 pt. (21 days) (RUP)
- Stallion, 9.5 to 11.75 oz. (21 days) (RUP)
- Vulcan, 1 to 2 pt. (21 days) (RUP)
- Warhawk, 1 to 2 pt. (21 days) (RUP)
- Whirlwind, 1 to 2 pt. (21 days) (RUP)

**Chlorpyrifos + Gamma-cyhalothrin**
- Bolton, 9 to 13 fl oz. (21 days) (RUP)
- Cobalt, 13 to 19 fl oz. (21 days) (RUP)
- Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)
- Dimethoate
  - Dimethoate 400, Dimethoate 4E, 1 pt.. (10 days)
Brussels Sprouts

Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
Exirel, 13.5-20.5 oz/A. (1)
Fulfid, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.
Imidacloprid
  • Admire Pro, 1.3 fl oz. (7 days)
  • Nuprid 1.6 F, 3.8 fl oz. (7 days) Do not use if Imidacloprid was
    used at planting. Do not exceed 19.2 oz/Acre per season.
Leverage 360, 3 fl oz. (7 days) (RUP)

Malathion
  • Malathion 5 (1.5 to 2 pt.) or Malathion 5 EC (1 to 2 pt.) or
    Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or
    Malathion 8 Aquamul (1.25 pt.) (7 days for Malathion 5 EC & 8; 2
    days for all others)
Movento, 4 to 5 fl oz. (1 day) Must be tank mixed with adjuvant
having spreading and penetrating properties.
Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
Pyreneone, 1 to 12 fl oz. (0 days)
Sivanto, 7 - 12 fl oz/A.
Volfam Flexi, 4 to 7 oz. (3 days)

THRIPS:
Acyvataprid
  • Assail 30 SG (4 oz.) or Assail 70WP (1.7 oz.) (7 days)
Actara, 3 to 5.5 oz. (0 days)
Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
Bifenthrin
  • Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
  • Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  • Brigade @ 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  • Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  • Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  • Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  • Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
  • Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
Bifenthrin + Imidacloprid
  • Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
  • Swagger, 0.48 to 12.2 fl oz. (7 days) (RUP)
Cypermethrin
  • Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
  • Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
  • Holster, 3.75 to 5 fl oz. (1 day) (RUP)
Exirel, 13.5-20.5 oz/A. (1)
Leverage 360, 3 fl oz. (7 days) (RUP)
Pyreneone, 1 to 12 fl oz. (0 days)
Radiant SC, 6 to 10 fl oz. (1 day) Minimum of 4 days between
applications; do not apply more than 34 fl oz per season.
Rimon 0.83EC, 12 fl oz. (7 days)
Scorpion 35SSL, 2 to 7 fl oz. (1 day)
Spinosad
  • Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (1 day)
Stallion, 9.5 to 11.75 oz. (21 days) (RUP)
Volfam Flexi, 4 to 7 oz. (3 days)

ARMYWORM:
Avaunt, 3.5 oz. (3 days) Add a wetting agent to improve spray
coverage.
Bacillus thuringiensis
  • Agree WG, 0.5 to 2 lb. (0 days)
  • Biobit HP, 0.5 to 2 lb. (0 days)
  • DiPel DF (1 to 2 lb.) or DiPel ES (1 to 2 pt.) (0 days)
  • XenTari, 0.5 to 2 lb. (0 days)
Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
Carbaryl
  • Carbaryl 4L, 1 to 2 qt. (3 days)
  • Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80
    WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
Chlorpyrifos + Gamma-cyhalothrin
  • Bolton, 9 to 23 fl oz. (21 days) (RUP)
  • Cobalt, 13 to 38 fl oz. (21 days) (RUP)
Confirm 2F, 6 to 8 fl oz. (7 days)
Coragen, 3.5 to 5 fl oz. (3 days)
Cypermethrin
  • Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
  • Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
  • Holster, 3.75 to 5 fl oz. (1 day) (RUP)
  • UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)
Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
Exirel, 7-13.5 oz/A. (1)
Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small
crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
Lambda-cyhalothrin
  • Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
  • Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior
    with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
Proxair, 2.56 to 3.84 fl oz. (1 day) (RUP)
Proclain, 2.4 to 4.8 oz. (7 days) (RUP)
Radiant SC, 5 to 10 fl oz. (1 day)
Rimon 0.83EC, 6 to 12 fl oz. (7 days)
Carbaryl 4L, 1 to 2 qt. (3 days)
Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80
WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
Spinosad
  • Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (1 day)
Stallion, 9.5 to 11.75 oz. (21 days) (RUP)
Volfam Flexi, 4 to 7 oz. (3 days)

CUTWORM:
Bacillus thuringiensis
  • Biobit HP, 0.5 to 1 lb. (0 days)
  • DiPel DF, 0.5 to 1 lb. (0 days)
  • XenTari, 0.5 to 1.5 lb. (0 days)
Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
Chlorpyrifos + Gamma-cyhalothrin
  • Bolton, 9 to 18 fl oz. (21 days) (RUP)
  • Cobalt, 13 to 26 fl oz. (21 days) (RUP)
Cypermethrin
  • Ammo 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
  • Cypermethrin, 2.5 to 5 fl oz. (1 day) (RUP)
  • Holster, 2.5 to 5 fl oz. (1 day) (RUP)
  • UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
Empower, 3.5 to 8.7 lb. (7 days) (RUP)
Lambda-cyhalothrin
  • Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)
  • Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior
    with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
Methomyl
  • Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (3 days) (RUP)
  • Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (3 days) (RUP)
Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
Proclain, 1.92 to 3.2 fl oz. (1 day) (RUP)
Stallion, 6.5 to 11.75 oz. (21 days) (RUP)

LEAFHOPPERS:
Sivanto, 7 - 10.5 fl oz/A.
WHITEFLIES:
Sivanto, 10.5 - 14 fl oz/A.

*Materials marked with an asterisk are particularly recommended for problem infestations.
MITES

Bifenthrin

- Bifenture EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Bifenture 10 DF, 12.8 to 16 oz/A. (7 days)
- Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 5.12 to 6.4 fl oz. (6 days) (RUP)
- Discipline 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin

- Hero (10.3 oz.) or Hero EW (11.2 oz.) (7 days) (RUP)

DISEASES

SEEDBED TREATMENT:

- CLUBROOT (Plasmodiophora brassicae):
  - Fluzinam
    - Omega 500 F, 2.6 pt. (50 days)

TRANSPLANT DRENCH:

- CLUBROOT (Plasmodiophora brassicae):
  - Fluzinam
    - Omega 500 F, 6.45 fl oz. (50 days)

FOLIAR TREATMENT:

- BLACK ROT (Xanthomonas campestris): Apply treatment (lowest rate) in fields as soon as transplants are established.
  - Copper Ammonium Carbonate
  - Copper Count N, 1 to 2 qt. (0 days)
  - Acibenzolar-S-methyl
    - Actigard, 0.5 to 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.
    - Copper Hydroxide: 6 fl oz. (7 days)
      - Champ DP Dry Prill, 1/3 to 2/3 lb. (0 days)
      - Champ Formula 2 Flowable, 1/3 to 2/3 pt. (0 days)
      - Champ WG, 1.06 lb. (0 days)
      - Champ WP, 1 to 2 lb. (0 days)
      - ChampION, 0.5 to 0.75 lb. (0 days)
      - Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
      - Kocide 3000, 0.5-0.75 lb. (0 day)
      - Nu-Cop 50 DF, 1 lb. (0 days)
    - Copper Hydroxide + Copper Oxyclore: 8.2 fl oz. (2 days)
      - Badger SC, 1 to 1.8 pt. (0 days)
      - Badger X2, 0.5 to 0.75 lb. (0 days)
  - Copper Sulfate: 14 oz. (7 days)
    - Cuprofix Ultra 40 Disperss, 3/4 to 1 1/4 lb. (0 days)

- ALTERNARIA LEAF SPOT (Alternaria brassicae): Apply when conditions favor disease development and repeat every 7 to 10 days.
  - Azoxystrobin
    - Quadris, 6.2 to 15.4 fl oz. (0 days)
  - Mefenoxam + Chlorothalonil
    - Bravo Ultra, 1.4 lb. (7 days)
    - Bravo Weather Stik, Equus 720 SST, 1.5 pt. (7 days)
  - Difenoconazole + Cyprodinil
    - Inspire Super, 16 to 20 fl oz. (7 days)

- Brussels Sprouts

BLACK LEG (Phoma lingam): There are presently no chemicals registered for use on this disease.

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Cabbage

Materials marked with an asterisk are particularly recommended for problem infestations.

**FALL SOIL FUMIGATION (BROADCAST):**

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50°F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan. Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**PREPLANT SOIL TREATMENT:**

- **Ethrop:**
  - Apply 34 lb/A up to one week before planting and incorporate to a depth of 3 inches. (RUP)

**SOIL TREATMENT AT PLANTING:**

- **Ethrop:**
  - Mocap 15 G, 13 lb. (36 inch row spacing) Apply in a 12- to 15-inch band over the row. Do not allow material to contact the seed. (RUP)

**INSECTS**

**SEEDBED TREATMENT:** Apply treatments to soil according to directions to protect young seedlings in the seedbed before transplanting in field.

**CABBAGE MAGGOT:** Apply to seedbed surface and incorporate to 3 to 4 inches.

- **Diazinon**
  - Diazinon 50 W (4 to 6 lb.) or Diazinon AG 500 (2 to 3 qt.) or Diazinon AG600 (51 to 76.5 fl oz.). Apply only as directed. (RUP)

**WHITE RUST:**

- **Potassium phosphite/chlorothalonil**
  - Apply 34 lb/A up to one week before planting and incorporate to a depth of 3 inches.

**CABBAGE MAGGOT:**

- **Prophyt, Catamaran, Prophalan, Catamaran, Prophytan, Prophytan II, Procop, Prophyt II, Echthrin, Echthrin**
  - Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) (RUP)

**SOIL TREATMENT:**

- **APHIDS**
  - Platinum, 5 to 11 fl oz. (30 days) See label for application methods.
  - Sivanto, 7.7 to 12 fl oz/A. (0 days)

- **FLEA BEETLE, THRIPS,**
  - Scorpion 3S, 7 to 10 fl oz. (21 days) See label for application methods.

- **LEAFHOPPERS**
  - Sivanto, 7 to 10 fl oz/A.

**WHITEFLIES**

- **Sivanto, 10.5 to 14 fl oz/A.**

**TRANSPLANT WATER TREATMENT:** Treatments are applied in water around roots at time plants are set in field.

**CABBAGE MAGGOT:**

- **Diazinon**
  - Diazinon 50 W (1 to 2 lb/200 gal) or Diazinon AG 500 (4 to 8 oz/50 gal) or Diazinon AG600 (3.25 to 6.5 fl oz/50 gal) Use only as directed. (RUP)
  - Verimark, 10-13.5 oz/A. (0 days)

**ARMY WORM, CABBAGE LOOPERS, DIAMONDBACK MOTH, IMPORTED CABBAGE WORM:**

- **Coragen, 3.5 to 5 fl oz. (3 days) See label for application methods.**
  - Verimark, 5-10 oz/A. (0 days)

**PLANTING TREATMENT:** Treatments applied at seeding.

**CABBAGE MAGGOT:**

- **Bifenthrin**
  - Bifenture 10 DF, 8 to 16 oz/A.

- **Brigade WSB,** 8 to 16 oz. Apply infurrow with seed or transplant. (RUP)

**Chlorpyrifos**

- **Chlorpyrifos 15G (4.6 to 9.3 oz/1000 row ft.) or Chlorpyrifos 4E AG (1.6 to 2.75 fl oz/1000 row ft.) (30 days) (RUP)**
  - Governor, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)

- **Hatchet, 1.6 to 2.75 fl oz/1000 row ft. (30 days) (RUP)**
  - Lorsban 15 G (4.6 to 9.2 oz/1,000 row ft.) or Lorsban 4E / Lorsban Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) or Lorsban 75

**CABBAGE**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Sugar beet cyst, northern root-knot and root-lesion nematodes can reduce cabbage yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for cabbage, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of sugar beet cyst, root-knot and lesion nematodes in cabbage production. It is best not to plant cabbage on land infested with sugar beet cyst nematodes.

**FALL SOIL FUMIGATION (BROADCAST):**

15-3-3

- Telone II, 25 g/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50°F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan. Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**PREPLANT SOIL TREATMENT:**

- **Ethrop**
  - Mocap 15 G, 13 lb. (36 inch row spacing) Apply in a 12- to 15-inch band over the row. Do not allow material to contact the seed. (RUP)

**CABBAGE**

**Cercospora leaf spot (Cercospora beticola):**

- *Fenamidone*
  - *Reason* 500 SC, 8.2 fl oz. (2 days) Suppression. 12 hr REI.

- *Pyraclostrobin*
  - *Cabrio,* 12-16 oz. (0 days)

**WHITE RUST:**

- *Fenamidone*
  - *Reason* 500 SC, 8.2 fl oz. (2 days) 12 hr REI.

- *Pyraclostrobin*
  - *Cabrio,* 12-16 oz. (0 days)

Cabbage

**SOIL TREATMENT AT PLANTING:**

- **Ethrop**
  - Mocap 15 G, 13 lb. (36 inch row spacing) Apply in a 12- to 15-inch band over the row. Do not allow material to contact the seed. (RUP)
Materials marked with an asterisk are particularly recommended for problem infestations.

**APHIDS, FLEA BEETLE, THRIPS:** Durivo, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)
APHIDS:
- *Saurus*, 4.6 to 9.2 oz/1,000 row ft. (30 days) (RUP)
- *Vulcan*, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)
- Warhawk, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)
- Whirlwind, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)

**ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS:**
Coragen, 3.5 to 5 fl oz. (3 days) See label for application methods.
Durivo, 10 to 13 fl oz. (30 days)
Vermark, 5-10 oz/A. (30 days)

**APHIDS, FLEA BEETLE, THRIPS:**
- *Durivo*, 4.8 to 6.4 oz.
- Scorpion 35SL, 9 to 10.5 fl oz. (21 days)
- *Scorpion*

**APHIDS:**
- *Chlorpyrifos*
  - Chlordane 4E AG, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - *Goverm*, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - *Hatchet*, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - *Lorsban 4E* / *Lorsban Advanced* (1.2 fl oz/1000 row ft.) or *Lorsban 75 WDG* (0.8 oz/1000 row ft.) (30 days) (RUP)
  - *Nufos 4E*, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - *Vulcan*, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Warhawk, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - Whirlwind, 1.2 fl oz/1000 row ft. (30 days) (RUP)
  - *Sivanto*, 7 - 12 fl oz/A.
  - *Vermark*, 6.75-13.5 oz/A. (0 days)

**GRUBS, WIREWORMS:**
- Bifenture 10 DF, 8 to 16 oz/A.

**ARMYWORM, CUTWORM:**
- Capture LFR, 3.4 to 6.8 oz. (RUP)
LEAFHOPPERS:
- *Sivanto*, 7 - 10.5 fl oz/A.

**WHITEFLIES:**
- *Sivanto*, 10.5 - 14 fl oz/A.

**SOIL TREATMENT AFTER TRANSPLANTING:**
APHIDS: Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.
- *Imidacloprid*, Additional generic brands available.
  - *Admire Pro*, 4.4 to 10.5 fl oz. (21 days)
  - *Nuprid 2 F*, 10 to 24 oz. (21 days)
  - *Sivanto*, 7 - 12 fl oz/A.

**CABBAGE MAGGOT:** Apply to the soil at base of plants after transplanting. Apply water to wet soil surface.
- *Chlorpyrifos*
  - *Lorsban 15 G* (4.6 to 9.2 oz/1,000 row ft.) or *Lorsban 4E* / Lorsban Advanced (1.6 to 2.75 fl oz/1,000 row ft.) Apply in a 4-inch band over row at time of seeding. Use only as directed. (RUP)

**ARMYWORM, CABBAGE LOOPERS, CORN EARWORM, DIAMONDBACK MOTH, IMPORTED CABBAGE WORM:**
Coragen, 3.5 to 5 fl oz. (3 days)
Durivo, 10 to 13 fl oz. (30 days)

**FOLIAR TREATMENT:**
FLEA BEETLE: Apply as needed soon after plants come up.
- *Actara*, 1.5 to 3 oz. (0 days)
- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
- *Belay*, . (14 days)
- *Belay* 50 WDG, 1.6 to 2.1 oz. (7 days)

**Bifenthrin**
- *Bifenture* 10 DF, 5.3 to 16 oz/A. (7 days)
- *Bifenture* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Brigade* @ 2EC (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) (7 days) (RUP)
- *Capture* 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Discipline* 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Sniper*, 2.1 to 6.4 fl oz. (7 days) (RUP)
- *Tundra* EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
Bifenthrin + *Zeta-Cypermethrin*
- *Hero* (4 to 10.3 oz.) or *Hero EW* (4.5 to 11.2 oz.) (7 days) (RUP)
- *Steed*, 3.5 to 4.7 fl oz. (7 days) (RUP)
- *Brigadier*, 3.8 to 6.1 fl oz. (7 days) (RUP)

**Carbaryl**
- *Carbaryl 4L*, 0.5 to 1 qt. (3 days)
- *Sevin 4 F* (0.5 to 1 qt.) or *Sevin 80 S* (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or *Sevin XLR Plus* (0.5 to 1 qt.) (3 days)

**Chlorpyrifos**
- *Hatchet*, 1 to 2 pt. (21 days) (RUP)
- *Lorsban 4E* / Lorsban Advanced (1 to 2 pt.) or *Lorsban 75 WDG* (0.67 to 1.33 lb.) (21 days) (RUP)
- *Whirlwind*, 1 to 2 pt. (21 days) (RUP)

**Cypermethrin**
- *Ampho* 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- *Cypermethrin*, 2.5 to 5 fl oz. (1 day) (RUP)
- *Holster*, 2.5 to 5 fl oz. (1 day) (RUP)
- *UP-Cyde* 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)

**Esfenvalerate**
- *Adjourn*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *S-FenvalStar*, 5.8 to 9.6 fl oz. (3 days) (RUP)
- *Exirel*, 13.5-20.5 oz/A. (1)

**Imidacloprid**, Additional generic brands available.
- *Admire Pro*, 1.3 fl oz. (7 days)
- *Nuprid 1.6 F*, 3.8 fl oz. (7 days)

Do not exceed 1.0 oz/Acre per season.
Kryocide, 8 to 16 lb. (14 days)

**Lambda-cyhalothrin**
- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- *Larvin*, 8 to 16 lb. (14 days)

**Leverage 360**, 3 fl oz. (7 days) (RUP)
*Malathion*
- *Malathion 8* (1.5 to 2.5 pt.) or *Malathion 8 Aquamul* (1.25 pt.) (7 days)
- *Mustang Max*, 2.24 to 4 oz. (1 day) (RUP)

Always read and follow label instructions carefully.
Cabbage

Recommended for problem infestations. Any cabbage "worm" before heading or if >10% are infested at or after heading is needed.

Baythroid coverage. Avaunt*

Warrior

Vetica

Pyrenone

Permethrin

Javelin

Chlorpyrifos

Bifenthrin + Imidacloprid

Brigadier

Swagger

Bifenthrin + Zeta-Cypermethrin

Hero

Steed

Carbaryl

Chlordimeformos

Ammo

Cypermethrin

Holster

UP-Cyte

Danitol

Diazinon

Dibrom

Endigo

Esfenvalerate

Adjourn

Asana XL

S-FenvalStar

Exirel

Intrepid 2F

Lambda-Cy

Warrior II

Warrior with Zeon Technology

Lambda

Loral

Lannate...
**Materials marked with an asterisk are particularly recommended for problem infestations.**

<table>
<thead>
<tr>
<th>Insect</th>
<th>Active Ingredient</th>
<th>Coverage</th>
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<tbody>
<tr>
<td><strong>Cabbage</strong></td>
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<tr>
<td>Pyrene</td>
<td>0.5 to 2 lb. (0 days)</td>
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<tr>
<td>Roof</td>
<td>1 to 2 lb. (0 days)</td>
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<tr>
<td>Carbaryl 4L</td>
<td>1 to 2 qt. (3 days)</td>
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<tr>
<td>Sevin 4F</td>
<td>1 to 2 qt.</td>
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<tr>
<td>Sevin 80</td>
<td>1.25 to 2.5 lb.</td>
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<tr>
<td>Sevin XLR Plus</td>
<td>1 to 2 qt. (3 days)</td>
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<tr>
<td>*Entrust</td>
<td>1 to 2 oz.</td>
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<tr>
<td>*Entrust SC</td>
<td>3 to 6 fl oz.</td>
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<tr>
<td>*Voliam Flexi</td>
<td>4 to 7 oz. (3 days)</td>
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| **DIAMONDBACK MOTH:** Apply if 20% or more are infested with any cabbage "worm" before heading or if >10% are infested at any heading. Use Bacillus thuringiensis to avoid killing important natural enemies of diamondback moth.  
- *Avant*, 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.  
- *Coragen*, 3.5 oz. (3 days)  
- *Entrust*, 0.5 to 1.25 oz. (1 day) | |
| *Acetamiprid* | | |
| *Assail 30 SG*, 4 oz. (7 days) | Suppression only |
| *Assail 70WP*, 1.7 oz. (7 days) | Suppression only |
| **Bacillus thuringiensis** | | |
| *Agree WSG*, 0.5 to 2 lb. (0 days) | |
| *Bifenture DF*, 0.25 to 1 lb. (0 days) | |
| *DiPel DF*, 0.25 to 1 lb. | |
| *Javelin WG*, 1.0 oz. (3 days) | |
| *XenTari*, 0.5 to 1 lb. (3 days) | |
| Baythroid XL | 2.4 to 3.2 oz. (0 days) | (RUP) |
| *Bifenthrin* | | |
| *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Brigade EC* @ 2 EC (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) | (7 days) (RUP) |
| *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Sniper*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| **Bifenthrin + Imidacloprid** | | |
| *Brigadier*, 3.8 to 6.1 fl oz. (7 days) | (RUP) |
| *Swagger*, 8.48 to 12.2 fl oz. (7 days) | (RUP) |
| **Bifenthrin + Zeta-Cypermethrin** | | |
| *Hero*, 10 to 12 oz. (7 days) | (RUP) |
| *Steed*, 3.5 to 4.7 fl oz. (7 days) | (RUP) |
| Bifenture 10 DF, 5.3 to 16 oz/A. (7 days) | |
| **Carbaryl** | | |
| *Carbaryl 4L*, 1 to 2 qt. (3 days) | |
| *Sevin 4F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days) | |
| Diazinon AG 500 | 0.5 to 1 pt. (21 days) | (RUP) |
| *Diromb* Emulsive, 1 pt. (1 day) | (RUP) |
| Endigo ZC, 4 to 4.5 fl oz. | (1 day) (RUP) |
| Exirel, 7-13 oz/A. (1) | |
| Kryocide, 8 to 16 lb. (14 days) | |
| Lambda-cyhalothrin | | |
| *Lambda-Cy*, 2.5 to 3.84 fl oz. (1 day) | (RUP) |
| *Warrior II* with *Zeon Technology* (1.28 to 1.92 fl oz.) or *Warrior* with *Zeon Technology* (2.56 to 3.84 fl oz.) (1 day) (RUP) | |
| Lariin 3.2, 24 to 40 fl oz. (7 days) | (RUP) |
| Lorsban 75 WG, 0.67 to 1.33 lb. (21 days) | (RUP) |
| Malathion | | |
| *Malathion 5*, *Malathion 5 EC*, 2 pt. | (7 days) |
| *Methomyl* | | |
| *Lannate LV* (1.5 to 3 pt.) or *Lannate SP* (0.5 to 1 lb.) (1 day) | (RUP) |
| *Nudrin LV* (1.5 to 3 pt.) or *Nudrin SP* (0.5 to 1 lb.) (1 day) | (RUP) |
| Mustang Max, 2.24 to 4 oz. (1 day) | (RUP) |
| **Permethrin** | | |
| *Ambush 25 W*, 3.2 to 12.8 oz. (1 day) | (RUP) |
| *Perm-UP* 25DF (3.2 to 12.8 oz.) or *Perm-UP* 3.2 EC (2 to 8 oz.) (1 day) | (RUP) |
| *Pounce* 25 WP, 3.2 to 12.8 oz. (1 day) | (RUP) |
| *Proaxis*, 2.56 to 3.84 fl oz. (1 day) | (RUP) |
| *Proclaim*, 2.4 to 4.8 oz. (7 days) | (RUP) |
| *Pyreneone*, 1 to 12 fl oz. (0 days) | |
| Radiant SC, 5 to 10 fl oz. (1 day) | |
| *Rimon 0.83EC*, 6 to 12 fl oz. (7 days) | |
| Carbaryl 4L, 1 to 2 qt. (3 days) | |
| *Sevin 4F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin 80 WSP* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (3 days) | |
| *Spinosad* | | |
| *Entrust* (0.5 to 1.25 oz.) or *Entrust SC* (1.5 to 4 fl oz.) (1 day) | (RUP) |
| *Voliam Flexi*, 4 to 7 oz. (3 days) | |
| **CABBAGE LOOPERS:** Apply if 20% or more are infested with any cabbage "worm" before heading or if >10% are infested at any heading. Most controls are less effective on larger worms.  
- *Coragen*, 3.5 to 5 fl oz. (3 days)  
- *Radiant SC*, 5 to 10 fl oz. (1 day)  
- *Avant*, 2.5 to 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.  
- *Bacillus thuringiensis* | |
| *Agree WGS*, 0.5 to 2 lb. (0 days) | |
| *Bifenture DF*, 0.5 to 1 lb. (0 days) | |
| *DiPel DF* (0.25 to 1 lb.) or *DiPel ES* (1 to 2 pt.) (0 days) | |
| *Javelin WG*, 0.12 to 1.5 lb. (0 days) | |
| *XenTari*, 0.5 to 1 lb. (0 days) | |
| *Baythroid XL*, 1.6 to 2.4 fl oz. (0 days) | (RUP) |
| **Bifenthrin** | | |
| *Bifenture 10 DF*, 5.3 to 16 oz/A. (7 days) | |
| *Bifenture EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Brigade EC* @ 2 EC (2.1 to 6.4 fl oz.) or *Brigade WSB* (5.3 to 16 oz.) | (7 days) (RUP) |
| *Capture 2 EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Discipline 2EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Fanfare 2EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Sniper*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| *Tundra EC*, 2.1 to 6.4 fl oz. (7 days) | (RUP) |
| **Bifenthrin + Imidacloprid** | | |
| *Brigadier*, 3.8 to 6.1 fl oz. (7 days) | (RUP) |
| *Swagger*, 8.48 to 12.2 fl oz. (7 days) | (RUP) |
| **Bifenthrin + Zeta-Cypermethrin** | | |
| *Hero*, 4 to 10.3 oz. | |
| *Steed*, 3.5 to 4.7 fl oz. (7 days) | (RUP) |
| *Conform 2F*, 6 to 8 fl oz. (7 days) | |
| **Cypermethrin** | | |
| *Ammo 2.5 EC*, 3.75 to 5 fl oz. (7 days) | (RUP) |
| *Cypermethrin*, 3.75 to 5 fl oz. (7 days) | (RUP) |
| *Holster*, 3.75 to 5 fl oz. (7 days) | (RUP) |
| *UP-Cyde 2.5 EC*, 3.75 to 5 fl oz. (7 days) | (RUP) |
| Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) | (RUP) |
| *Diromb* Emulsive, 2 pt. (1 day) | (RUP) |
| *Endigo ZC*, 4 fl oz. (1 day) | (RUP) |
**Cabbage**

- **Esfenvalerate**
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - S-FenvaloStar, 5.8 to 9.6 fl oz. (1 day) (RUP)

- **Bifenthrin + Imidacloprid**
  - Belay
  - Actara
  - Acetamiprid
  - Rimon
  - Pyrenone
  - Proclaim
  - Permethrin
  - Methomyl
  - Malathion
  - Larvin

- **Lambda-cyhalothrin**
  - Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
  - Larvin 3.2, 24 to 40 fl oz. (7 days) (RUP)

- **Leverage 360**, 3 fl oz. (7 days) (RUP)

- **Malathion**
  - Malathion 5, Malathion 5 EC, or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion 8 Aquamul (1.25 pt.) (7 days)

- **Methomyl**
  - Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
  - Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
  - Mustang Max, 3.2 to 4 oz. (1 day) (RUP)

- **Permethrin**
  - Ambush 25 W, 3.2 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (1 day) (RUP)
  - Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)
  - Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
  - Proclaim, 3.2 to 4.8 oz. (7 days) (RUP)
  - Pyreneone, 1 to 12 fl oz. (0 days)
  - Rimon 0.83EC, 6 to 12 fl oz. (7 days)

- **Spinosad**
  - Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
  - Velga, 10 to 20 fl oz. (1 day)
  - Voltiac Flexi, 4 to 7 oz. (3 days)

- **APHISD: Apply if there are >5 per plant.**

- **Acetamiprid**
  - Assail 30 SG (2 to 4 oz.) or Assail 70WP (0.8 to 1.7 oz.) (7 days)
  - Actara, 1.5 to 3 oz. (0 days)
  - Actara, 1.5 to 3 oz. (0 days)
  - Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
  - Beleaf 50 SG, 2 to 2.8 oz. (0 days)

- **Bifenthrin**
  - Bifenthrin EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (6.3 to 16 oz.) (7 days) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

- **Bifenthrin + Imidacloprid**
  - Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
  - Swagger, 0.48 to 12.2 fl oz. (7 days) (RUP)

- **Cypermethrin**
  - Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
  - Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
  - Holster, 3.75 to 5 fl oz. (1 day) (RUP)
  - UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)

- **Exirel, 13.5-20.5 oz/A. (1)**
  - Hero, 10.3 oz. (7 days) (RUP)
  - Leverage 360, 3 fl oz. (7 days) (RUP)
  - Pyreneone, 1 to 12 fl oz. (0 days)

- **Rimon 0.83EC, 6 to 12 fl oz. (7 days) (RUP)**

- **Scorpion 3SSL, 2 to 7 fl oz. (1 day)**

- **Spinosad**
  - Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (1 day)
  - Voltiac Flexi, 4 to 7 oz. (3 days)

- **CUTWORM:**

  - **Bacillus thuringiensis**
    - Biobit HP, 0.5 to 1 lb. (0 days)
    - DiPel DF, 0.5 to 1 lb. (0 days)
    - XenTari, 0.5 to 1.5 lb. (0 days)
    - Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.*

*Always read and follow label instructions carefully.
**Materials marked with an asterisk are particularly recommended for problem infestations.**

**ARMYWORM:**
- WSP
- Sevin
- Carbaryl
- Rimon
- Radiant
- Proclaim
- Proaxis
- Methomyl
- Larvin
- Lambda (crops)
- or 8 to 10 fl oz (mid season applications)
- Endigo
- Danitol
- Cypermethrin
- Coragen
- Carbaryl
- or 8 to 10 fl oz (7 days) (RUP)
- Mustang Max.
- or 8 to 10 fl oz (1 day) (RUP)
- Proaxis
- or 8 to 10 fl oz (1 day) (RUP)
- Proclaim
- or 8 to 10 fl oz (7 days) (RUP)
- Radiant SC
- or 8 to 10 fl oz (1 day)
- Rimon 0.83EC
- or 8 to 12 fl oz. (7 days)
- Carbaryl 4L
- or 8 to 10 fl oz (3 days)
- Sevin 4 F
- or 8 to 10 fl oz (1 day)
- or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

**Esfenvalerate**
- Adjourn
- or 8 to 10 fl oz (3 days) (RUP)
- Asana XL
- or 8 to 10 fl oz (3 days) (RUP)
- S-Fenvalstar
- or 8 to 10 fl oz (3 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy
- or 8 to 10 fl oz (1 day) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

**Methomyl**
- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (1 day) (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (1 day) (RUP)
- Mustang Max.
- 2.24 to 4 oz. (1 day) (RUP)
- Proaxis
- 1.92 to 3.2 fl oz. (1 day) (RUP)
- Steed
- 3.5 to 4.7 fl oz. (7 days) (RUP)

**ARMYWORM**:
- Avant
- 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.

**Bacillus thuringiensis**
- Agree WG
- 0.5 to 2 lb. (0 days)
- Biobit HP
- 0.5 to 2 lb. (0 days)
- DiPel DF
- (1 to 2 lb.) or DiPel ES (2 to 4 pt.) (0 days)
- XenTari
- 0.5 to 2 lb. (0 days)
- Baythroid XL
- 2.4 to 3.2 fl oz. (0 days) (RUP)
- Carbaryl
- 0.5 to 1 lb. (0 days)
- or 8 to 10 fl oz (mid- to late season applications). (1 day)
- Confirm 2F
- 8 to 10 fl oz. (7 days)
- Coragen
- 3.5 to 6 fl oz. (3 days)

**Cypermethrin**
- Ammo 2.5 EC
- 3.75 to 5 fl oz. (1 day) (RUP)
- Cypermethrin
- 3.75 to 5 fl oz. (1 day) (RUP)
- Holster
- 3.75 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC
- 3.75 to 5 fl oz. (1 day) (RUP)
- Daconil 2.4 EC
- 10.66 to 16 fl oz. (7 days) (RUP)
- Endigo ZC
- 4 to 4.5 fl oz. (1 day) (RUP)
- Proclaim
- 1.92 to 3.2 fl oz. (1 day) (RUP)
- Rimon 0.83EC
- or 8 to 12 fl oz (7 days)
- Carbaryl 4L
- or 8 to 10 fl oz (3 days)
- Sevin 4 F
- or 8 to 10 fl oz (1 day)
- or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

**Spinosad**
- Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (1 day)
- Voliam Flexi
- 4 to 7 oz. (3 days)

**SWEET POTATO WHITEFLY**,
**SILVER LEAF WHITEFLY**:

**Acetamiprid**
- Assail 30 SG
- 2.5 to 4 oz. (7 days)
- Assail 70WP
- 1.1 to 1.7 oz. (7 days)
- Endrin 13.5-20.5 oz/A. (1)

**LEAFHOPPER**:
- Svanto
- 7 - 10.5 fl oz/A.
- WHITEFLIES:
- Svanto
- 10.5 - 14 fl oz/A.

**MITES**

**Bifenithrin**
- Bifenture EC
- 5.12 to 6.4 fl oz. (7 days) (RUP)
- Bifenture 10 DF
- 12.8 to 16 oz/A. (7 days)
- Brigade @ 2EC
- 5.12 to 6.4 fl oz. (7 days) (RUP)
- Capture 2 EC
- 5.12 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC
- 5.12 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC
- 5.12 to 6.4 fl oz. (7 days) (RUP)
- Sniper
- 5.12 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC
- 5.12 to 6.4 fl oz. (7 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
- or 8 to 10 fl oz (1 day)

**SLUGS**
- Deadline M-Ps
- 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb) Apply between rows. Avoid contact to edible product.

**DISEASES**

**SEED TREATMENT**:

**DAMPING OFF**,
**WIRE STEM** (**Pythium** spp., **Rhizoctonia solani**):
- Captan
- Captan 4 Flowable
- 2.2 fl oz/100 lb seed.
- Fludioxonil
- Maxim 4 FS
- 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only (**Rhizoctonia**.
- Mefenoxam
- Apron XL
- 0.085 - 0.64 fl oz/100 lb seed (**Pythium**). (0 days)

**Thiram**
- 42-S Thiram
- Thiram 480DP, Thiram 50 WP Dyed, 8 oz/100 lb seed.

**BLACK LEG** (**Phoma lingam**): There are presently no chemicals registered for use on this disease.

**SEEDBED TREATMENT**:
- Apply treatments to soil according to directions to protect young seedlings in the seedbed before transplanting in field.

**CLUBROOT** (**Plasmodiophora brassicae**):
- Fluzinam
- Omega 500 F
- 2.6 pt. (50 days)

**DAMPING OFF** (**Pythium** spp.),
**BASAL STEM ROT** (**Phytophthora** spp.):
- Mefenoxam
- Apply as a broadcast preplant incorporation or surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.
- Ridomil Gold SL
- 0.25-0.5 pt (**Pythium**) 1-2 pt (**Phytophthora**),
- Ridomil Gold WSP
- 1 to 2 lb (1/4 to 1/2 lb, surface application, **Pythium** only).

*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label instructions carefully.
Cabbage

**FOLIAR TREATMENT:**

Cabbage recommended for problem infestations. Conditions favor disease development and repeat every 7 to 10 days.

**CLUBROOT** (*Plasmodiophora brassicae*): Apply treatment (lowest rate) in the field as soon as transplants are established.

- **Copper Ammonium Carbonate**
  - Copper Count N, 1 to 2 qt. (0 days) Flecking of wrapper leaves may occur.

**Copper Hydroxide**

- Champ DP Dry Prill, 0.33 to 0.67 lb. (0 days)
- Champ Formula 2 F, 0.33 to 0.66 pt. Flecking of wrapper leaves may occur.
- Champ WG, 1.06 lb. (0 days)
- ChampION, 0.5 to 0.75 lb. (0 days)
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 day)
- Nu-Cop 3 L, 2/3 to 1 1/3 pt. (0 days)
- Nu-Cop 50 DF, 1 lb. (0 days) Flecking of wrapper leaves may occur.

**Copper Hydroxide + Copper Oxychloride**

- Badge SC, 1 to 1.8 pt. (0 days)
- Badge X2, 0.5 to 0.75 lb. (0 days)

**ALTERNARIA LEAF SPOT** (*Alternaria brassicae*): Apply when conditions favor disease development and repeat every 7 to 10 days.

- **Azoxystralin**
  - Quadris, 6.2 to 15.4 fl oz. (0 days)
  - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- **Azoxystralin + Difenconazole**
  - Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
- **Chlorothalonil**
  - Bravo Ultrex, 1.4 lb. (7 days)
  - Bravo Weather Stik, Equus 720 SST, 1.5 pt. (7 days)
  - Difenconazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)
- **Boscalid**
  - Endura, 6 to 9 oz. (0 days)

**Copper Ammonium Carbonate**

- Copper Count N, 1 to 2 qt. (0 days) Flecking of wrapper leaves may occur.

**Copper Hydroxide**

- Champ DP Dry Prill, 0.33 to 0.67 lb. (0 days)
- Champ Formula 2 F, 0.33 to 0.66 pt. (0 days) Flecking of wrapper leaves may occur.
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 day)
- Nu-Cop 3 L, 2/3 to 1 1/3 pt. (0 days) Minimum of 25 GPA.
- Nu-Cop 50 DF, 1 lb. (0 days) Flecking of wrapper leaves may occur.

**Copper Hydroxide + Copper Oxychloride**

- Badge SC, 1 to 1.8 pt. (0 days)
- Badge X2, 0.5 to 0.75 lb. (0 days)

**Cuprofix Ultra 40 Disperss**, 3/4 to 1 1/4 lb. (0 days)

**Cercospora leaf spot** (*Cercospora beticola*): Apply when conditions favor disease development and repeat every 7 to 10 days.

- **Amenoctradin + Dimethomorph**
- **Zampro, 14 fl oz. (7 days)**
- **Fluopicolide**
  - Presidio, 3-4 fl oz. (2 days) Must tank mix with other fungicide.
- **Tosyl-Aluminum**
  - Aliette WDG, 2 to 5 lb, 7- to 21-day intervals. (3 days) Do not tank mix with copper fungicides.
- **Mefenoxam + Chlorothalonil**
  - Ridomil Gold Bravo, 1 1/2 pt, 14-day intervals. (7 days) Cabbage and tight-headed Chinese cabbage. Do not tank mix with copper fungicides.
- **Mefenoxam + Chlorothalonil**
  - Ridomil Gold Bravo, 1 1/2 pt, 14-day intervals. (7 days) Cabbage and tight-headed Chinese cabbage. Maximum 4 applications.
- **Cuprofix Ultra 40 Disperss**
  - Switch 62.5 WG, 11 to 14 oz. (7 days)
  - Bacillus amyloliquefaciens FZB 42
  - Bacillus subtilis var. amyloliquefaciens FZB 42
  - Bacillus subtilis var. amyloliquefaciens FZB 42

**Downy Mildew** (*Peronospora parasitica*): Apply when conditions favor disease development and repeat every 7 to 10 days.

- **Amenoctradin + Dimethomorph**
- **Zampro, 14 fl oz. (7 days)**
- **Fluopicolide**
- **Tosyl-Aluminum**
- **Aliette WDG, 2 to 5 lb, 7- to 21-day intervals. (3 days) Do not tank mix with copper fungicides.**
- **Mefenoxam + Chlorothalonil**
- **Ridomil Gold Bravo, 1 1/2 pt, 14-day intervals. (7 days) Cabbage and tight-headed Chinese cabbage. Maximum 4 applications.**

**Cuprofix Ultra 40 Disperss**

- Bacillus amyloliquefaciens FZB 42

- **Fluopicolide**
  - Presidio, 3-4 fl oz. (2 days) Must tank mix with other fungicide.
  - **Tosyl-Aluminum**
  - Aliette WDG, 2 to 5 lb, 7- to 21-day intervals. (3 days) Do not tank mix with copper fungicides.
  - **Mefenoxam + Chlorothalonil**
  - Ridomil Gold Bravo, 1 1/2 pt, 14-day intervals. (7 days) Cabbage and tight-headed Chinese cabbage. Maximum 4 applications.
  - **Cuprofix Ultra 40 Disperss**
  - Switch 62.5 WG, 11 to 14 oz. (7 days)

**Mefenoxam**

- **Reason 500 SC, 5.5 - 8.2 fl oz. (2 days) No more than 1 application before alternating. 12 hr REI.**

**Cuprofix Ultra 40 Disperss**

- **Mecoprop-P</p>
Carrots

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES
Northern root-knot, pin and carrot cyst nematodes severely reduce carrot quality and yields. Crop rotation is an essential part of nematode management in carrot production in Michigan. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present, crop rotation or application of a nematicide will be recommended. The following nematicides are suitable for control of root-knot nematodes in carrot production.

**FALL SOIL FUMIGATION (BROADCAST):**
- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).
- Fumigate in the fall when soil temperatures at a 6-inch depth are above 50°F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations, soil fumigants can be applied in the spring in Michigan.
- Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**PREPLANT TREATMENT:**
- OxaMyl, Vydant L, Broadcast. Apply 2 gal in a minimum of 20 gallons of water as a broadcast treatment. Apply within one week of planting and thoroughly incorporate to a depth of 4 to 6 inches. (RUP)

**PLANTING TREATMENT:**
- OxaMyl, Vydant L, in-row. Apply 1 to 2 gal in a minimum of 20 gallons of water in the seed furrow at planting. (RUP)

**POST-PLANT TREATMENT:**
- OxaMyl, Vydant L, Broadcast. Apply 2 gal/A in at least 20 gal water/A before emergence. Incorporate into the soil. (RUP)

**SOIL TREATMENT:**
APHIDS, LEAFHOPPERS:
- Sivanto, 7 - 10.5 fl oz/A.
WHITEFLIES:
- Sivanto, 10.5 - 14 fl oz/A.

**PRE-PLANT TREATMENT:**
WIREWORM: May be found in grassy or weedy fields. If wireworm are present, apply evenly to the soil surface and incorporate 4 to 8 inches deep prior to planting.
- Diazinon
  - Diazinon 50 W (6 to 8 lb.), or Diazinon AG 500 (3 to 4 qt.) or Diazinon AG600 (76.5 to 102 fl oz.) Preplant soil application only. (RUP)

CUTWORM:
- Diazinon
  - Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) Use only as directed. (RUP)

**FOLIAR TREATMENT:**
CUTWORM: Apply when cutworm are first seen.
- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
- Esfenvalerate
- Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (7 days) (RUP)

**LEAFHOPPERS (Aster yellows):** Treat fields if numbers exceed 20/100 sweeps. Repeat as needed (every 3 to 6 days) depending on the number of leafhoppers.
- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
- Esfenvalerate
- Asana XL, 9.6 fl oz. (7 days) Ground application only. (RUP)
- S-FenvaloStar, 9.6 fl oz. (7 days) (RUP)
- S-FenvaloStar, 9.6 fl oz. (7 days) (RUP)

Always read and follow label instructions carefully.

*Materials marked with an asterisk are particularly recommended for problem infestations.
Carrots

Recommended for problem infestations.

FLEA BEETLE:

- Bifenthrin + Zeta Baythroid
- Pyrenone
- Malathion
- Leverage (0.5 to 1 qt. per season)
- Imidacloprid

ARMYWORM, CUTWORM:

- Carbaryl
- Spinosad
- Bacillus thuringiensis

TARNISHED PLANT BUG:

- Imidacloprid
- Endosulfan
- Cypermethrin

*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label Instructions carefully.
**Carrots**

- **Javelin WG**, 0.12 to 1.5 lb. (0 days)
- **Pyrenone**, 1 to 12 fl oz. (0 days)
- **Carbaryl 4L**, 1 to 2 qt. (7 days)
- **Sevin 4 F** (1 to 2 qt.) or **Sevin 80 S** (1.25 to 2.5 lb.) or **Sevin XLR** Plus (1 to 2 qt.) (7 days)

**THIRPS:**
- **Blackhawk**, 1.7-3.3 oz/A. (7 days) Add adjuvant

**LEAFHOPPERS:**
- **Sivanto**, 7 - 10.5 fl oz/A.
- **WHITEFLIES:**
  - Sivanto, 10.5 - 14 fl oz/A.

**MITES**
- **Bifenthrin**
  - **Bifenture EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - **Bifenture 10 DF**, 12.8 to 16 oz/A. (21 days)
  - **Brigade @ 2EC** (5.12 to 6.4 fl oz.) or **Brigade WSB** (12.8 to 16 oz.) (21 days) (RUP)
  - **Fanfare 2EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - **Sniper**, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - **Bifenthrin + Zeta-Cypermethrin**
    - **Hero** (10.3 oz.) or **Hero EW** (11.2 oz.) (21 days) (RUP)

**DISEASES**

**SEED TREATMENT:**
- **DAMPING OFF (Pythium spp., Rhizoctonia solani)**: Use only as directed; overtreatment may cause injury.
  - **Fludioxonil**
    - **Maxim 4 FS**, 0.08 to 0.16 fl oz/100 lb seed. Commercial seed treatment plants only (Rhizoctonia).
    - **Maxim XL**, 0.167 to 0.334 fl oz/100 lb seed.
    - **Mefenoxam**
      - **Apron XL LS**, 0.32 to 0.64 fl oz/100 lb seed (Pythium).
      - **Metalaxyl**
        - **Allegiance-FL**, 0.75 fl oz/100 lb seed.
      - **Thiram**
        - 42-S Thiram, **Thiram 480DP**, **Thiram 50 WP Dyded**, 8 oz/100 lb seed.

**PREPLANT INCORPORATED:**
- **CAVITY SPOT (Pythium viola):**
  - **Fluopicolide**
    - **Presidio**, 4 fl oz/100 lb seed. (7 days) Must be tanked mixed with labeled product active against target pathogen.
  - **Mefenoxam**
    - **Ridomil Gold SL**, 0.5-1.3 pt.

**PREPLANT OR PLANTING TREATMENT:**
- **CAVITY SPOT (Pythium spp. and Phytophthora spp.):**
  - **Mefenoxam**
  - **Ridomil Gold SL**, 1-2 pt. Please see label for application procedures
  - **Ultra Flourish**, 2 to 4 pt.

**FOLIAR TREATMENT:**
- **POWDERY MILDEW (Sphaerotheca fuliginea or Erysiphe cichoracearum)**: Apply at early leaf stage and repeat every 14 days.
  - **Penthiopyrad**
  - **Fontelis**, 16 - 30 fl oz. (0 days)
  - **Pyraclostrobin/Boscalid**
  - **Pristine**, 8 to 10.5 oz. (0 days)
  - **Trifloxystrobin**
  - **Flirt**, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

**Fluxapyroxad + Pyraclostrobin**
- **Merivon Xemium Brand Fungicide**, 4 - 5.5 fl oz. (7 days)
- **Neem Oil**
  - **Trilogy**, 2 pt. (0 days)
  - **Propiconazole**
    - **Propimax EC**, 4 fl oz. (14 days)
  - **Tilt**, 4 fl oz. (14 days)
  - **Sulfur**
    - **Kumulus DF**, **Micro Sulf**, **Microthiol Dispers**, **Thiolux**, 3 to 10 lb. (0 days)
  - **ALTERNARIA LEAF BLIGHT (Alternaria dauci)**: Apply every 7 to 14 days after emergence.
    - **Azoxystrobin**
      - **Quadris**, 3.2 - 15.8 fl oz every 7 - 14 days. (0 days)
  - **Azoxystrobin + Propiconazole**
  - **Quilt** or **Quilt Xcel**, 14 fl oz. (14 days)
  - **Boscalid**
    - **Endura**, 4.5 oz. (0 days)
  - **Chlorothalonil**
  - **Bravo Ultrax**, **Equus DF**, 1.4 to 1.8 lb every 7 to 10 days. (0 days)
  - **Bravo Weather Stik**, **Echo 720**, **Equus 720 SST**, 1.5 to 2 pt. (0 days)
  - **Echo 90 DF**, 1.25 to 1.625 lb. (0 days)
  - **Fluxapyroxad + Pyraclostrobin**
  - **Merivon Xemium Brand Fungicide**, 4 - 5.5 fl oz. (7 days)
  - **Iprodione**
    - **Iprodione 4L AG**, **Rovral 4 Flowable**, 1 to 2 pt. (0 days) Maximum 4 applications. See label for permissible rotation crops. Or 1 pt as a tank mix with another fungicide, maximum 10 applications.
  - **Penthiopyrad**
    - **Fontelis**, 16 - 30 fl oz. (0 days)
  - **Pyraclostrobin**
    - **Cabrio**, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
  - **Pyraclostrobin/Boscalid**
    - **Pristine**, 8 to 10.5 oz. (0 days)
    - **Trifloxystrobin**
    - **Flirt**, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

**Copper Ammonium Carbonate**
- **Copper Count N**, 2 to 3 qt. (0 days)
- **Copper Hydroxide**
  - **Badge X2**, 0.75 - 3.57 lb. (0 days)
  - **Champ DP Dry Prill**, 1 1/3 lb. (0 days)
  - **Champ Formula 2 F**, 1 1/3 pt. (0 days)
  - **ChampION**, 0.75 to 1.5 lb. (0 days)
  - **Kocide 2000**, 1 1/2 lb. (0 days)
  - **Kocide 3000**, 0.75-1.5 lb. (0 day)
  - **Copper Hydroxide + Copper Oxycide**
  - **Badge X2**, 0.75 - 3.57 lb. (0 days)

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*Materials marked with an asterisk are particularly recommended for problem infestations.*

*Always read and follow label instructions carefully*
Cauliflower

- Champ DP Dry Prill, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- ChampION, 0.75 to 1.5 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.75-1.5 lb. (0 day)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 1.8 pt. (0 days)

Copper Sulfate
- Cuprofix Ultra 40 Disperss, 1.25 lb. (0 days)

Cyperconazole
- Propimax EC, 4 fl oz. (14 days)
- Tilt, 4 fl oz. (14 days)

Neem Oil
- Trilogy, 2 pt. (0 days)

Cercospora leaf spot (Cercospora carotae): Apply every 7 to 14 days after emergence.
- Azoxystrobin
  - Quadris, 9.2 to 15.4 fl oz. (0 days)
  - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- Azoxystrobin + Chlorothalonil
- Quadris Opti, 2.4 pt every 7-14 days. (0 days)
- Azoxystrobin + Propiconazole
- Quilt, Quilt Xcel, 14 fl oz. (14 days)
- Chlorothalonil
  - Bravo Ulltix, Equus DF, 1.4 to 1.8 lb. (0 days) May be applied through sprinkler irrigation equipment.
  - Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)
  - Echo 90 DF, 1.3 to 1.5 lb. (0 days)
- Fluxapyroxad + Pyraclostrobin
- Mervon Xemium Brand Fungicide, 5.5 fl oz. (7 days)
- Penthiopyrad
- Fontelis, 16 - 30 fl oz. (0 days)
- Pyraclostrobin
- Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- Pyraclostrobin/Boscalid
- Pristine, 8 to 10.5 oz. (0 days)
- Trifloxystrobin
- Flint, 2 to 3 oz. (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

Copper Ammonium Carbonate
- Copper Count N, 2 to 3 qt. (0 days)

Copper Hydroxide
- Badge X2, 0.75 - 3.57 lb.
- Champ DP Dry Prill, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champ WG, 2.0 lb. (0 days)
- ChampION, 0.75 to 1.5 lb. (0 days)

FALL SOIL FUMIGATION (BROADCAST):
- **SUGAR BEET CYST, ROOT-KNOT and LESION NEMATODES**: Sugar beet cyst, root-knot and lesion nematodes can reduce cauliflower

**Cauliflower**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.
PLANTING TREATMENT: Treatments applied at seeding.
CABBAGE MAGGOT: Apply in a 4 inch band over row at time of seeding.

- **Bifenthrin**
- **Capture LFR**, 3.4 to 6.8 oz. See label for application methods. (RUP)

**Chlorpyrifos**
- **Chlorpyrifos 15G (4.6 to 9.3 oz/1000 row ft.)**, or **Chlorpyrifos 4E AG (1.6 to 2.4 fl oz/1000 row ft.)** (21 days for 15G, 30 days for 4E AG) (RUP)
- **Goverm**, 1.6 to 2.4 fl oz/1,000 row ft. (30 days) (RUP)
- **Goverm 4E**, 1.6 to 2.4 fl oz/1,000 row ft. (30 days)(RUP), (30 days) (RUP)
- **Hatchet**, 1.6 to 2.4 fl oz/1,000 row ft. (30 days) (RUP)
- **Lorsban 15G (4.6 to 9.2 oz/1,000 row ft.)**, or **Lorsban 4E / Lorsban Advanced (1.6 to 2.4 fl oz/1,000 row ft.)**, or **Lorsban 75 WG (1.1 to 1.6 oz/1000 row ft.)** (RUP)
- **Nufos 4E**, 1.2 fl oz/1000 row ft. (30 days) (RUP)
- **Saurus**, 4.6 to 9.2 oz/1000 row ft. (30 days) (RUP)
- **Vulcan**, 1.6 to 2.4 fl oz/1,000 row ft. (30 days) (RUP)
- **Warhawk**, 1.6 to 2.4 fl oz/1,000 row ft. (30 days) (RUP)
- **Whirlwind**, 1.6 to 2.4 fl oz/1,000 row ft. (30 days) (RUP)
- **Verimark**, 10-13.5 oz/A. (0 days)

**APHIDS and FLEA BEETLE**:
- **Belay 50 WDG**, 4.8 to 6.4 oz. (RUP)
- **Thiamethoxam**
  - **Platinum (5 to 11 fl oz.)**, or **Platinum 75 SG (1.66 to 3.67 oz.)** (30 days) See label for application methods.

**ARMYWORM, IMPORTED CABBAGE WORM, DIAMONDBACK MOTH, CABBAGE LOOPERS**:
- **Coragen**, 3.5 to 5.0 fl oz. (3 days) See label for application methods.
- **Durivo**, 10 to 13 fl oz. (30 days)
- **Verimark**, 5-10 oz/A. (0 days)

**FLEA BEETLE**:
- **Scorpion 35SL**, 9 to 10.5 fl oz. (21 days)
- **Verimark**, 6.75-13.5 oz/A. (0 days)

**GRUBS, WIREWORMS**:
- **Bifenthrin 10 DF**, 8 to 16 oz/A. (0 days)

**LEAFHOPPERS**:
- **Sivanto**, 7 - 10.5 fl oz/A.
- **Verimark**, 10.5 - 14 fl oz/A.

**WHITEFLIES**:
- **Sivanto**, 10.5 - 14 fl oz/A.

**SOIL TREATMENT AFTER TRANSPLANTING**:
- **APHIDS**: Apply as a post-seeding drench, transplant drench, or hill drench, or as a sidedress after plants are established.
- **Imidacloprid**
  - **Admire Pro**, 4.4 to 10.5 fl oz. (21 days)
  - **Nuprid 2 F**, 10 to 24 fl oz. (21 days)
  - **Sivanto**, 7 - 12 fl oz/A.

**APHIDS, FLEA BEETLES, and THRIPS**:
- **Thiamethoxam**
  - **Platinum (5 to 11 fl oz.)**, or **Platinum 75 SG (1.66 to 3.67 oz.)** (30 days) See label for application methods.
  - **Verimark**, 6.75-13.5 oz/A. (0 days)

**Materials marked with an asterisk are particularly recommended for problem infestations.**
Cauliflower

LEAFHOPPERS:
- **Sivanto**, 7 - 10.5 fl oz/A.

WHITEFLIES:
- **Sivanto**, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

**FLEA BEETLE:** Apply as needed soon after plants come up.
- **Actara**, 1.5 to 3 oz. (0 days)
- **Baythroid XL**, 1.6 to 2.4 fl oz. (0 days) (RUP)
- **Belay 50 WDG**, 1.6 to 2.1 oz. (7 days)

**Bifenthrin**
- **Bifenture 10 DF**, 5.3 to 16 oz./A. (7 days)
- **Bifenture EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Brigade @ 2EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Capture 2 EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Discipline 2EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Fanfare 2EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Sniper**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Tundra EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- **Herb**, 4 to 10.3 oz. or **Herb EW**, 4.5 to 11.2 oz. (7 days) (RUP)
- **Steed**, 3.5 to 4.7 fl oz. (7 days) (RUP)
- **Brigadier**, 3.8 to 6.1 fl oz. (7 days) (RUP)

**Carbaryl**
- **Carbaryl 4L**, 0.5 to 1 qt. (3 days)
- **Sevin 4 F**, 0.5 to 1 qt. or **Sevin 80 S**, 0.63 to 1.25 lb. or **Sevin 80 WSP**, 0.67 to 1.25 lb. or **Sevin XLR Plus**, 0.5 to 1 qt. (3 days) (RUP)

**Chlorpyrifos**
- **Hatchet**, 1 to 2 pt. (21 days) (RUP)
- **Lorsban 4 E / Lorsban Advanced**, 1 to 2 pt. (21 days) (RUP)

**Cypermethrin**
- **Ammo 2.5 EC**, 2.5 to 5 fl oz. (1 day) (RUP)
- **Cypermethrin**, 2.5 to 5 fl oz. (1 day) (RUP)
- **Holster**, 2.5 to 5 fl oz. (1 day) (RUP)
- **UP-Cyde 2.5 EC**, 2.5 to 5 fl oz. (1 day) (RUP)

**Dinofuran**
- **Scorpion 3SSL**, 2 to 7 fl oz. or **Venom**, 3 to 4 oz. (1 day)
- **Entrust SC**, 4 to 8 fl oz. (1 day)

**Esfenvalerate**
- **Adjourn**, 5.8 to 9.6 fl oz. (3 days) (RUP)
- **Asana XL**, 5.8 to 9.6 fl oz. (3 days) (RUP)
- **S-FenvalaStar**, 5.8 to 9.6 fl oz. (3 days) (RUP)
- **Exirel**, 13.5-20.5 oz/A. (1 day)

**Imidacloprid**
- **Admire Pro**, 1.3 fl oz. (7 days)
- **Nuprid**, 1.6 F, 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.

**Kryocide**, 8 to 16 lb. (7 days)
- **Lambda-cyhalothrin**
- **Lambda-Cy**, 2.56 to 3.84 fl oz. (1 day) (RUP)
- **Warrior II with Zeon Technology**, 1.28 to 1.92 fl oz. or **Warrior with Zeon Technology**, 2.56 to 3.84 fl oz. (1 day) (RUP)
- **Larvin 3.2**, 16 to 32 fl oz. (7 days) (RUP)
- **Leverage 360**, 3 fl oz. (7 days) (RUP)

**Malathion**
- **Malathion 8** (1.5 to 2.5 pt. or **Malathion 8 Aquamul** (1.25 pt.) (7 days for Malathion 8; 2 days for Malathion 8 Aquamul)
- **Mustang Max**, 2.24 to 4 oz. (1 day) (RUP)
- **Perm-UP 3.2 EC**, 2 to 4 oz. (1 day) (RUP)
- **Proaxis**, 2.56 to 3.84 fl oz. (1 day) (RUP)
- **Pyrenone**, 1 to 12 fl oz. (0 days)
- **Carbaryl 4L**, 0.5 to 1 qt. (3 days)

**Sevin 4 F** (0.5 to 1 qt.) or **Sevin 80 S**, 0.63 to 1.25 lb. or **Sevin XLR Plus** (0.5 to 1 qt.) (3 days)

**Voliam Flexi**, 4 to 7 oz. (3 days)

**IMPORTED CABBAGE WORM:** Apply if: 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering or 3) >10% of plants are infested at or after 1st flowering.

**Acetate**
- **Acetate 90 WDG**, 11.1 lb. or **Acetate 90 WSP**, 1.1 lb. or **Acetate 97**, 1 lb. or **Acetate 97 UP**, 1 lb. (14 days)
- **Bracket 97**, 16 oz. (14 days)
- **Orthene**, 16 oz. (14 days)

**Avant**, 2.5 to 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.

**Bacillus thuringiensis**
- **Agree WG**, 0.5 to 2 lb. (0 days)
- **BioBt HP**, 0.5 to 1 lb. (0 days)
- **DiPel DF**, 0.25 to 1 lb. or **DiPel ES**, 1 to 2 pt. (0 days)
- **Javelin WG**, 0.12 to 1.5 lb. (0 days)
- **XenTari**, 0.5 to 1.5 lb. (0 days)

- **Baythroid XL**, 1.6 to 2.4 fl oz. (0 days) (RUP)

**Bifenthrin**
- **Bifenture 10 DF**, 5.3 to 16 oz/A. (7 days)
- **Bifenture EC**, 2.1 to 6.4 oz. (7 days) (RUP)
- **Brigade @ 2EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Capture 2 EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Discipline 2EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Fanfare 2EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Sniper**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Tundra EC**, 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- **Brigadier**, 3.8 to 6.1 fl oz. (7 days) (RUP)
- **Swagger**, 8.48 to 12.2 fl oz. (7 days) (RUP)

**Bifenthrin + Imidacloprid**
- **Brigadier**, 3.8 to 6.1 fl oz. (7 days) (RUP)
- **Holster**, 2.5 to 5 fl oz. (1 day) (RUP)

**Carbaryl**
- **Carbaryl 4L**, 1 to 2 qt. (3 days)
- **Sevin 4 F**, 1 to 2 pt. or **Sevin 80 S**, 1.25 to 2.5 lb. or **Sevin XLR Plus**, 1 to 2 pt. (3 days)

**Chlorpyrifos**
- **Hatchet**, 1 to 2 pt. (21 days) (RUP)
- **Lorsban 4 E / Lorsban Advanced**, 1 to 2 pt. (21 days) (RUP)

**Confirm 2F**, 6 to 8 fl oz. (7 days)
- **Coragen**, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

**Cypermethrin**
- **Ammo 2.5 EC**, 2.5 to 5 fl oz. (1 day) (RUP)
- **Cypermethrin**, 2.5 to 5 fl oz. (1 day) (RUP)
- **Holster**, 2.5 to 5 fl oz. (1 day) (RUP)
- **UP-Cyde 2.5 EC**, 2.5 to 5 fl oz. (1 day) (RUP)
- **Danitol 2.4 EC**, 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)
- **Dibrom 8 Emulsive**, 1 pt. (1 day) Allow a minimum of 7 days between applications. Do not apply more than 10 pts per acre per season. (RUP)

**Endico ZC**, 4 fl oz. (1 day) (RUP)

**Esfenvalerate**
- **Adjourn**, 2.9 to 5.8 fl oz. (3 days) (RUP)
- **Asana XL**, 2.9 to 5.8 fl oz. (3 days) (RUP)
- **S-FenvalaStar**, 2.9 to 5.8 fl oz. (3 days) (RUP)
- **Exirel**, 7-13.5 oz/A. (1 day)

*Materials marked with an asterisk are particularly recommended for problem infestations.*

54 Always read and follow label instructions carefully
**Cauliflower**

*Materials marked with an asterisk are particularly recommended for problem infestations.*

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**Insecticides**

**Lambda-cyhalothrin**
- Lambda-Cy, 1.92 to 3.2 fl oz. (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
- Lannate 5 EC, 16 to 32 fl oz. (7 days) (RUP)
- Malathion 5 EC (1 to 2 pt.) or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion Aquamul (1.25 pt.) (7 days for Malathion 8; 2 days for others)
- Methomyl
  - Lannate LV (0.75 to 3 pt.) or Lannate SP (0.25 to 1 lb.) (3 days) (RUP)
  - Nudrin LV (0.75 to 3 pt.) or Nudrin SP (0.25 to 1 lb.) (3 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
- Permethrin
  - Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
  - Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3 EC (2 to 4 fl oz.) (1 day) (RUP)
  - Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 6 to 12 fl oz. (7 days)
- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- Spinosad
  - Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
  - Thiamefoxam + Chlorantraniliprole
  - Durivo (10 to 13 fl oz) or Voliam Flexi (4 to 7 oz) (3 days)
- Vetica, 10 to 20 fl oz. (1 day)

**Diagnose MOTH**

Apply **after** 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested or after 1st flowering.

Use Bacillus thuringiensis to avoid killing important natural enemies of diamondback moth.

* Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - BioBt HP, 0.5 to 1 lb. (0 days)
  - DiPel DF (0.25 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - XenTari, 0.5 to 1.5 lb. (0 days)
  - Spinosad
  - Entrust (0.5 to 1.25 oz.) or Entrust SC (1.5 to 4 fl oz.) (1 day)

**Acephate**

- Acephate 90 WDG (1.1 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (14 days)
- Bracket 97, 16 oz. (14 days)
- Orthene 97, 16 oz. (14 days)
- Avadant, 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.

**Baythroid XL** 2.4 to 3.2 fl oz. (0 days) (RUP)

**Bifenthrin**

- Bifenture EC, 2.1 to 6.4 oz. (7 days) (RUP)
- Brigade @ 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fandfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Imidacloprid**

- Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 8.4 to 12.2 fl oz. (7 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin

- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Tdide, 3.5 to 4.7 fl oz. (7 days) (RUP)
- Carbaryl
  - Carbaryl 4L, 1 to 2 qt. (3 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

**Coragen**, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

- Diazinon AG 500, 0.5 to 1 pt. (5 days) (RUP)
- Dibrom 8 Emulsive, 1 pt. (1 day) Allow a minimum of 7 days between applications. Do not apply more than 10 pts per acre per season (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Exirel, 7-13 oz/A. (1)
- Intrepid 2F, 12 to 16 oz. (1 day) Suppression only. Infestation and crop damage are reduced when applied at initiation of egg laying.

**Kryocide**, 8 to 16 lb. (14 days)

**Lambda-cyhalothrin**

- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.26 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz) (1 day) (RUP)
- Lannate 3.2, 24 to 40 fl oz. (7 days) (RUP)
- Lorsban 75 WG, 0.67 to 1.33 lb. (21 days) (RUP)
- Malathion
  - Malathion 5 EC (2 pt.) or Malathion 5 EC (2 to 4 pt.) (7 days for Malathion 5 EC; 2 days for Malathion 5)

**Methomyl**

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (3 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (3 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

**Permethrin**

- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 3 EC (2 to 4 fl oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 6 to 12 fl oz. (7 days)
- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- Thiamethoxam + Chlorantraniliprole
  - Durivo (10 to 13 fl oz) or Voliam Flexi (4 to 7 oz) (30 days)
- Vetica, 10 to 20 fl oz. (1 day)

**CABBAGE LOOPERS**: Apply **after** 1) >10% of transplants are infested with any type of cabbage "worm", 2) >50% of plants are infested before flowering, or 3) >10% of plants are infested or after 1st flowering. Most controls are less effective on larger worms.

**Acephate**

- Acephate 90 WDG (1.11 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (14 days)
- Acephate 90 WDG (1.11 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (14 days) (RUP)

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Cauliflower

- Bracket 97, 16 oz. (14 days)
- Orthene 97, 16 oz. (14 days)

For infestations, consider adding a wetting agent to improve spray coverage.

Bacillus thuringiensis

- Agree WG, 0.5 to 2 lb. (0 days)
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- XenTan, 0.5 to 1 lb. (0 days)

Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)

Bifenthrin

- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

Bifenthrin + Imidacloprid

- Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swaggert, 8.48 to 12.2 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin

- Hero (4 to 10.3 oz.), or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)
- Confirm 2F, 6 to 8 fl oz. (7 days)
- Coragen, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications. Do not apply more than 15 fl oz. per season.

Cypermethrin

- Ammo 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)
- Holster, 3.75 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)
- Danitol 2.4 EC, 2.4 EC, 10-23 to 16 fl oz. (7 days) (RUP)
- Dibrom 8 Emulsively, 2 pt. (1 day) Allow a minimum of 7 days between applications. Do not apply more than 10 pts per acre per season (RUP)

Endigo ZC, 4 fl oz. (1 day) (RUP)

Esfenvalerate

- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvalStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Exirel, 10-17 oz/A. (1)

Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)

Kryocide, 8 to 16 lb. (7 days)

Lambda-cyhalothrin

- Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)

Larvin 3.2, 24 to 40 fl oz. (7 days) (RUP)

Leverage 360, 3 fl oz. (7 days) (RUP)

Malathion

- Malathion 5, or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (1.5 to 2.5 pt.) or Malathion 8 Aquamul (1.25 pt.) (7 days for Malathion 8; 2 days for others)

Methomyl

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (3 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (3 days) (RUP)
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)

Permethrin

- Ambush 25 W, 3.2 to 6.4 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 6.4 oz.) or Perm-UP 25 EC (2 to 4 fl oz) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 6.4 oz. (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
- Proclaim, 3.2 to 4.8 oz. (7 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 6 to 12 fl oz. (7 days)

Spinosad

- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)

Thiamethoxam + Chlorantraniliprole

- Durivo (10 to 13 fl oz) or Voltiam Flexi (4 to 7 oz) (30 days)
- Vetica, 10 to 20 fl oz. (1 day)

APHIDS: Apply if there are >100 aphids per plant before flowering or >5/plant at flowering or beyond.

Acephate

- Acephate 90 WDG (0.55 to 1.11 lb.) or Acephate 90 WSP (0.5 to 1.1 lb.) or Acephate 97 (0.5 to 1 lb.) or Acephate 97 UP (0.5 to 1 lb.) (14 days)
- Bracket 97, 8 to 16 oz. (14 days)
- Orthene 97, 8 to 16 oz. (14 days)

Acytominphrid

- Assail 30 SG (2 to 4 oz.) or Assail 70 WP (0.8 to 1.7 oz.) (7 days)
- Actara, 1.5 to 3 oz. (0 days)
- Belay 50 WD, 1.6 to 2.1 oz. (7 days)
- Beleef 50 SG, 2 to 2.8 oz. (0 days)

Bifenthrin

- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

Bifenthrin + Imidacloprid

- Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swaggert, 8.48 to 12.2 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin

- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

Chlorpyrifos

- Hatchet, 1 to 2 pt. (21 days) (RUP)
- Lorsban 4 E or Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- Diazinon AG 500, 0.5 to 1 pt. (5 days) (RUP)
- Dibrom 8 Emulsively, 1 pt. (1 day) Allow a minimum of 7 days between applications. Do not apply more than 10 pts per acre per season (RUP)

Dimethoate

- Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt. (7 days)
- Endosulfan 3 EC, 1 to 1.33 qt. (14 days) Consult label for rotation restrictions. (RUP)
- Exirel, 13.5-20.5 oz/A. (1)
- Fulfilt, 2.75 oz. (170 days)

Imidacloprid

- Admire Pro, 1.3 fl oz (7 days)
- Nuprid 1.6 F, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.

Leverage 360, 3 fl oz. (7 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Materials marked with an asterisk are particularly recommended for problem infestations.

**Spinosad**

**WSP**

**Carbaryl**

**Proaxis**

**Permethrin**

**Mustang**

**Larvin**

**Lambda crops**

**Exirel**

**Endigo**

Cypermethrin applications; do not apply more than 15.4 fl oz per season.

**Confirm**

**Carbaryl Bayt**

**A Thiamethoxam + Chlorantraniliprole**

**Pyrenone**

**Movento**

**Malathion**

**tang - Cyde**

**UP 4 F**

**Cyhalothrin 3.2 to 4 oz. (1 day) (RUP)**

**Perm-UP 25DF, 3.2 to 6.4 oz. (1 day) (RUP)**

**Pyreneone, 1 to 12 fl oz. (0 days)**

**Sivanto, 7 - 12 fl oz/A.**

**Thiamefoxam + Chlorantraniliprole**

**Durivo (10 to 13 fl oz) or Voliam Flexi (4 to 7 oz) (30 days)**

**ARMYWORM:**

**Avaunt, 3.5 oz. (3 days) Add a wetting agent to improve spray coverage.**

**Bacillus thuringiensis**

**Agree WG, 0.5 to 2 lb. (0 days)**

**Biobit HP, 0.5 to 2 lb. (0 days)**

**DiPel DF (1 to 2 lb.) or DiPel ES (2 to 4 pt.) (0 days)**

**XenTari, 0.5 to 2 lb. (0 days)**

**Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)**

**Carbaryl**

**Carbaryl 4L, 2 to 4 qt. (3 days)**

**Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)**

**Confirm 2F, 6 to 8 fl oz. (7 days)**

**Coragen, 3.5 to 5.0 fl oz. (3 days) Minimum of 3 days between applications; do not apply more than 15.4 fl oz per season.**

**Cypermethrin**

**Amno 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)**

**Cypermethrin, 3.75 to 5 fl oz. (1 day) (RUP)**

**Holster, 3.75 to 5 fl oz. (1 day) (RUP)**

**UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (1 day) (RUP)**

**Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)**

**Endico ZC, 4 to 4.5 fl oz. (1 day) (RUP)**

**Exirel, 7-13.5 oz/A. (1)**

**Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)**

**Lambda-cyhalothrin**

**Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)**

**Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)**

**Larvin 3.2, 16 to 32 fl oz. (7 days) (RUP)**

**Mustang Max, 3.2 to 4 oz. (1 day) (RUP)**

**Permethrin**

**Perm-UP 25DF, 3.2 to 6.4 oz. (1 day) (RUP)**

**Perm-UP 25DF, 3.2 to 6.4 oz. (1 day) (RUP)**

**Perm-UP 3.2 EC, 2 to 4 fl oz. (1 day) (RUP)**

**Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)**

**Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)**

**Radiant SC, 5 to 10 fl oz. (1 day)**

**Rimon 0.83EC, 6 to 12 fl oz. (7 days)**

**Carbaryl 4L, 1 to 2 qt. (3 days)**

**Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)**

**Spinosal**

**Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (1 day)**

**Vetica, 10 to 20 fl oz. (1 day)**

**Voliam Flexi, 4 to 7 oz. (3 days)**

**CUTWORM:**

**Bacillus thuringiensis**

**Biobit HP, 0.5 to 1 lb. (0 days)**

**DiPel DF, 0.5 to 1 lb. (0 days)**

**XenTari, 0.5 to 1.5 lb. (0 days)**

**Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)**

**Cypermethrin**

**Amno 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)**

**Cypermethrin, 2.5 to 5 fl oz. (1 day) (RUP)**

**Holster, 2.5 to 5 fl oz. (1 day) (RUP)**

**UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)**

**Esfenvalerate**

**Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)**

**Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)**

**S-FenvalatoStar, 5.8 to 9.6 fl oz. (3 days) (RUP)**

**Lambda-cyhalothrin**

**Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)**

**Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)**

**Methomyl**

**Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (3 days) (RUP)**

**Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (3 days) (RUP)**

**Mustang Max, 2.24 to 4 oz. (1 day) (RUP)**

**Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)**

**LEAFHOPPERS:**

**Sivanto, 7 - 10.5 fl oz/A.**

**WHITEFLIES:**

**Sivanto, 10.5 - 14 fl oz/A.**

**MITES**

**Bifenthrin**

**Bifenthrin EC, 5.12 to 6.4 fl oz. (7 days) (RUP)**

**Bifenthrin 10 DF, 12.8 to 16 oz/A. (7 days) (RUP)**

**Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (7 days) (RUP)**

**Capture 2 EC, 5.12 to 6.4 fl oz. (7 days) (RUP)**

**Discipline 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)**

**Fanfare 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)**

**Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)**

**Tundra EC, 5.12 to 6.4 fl oz. (7 days) (RUP)**

**Bifenthrin + Zeta-Cypermethrin**

**Hero (10.3 oz.) or Hero EW (11.2 oz.) (7 days) (RUP)**

**DISEASES**

**SEED TREATMENT:**

**DAMPING OFF, WIRE STEM (Pythium spp., Rhizoctonia solani):**

**Captan**

**Captan 4 Flowable, 2.2 fl oz/100 lb seed.**

**Fludioxinil**

**Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed**

(Rhizoctonia). Commercial seed treatment plants only.

**Mefenoxam**

**Apron XL, 0.085 - 0.64 fl oz/100 lb seed. (0 days)**

**Thiram**

**42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 8 oz/100 lb seed.**

**BLACK LEG (Phoma lingam):** There are presently no chemicals registered for use on this disease.
Cauliflower

SEEDBED TREATMENT: Apply treatments to the soil according to directions to protect young seedlings in the seedbed before transplanting in field.

CLUBROOT (*Plasmodiophora brassicae*): Sterilize seedbed before planting (Appendix A) or apply to soil surface as a drench.

Fluazinam
- Omega 500 F, 2.6 pt. (50 days)

DAMPING OFF (*Pythium spp.*):
- Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone with 1/2 to 1 in. of sprinkler irrigation.
- Ridomil Gold SL, 0.25-0.5 pt.

TRANSPLANT DRENCH:

CLUBROOT (*Plasmodiophora brassicae*):

Fluazinam
- Omega 500 F, 6.45 fl oz. (50 days)

FOLIAR TREATMENT:

BLACK ROT (*Xanthomonas campestris*): Apply treatment (lowest rates) in the field as soon as transplants are established.

Acibenzolar-S-methyl
- Actigard, 0.5 to 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.

Copper Ammonium Carbonate
- Copper Count N, 1 - 2 qt. (0 days)

Copper Hydroxide
- Champ DP Dry Prill, 1/3 to 2/3 lb. (0 days)
- Champ Formula 2 Flowable, 1/3 to 2/3 pt. (0 days)
- Champ WG, 1.06 lb. (0 days)
- ChampION, 0.5 to 0.75 lb. (0 days)
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 day)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 1.8 pt. (0 days)
- Badge X2, 0.5 to 0.75 lb. (0 days)

Copper Sulfate
- Cuprofix Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)

Cuprox Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)

ALTERNARIA LEAF SPOT (*Alternaria brassicaceae*): Apply when conditions favor disease and repeat every 7 to 10 days.

- Actigard, 6.2 to 15.4 fl oz.
- Endura, 6 to 9 oz. (0 days)
- Bravo Ultrex, 1.4 lb. (7 days)
- Bravo Weather Stik, Equus 720 SST, 1.5 pt. (7 days)
- Difenconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz. (7 days)
- Pyraclostrobin
- Cabrio, 12-16 oz. (0 days)

Copper Ammonium Carbonate
- Copper Count N, 1 to 2 qt. (0 days)

Copper Hydroxide
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 days)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 1.8 pt. (0 days)
- Badge X2, 0.5 to 0.75 lb. (0 days)

Copper Sulfate
- Cuprofix Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)

Cuprox Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)

DOWNY MILDEW (*Peronospora parasitica*): Apply when conditions favor disease.

- Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.

Copper Ammonium Carbonate
- Copper Count N, 1 - 2 qt. (0 days)

Copper Hydroxide
- Champ DP Dry Prill, 1/3 to 2/3 lb. (0 days)
- Champ Formula 2 Flowable, 1/3 to 2/3 pt. (0 days)
- Champ WG, 1.06 lb. (0 days)
- ChampION, 0.5 to 0.75 lb. (0 days)
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 day)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 1.8 pt. (0 days)
- Badge X2, 0.5 to 0.75 lb. (0 days)

Copper Sulfate
- Cuprofix Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)

ALTERNARIA LEAF SPOT (*Alternaria brassicaceae*): Apply when conditions favor disease and repeat every 7 to 10 days.

- Actigard, 6.2 to 15.4 fl oz.
- Endura, 6 to 9 oz. (0 days)
- Bravo Ultrex, 1.4 lb. (7 days)
- Bravo Weather Stik, Equus 720 SST, 1.5 pt. (7 days)
- Difenconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz. (7 days)
- Pyraclostrobin
- Cabrio, 12-16 oz. (0 days)

Copper Ammonium Carbonate
- Copper Count N, 1 to 2 qt. (0 days)

Copper Hydroxide
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-0.75 lb. (0 days)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 1.8 pt. (0 days)
- Badge X2, 0.5 to 0.75 lb. (0 days)

Copper Sulfate
- Cuprofix Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)

Cuprox Ultra 40 Dispers, 3/4 to 1 1/4 lb. (0 days)

Note: Fungicides that protect against Alternaria also provide limited downy mildew protection.

CERCOSPORA LEAF SPOT (*Cercospora beticola*):

Pyraclostrobin
- Cabrio, 12-16 oz. (0 days)

WHITE RUST:

Pyraclostrobin
- Cabrio, 12-16 oz. (0 days)
Celery

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Root-knot, pin, needle and root-lesion nematodes can reduce celery yields. Fields with root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for celery, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot, pin, needle and lesion nematodes in celery production. Nematode-free transplants must be used to prevent serious losses.

**FALL SOIL FUMIGATION (BROADCAST):**

1.3-D
- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).
  Fumigate in the fall when soil temperatures at a 6-inch depth are above 50°F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be directed in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**PREPLANT TREATMENT:**

- Oxamyl

  Vydate L. Apply 2 gal/acre in 20 gal of water in 8- to 16-inch band. Incorporate to a depth of 4 inches. (RUP)

**PLANTING TREATMENT:**

- Oxamyl

  Vydate L. apply 0.5 to 1 gal/acre in at least 100 gal of water immediately after transplanting seedlings in the field. (RUP)

**POST-PLANT TREATMENT:**

- Oxamyl

  Vydate L. apply 1 gal/acre in at least 100 gal of water as a foliar treatment with permethrin may cause increased aphid problems.

  Apply again 3 weeks after first treatment. (RUP)

**INSECTS**

**SOIL TREATMENT:**

**LEAF MINERS, LEAFHOPPER:**
- Venom, 5 to 6 oz. (21 days)
  See label for application methods.

**CABBAGE LOOPERS, ARMYWORM:**
- Coragen, 3.5 to 5 fl oz. (1 day) See label for application methods.

**VEGETABLE LEAFMINER:**
- Coragen, 5 to 7.5 fl oz. (1 day) See label for application methods.
- Verimark, 6.75-13.5 oz/A. (0 days)

**LEAFHOPPERS:**
- Belay 50 WDG, 4.8 to 6.4 oz.
  - Admire Pro, 4.4 to 10.5 fl oz. (45 days)
  - Nuprid 2 F, 10 to 24 fl oz. (45 days)
  - Sivanto, 7 - 10.5 fl oz/A.
  - Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days)

**APHIDS, ARMYWORM, CABBAGE LOOPERS, LEAFHOPPERS:**
- Durivo, 10 to 13 fl oz. (30 days)
- ARMYWORM, CORN EARWORM, DIAMONDBACK MOTH, LOOPERS, APHIDS, LEAFMINERS:
- Verimark, 6.75-13.5 oz/A. (0 days)
- APHIDS:
  - Sivanto, 10.5 - 12 fl oz/A.
  - WHITEFLIES:
  - Sivanto, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

**CUTWORM, ARMYWORM:** Apply preventive treatments within 4 weeks of harvest.
- *Permethrin* (0.5 to 2 qt.) (14 days)

  - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (1 day) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)
  - Belt SC, 1.5 fl oz. (1 day)

**Bifenthrin**
- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Brigade WSB, 5.3 to 16 oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Pyrene, 1 to 12 fl oz. (0 days)
- Venison, 35SL, 12 to 13 fl oz. (30 days)

**WHITEFLIES:**
- *Sevin 4 F* (0.5 to 2 oz.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin 80 WSP (0.67 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (14 days)

**DIOTEFURAN**
- Scorpion 35SL, 2 to 5.25 fl oz. (7 days)
- Venom, 1 to 3 oz. (7 days)
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.*
Celery

Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (7 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (7 days) (RUP)
Pyrene, 1 to 12 fl oz. (0 days)
Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin 80 WSP (0.67 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (14 days)
Torac, 14-21 oz/A (1) Do not make more than 2 applications per crop cycle.
Vetica, 14 to 17 fl oz. (7 days)
Voliam Flexi, 4 to 7 oz. (7 days)

TARNISHED PLANT BUG: Apply if numbers exceed 2 to 4 per 20 plants.
Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
Beleaf 50 SG, 2 to 2.8 oz. (0 days)

Carbaryl
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)
Gladiator, 14 to 19 fl oz. (7 days) (RUP)
Mustang Max, 3.2 to 4 oz. (1 oz.) (RUP)
Pyrene, 1 to 12 fl oz. (0 days)
Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)
Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)

APHIDS: Apply if more than 3% of plants are infested or if there are more than 6/100 sweeps. Over-treatment with pyrethroids may cause increased aphid problems.
- Beleaf 50 SG, 2 to 2.8 oz. (0 days)
- Fulfill, 2.75 oz. (0 days) May require 5 to 7 days for aphid mortality.
- Movento, 4 to 5 fl oz. (3 days) Must be tank mixed with penetrating adjuvant.

Acephate
- Acephate 90 WDG (0.55 to 1.11 lb.) or Acephate 90 WSP (0.5 to 1.1 lb.) or Acephate 97 (0.5 to 1 lb.) or Acephate 97 UP (0.5 to 1 lb.) (21 days)
- Bracket 97, 8 to 16 oz. (21 days)
- Orthene 97, 8 to 16 oz. (21 days)

Acetamiprid
- Assail 30 SG (2 to 4 oz.) or Assail 70WP (0.8 to 1.7 oz.) (7 days)
Actara, 1.5 to 3 oz. (7 days)
Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
Bifenthrin
- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Brigade WSB, 5.3 to 16 oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Dibrom 8 Emulsive, 1 to 1.5 pt. (1 day) (RUP)
- Exirel, 13.5-20.5 oz/A. (1)
Gladiator, 19 fl oz. (7 days) (RUP)

Malathion
- Malathion 5, Malathion 5 EC, or Malathion 57 EC (1.5 pt.) or Malathion 8 (1 to 1.5 pt.) or Malathion 8 Aquamul (1 to 1.5 pt.) (7 days)
Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

Permethrin
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (1 day) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)
Pyrene, 1 to 12 fl oz. (0 days)
Sivanto, 10.5-12 fl oz/A.
Torac, 17-21 oz/A. (1) Do not make more than 2 applications per crop cycle.
Vetica, 4 to 7 oz. (7 days)

LOOPERS (CELERY and CABBAGE): Apply if needed to protect plants within 4 weeks of harvest.
- Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
- Permethrin
  - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (1 day) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)

Acephate
- Acephate 90 WDG (1.11 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (21 days)
- Bracket 97, 16 oz. (21 days)
- Orthene 97, 16 oz. (21 days)

Carbaryl
- Sevin 4 F 1 to 2 qt. or Sevin 80 S 1.25 to 2.5 lb. or Sevin 80 WSP 1.25 to 2.5 lb. or Sevin XLR Plus 1 to 2 qt. (14 days)

Always read and follow label instructions carefully.

* Materials marked with an asterisk are particularly recommended for problem infestations.
Pyrene, 1 to 12 fl oz. (0 days)
Radiant SC, 6 to 10 fl oz. (1 day)

**Spinosad**
- Entrust (2 to 3 oz.) or Entrust SC (6 to 10 fl oz.) (1 day)
Trigard, 2.66 oz. (7 days)

**ARMY WORM**
- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)

**Acephate**
- Acephate 90 WDG (1.1 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (21 days)
- Bracket 97, 16 oz. (21 days)
- Orthene 97, 16 oz. (21 days)

**Avaunt**, 3.5 oz. (3 days)

**Bacillus thuringiensis**
- Agree WG, 0.5 to 2 lb. (0 days)
- Bioit HP, 0.5 to 2 lb. (0 days)
- DiPel DF (1 to 2 lb.) or DiPel ES (2 to 4 pt.) (0 days)
- XenTari, 0.5 to 2 lb. (0 days)

**Carbaryl**
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)
- Confirm 2F, 6 to 8 fl oz. (7 days)
- Coragen, 3.5 to 5 fl oz. (1 day)
- Dibrom 8 Emulsive, 1 to 1.5 pt. (1 day) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Larvin 3.2, 16 to 30 fl oz. (14 days) (RUP)

**Methomyl**
- Lannate LV (0.75 to 3 pt.) or Lannate SP (0.25 to 1 lb.) (7 days) (RUP)
- Nudrin LV (0.75 to 3 pt.) or Nudrin SP (0.25 to 1 lb.) (7 days) (RUP)
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
- Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)

**Spinosad**
- Entrust (1.25 to 2.5 oz.) or Entrust SC (4 to 8 fl oz.) (1 day)

**SUPPRESSION ONLY**
- Torac, 21 oz/A. (1) Do not make more than 2 applications per crop cycle
- Voltiam Flexi, 4 to 7 oz. (7 days)

**CUT WORM**

**Bacillus thuringiensis**
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF, 0.5 to 1 lb. (0 days)
- XenTari, 0.5 to 1.5 lb. (0 days)
- Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)

**Methomyl**
- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (7 days) (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (7 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

**SUPPRESSION ONLY**
- Torac, 21 oz/A. (1) Suppression only. Do not make more than 2 applications per crop cycle

**WHITEFLIES**
- Exirel, 13.5-20.5 oz/A. (1) For best performance, use with an effective adjuvant
- Movenito, 4.0 to 5.0 fl oz. (3 days) Must be tank mixed with adjuvant having spreading and penetrating properties
- Sivanto, 10.5 - 14 fl oz/A.
- Torac, 21 oz/A. (1) Do not make more than 2 applications per crop cycle

**SWEET POTATO WHITEFLY**, **SILVER LEAF WHITEFLY**: SUPPRESSION
- Acetamiprid
  - Assail 30 SG, 3 to 4 oz. (7 days)
  - Assail 70WP, 1.1 to 1.7 oz. (7 days)
- Torac, 21 oz/A. (1) Do not make more than 2 applications per crop cycle

**DIAMONDBACK MOTH**
- Movenito, 4.0 to 5.0 fl oz/A. (1) Must be tank mixed with adjuvant having spreading and penetrating properties

**ARMY WORM, CORN EAR WORM, DIAMONDBACK MOTH**: 
- Exirel, 7-13.5 oz/A. (1)

**THRIPS**
- Exirel, 13.5-20.5 oz/A. (1)
- Torac, 21 oz/A. (1) Do not make more than 2 applications per crop cycle

**CORN EAR WORM**: SUPPRESSION ONLY
- Torac, 21 oz/A. (1) Suppression only. Do not make more than 2 applications per crop cycle

**LEAF HOPPERS**: Sivanto, 7 - 10.5 fl oz/A.

**MITES**
- Abamectin
  - Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
- Bifenthrin
  - Bifenthrin 10 DF, 12.8 to 16 oz/A. (7 days)
  - Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Dinethoate
  - Dinethoate 4 EC, 1 pt. (7 days)
  - Malathion
    - Malathion 5, Malathion 5 EC, or Malathion 57 EC (1.5 pt.) or Malathion 8 or Malathion 8 Aquarm (1 to 1.5 pt.) (7 days)
- Spiromesifen
  - Oberon 2 SC, 7 to 8.5 fl oz. (7 days) Special Michigan SLN label.
- Zeta-Cypermethrin + Avermectin
  - Gladiator, 19 fl oz. (7 days) (RUP)

**SLUGS**
- Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb) Apply between rows. Avoid contact to edible product.

**DISEASES**

**PREPLANT TREATMENT**: DAMPING OFF (Pythium spp.):
- Mefenoxam

**PLANTING TREATMENT**: DAMPING OFF (Pythium spp.):
- Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note**: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.
  - Ridomil Gold GR, 20 to 40 lb.
  - Ultra Flourish, 2 to 4 pt.

*Materials marked with an asterisk are particularly recommended for problem infestations.*
FOLIAR TREATMENT:

CRATER ROT (Rhizoctonia solani): Apply as a basal spray after each cultivation.
- Azoxystrobin. See label.
  - Quadris, 0.4 to 0.8 fl oz per 1000 row feet. (0 days)
- Azoxystrobin + Chlorothalonil
  - Quadris Opti, 2.4 - 3.7 pts every 7-14 days. (7 days)
- Chlorothalonil
  - Bravo Ultrex, Equus DF, 1.8 to 2.7 lb every 7 days.
  - Bravo Weather Stk, Equus 720 SST, 2 to 3 pt every 7 days. (7 days)
  - Echo 720, 1 to 1 1/2 pt every 3-5 days or 2 to 3 pt every 7 days. (7 days)
  - Echo 90 DF, 1 5/8 to 2 1/2 lb every 7 days. (7 days)
  - Echo 90 DF, 7/8 to 1 1/4 lb every 3 - 5 days. (7 days)
  - Echo Zn, 1 1/2 to 2 1/8 pt every 3 to 5 days or 3 to 4 1/4 pt every 7 days. (7 days)
  - Potassium phosphite/chlorothalonil
    - Catamaran, 4-5 pt. (0 days)

PINK ROT (Sclerotinia sclerotiorum):
- Chlorothalonil
  - Bravo Ultrex, Equus DF, 2.7 lb every 7 days (pink rot suppression). (7 days)
  - Bravo Weather Stk, Equus 720 SST, 3 pt every 7 days (pink rot suppression). (7 days)
  - Echo 90 DF, 1.7 to 2.4 lb. (7 days)
  - Equus DF, 1.8 to 2.7 lb. (7 days)
  - Cyprodinil + Fludioxonil
    - Switch 62.5 WG, 11 to 14 oz. (0 days)

EARLY BLIGHT (Cercospora beticola), LATE BLIGHT (Septoria apiicola): Treat every 7 to 10 days beginning after transplanting.
- Azoxystrobin
  - Quadris, 9.0 to 15.5 fl oz every 7 - 14 days. (0 days)
  - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- Azoxystrobin + Chlorothalonil
  - Quadris Opti, 2.4 - 3.7 pt every 7-14 days. (7 days)
- Azoxystrobin + Propiconazole
  - Quilt, Quilt Xcel, 14 fl oz. (14 days)
- Chlorothalonil
  - Bravo Ultrex, Equus DF, 1.8 to 2.7 lb every 7 days. (7 days)
  - Bravo Weather Stk, Equus 720 SST, 2 to 3 pt every 7 days. (7 days)
  - Echo 720, 1 to 1 1/2 pt every 3-5 days or 2 to 3 pt every 7 days. (7 days)
  - Echo 90 DF, 7/8 to 1 1/4 lb every 5 days or 1 5/8 to 2 1/2 lb every 7 days. (7 days)
  - Echo 90 DF, 7/8 to 1 1/4 lb every 3 - 5 days. (7 days)
  - Echo Zn, 1 1/2 to 2 1/8 pt every 5 days or 3 to 4 1/4 pt every 7 days. (7 days)
  - Echo Zn, 1 1/2 to 2 1/8 pt every 3 - 5 days. (7 days)
- Fluxapyroxad + Pyraclostrobin
  - Merivon Xemium Brand Fungicide, 4 - 11 fl oz. (1 day)
- Propiconazole
  - Propimax EC, Tilt, 4 fl oz. (14 days) Maximum of four applications per season.
- Trifloxystrobin
  - Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) Do not apply more than three sequential foliar application of strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Materials marked with an asterisk are particularly recommended for problem infestations.**
Insecticide and fungicide treatments can be combined according to directions. 

**Materials marked with an asterisk are particularly recommended for problem infestations.**

### SEED TREATMENT:

#### INSECTS

- **The following nematicides are suitable for control of root nematodes:**
  - **Cabrio, 12-16 oz. (0 days)**
  - **Avicta, 0.66 fl oz/1000 row ft. (21 days)**
  - **Proactive, 6.7 oz/1000 ft. of row. (RUP)**
  - **Mocap, 6 oz/1000 row ft, banded. (RUP)**
  - **Counter 15G, 8 oz/1000 row ft. (RUP)**
  - **Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. (RUP)**

#### NEMATODES

- **CUTWORM, CORN LEAF APHIDS:**
  - **Lorsban, 2 oz/100 lb seed. (0 days) (RUP)**
  - **Lorsban 4E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)**
  - **Nufos 4E, 1 to 2 pt. (21 days) (RUP)**
  - **Vulcan, 1 to 2 pt. (21 days) (RUP)**
  - **Whirlwind, 1 to 2 pt. (21 days) (RUP)**

#### FUMIGATION:

- **Mocap 15 G, 20 lb. See label for application methods. (RUP)**
  - **Warhawk, 1 to 2 pt. (21 days) (RUP)**
  - **Warrior, 1 to 2 pt. (21 days) (RUP)**

#### PLANTING TREATMENT:

- **Wireworm:**
  - **Bolton, 9 to 23 fl oz. (21 days) (RUP)**
  - **Cobalt, 13 to 38 fl oz. (21 days) (RUP)**

### PLANTING TREATMENT:

- **Wireworm:** Broadcast evenly on soil surface and incorporate to 4 to 6 inches or band over the row at planting at reduced rate. **Note:** Consult the labels for other uses of these materials.
  - **Aztec 2 G, 6.7 oz/1000 row ft. (RUP)**
  - **Chlorpyrifos + Gamma-cyhalothrin**
    - **Bolton, . (21 days) (RUP)**
    - **Cobalt, . (21 days) (RUP)**
  - **Rates dependent on row spacing.**
  - **Lorsban 15 G, 8 oz/1000 row ft. (RUP)**
  - **Mocap 15 G, 8 oz/1000 row ft. See label for application methods. (RUP)**
- **Pounce 1.5 G, 8 oz/1000 row ft. (RUP)**
- **Tebufo**
  - **Counter 15G-G Lock'n Load, or Counter 15G Smartbox (6 to 8 oz/1000 row ft.) or Counter 20G Smartbox (4.5 to 6 oz/1000 row ft.) (RUP)**
  - **Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. (RUP)**
- **SEED CORN MAGGOT:**
  - **Aztec 2 G, 6.7 oz/1000 ft. of row. (RUP)**
  - **Chlorpyrifos + Gamma-cyhalothrin**
    - **Bolton, . (21 days) (RUP)**
    - **Cobalt, . (21 days) (RUP)**
  - **Lambda-Cyhalothrin**
    - **Lambda-Cy, 0.86 fl oz/1000 row ft. (21 days) (RUP)**
    - **Warrior II with Zeon Technology (0.33 fl oz/1000 row ft.) or Warrior with Zeon Technology (0.66 fl oz/1000 row ft.) (21 days) (RUP)**
    - **Lorsban 15 G, 8 oz/1000 row ft. banded. (RUP)**
  - **Pounce 1.5 G, 8 oz/1000 row ft. (RUP)**
  - **Proaxis, 0.66 fl oz/1000 row ft. (21 days) (RUP)**

### INSECTS

- **CORN FLEA BEETLE, WIRE WORM, SEED CORN MAGGOT,**
  - **CUTWORM, CORN LEAF APHIDS:**
    - **Avicta, . See label for rates and application methods. (RUP)**
    - **Cruiser 5 FS, Purchase seed treated at 1.28 to 5.1 fl oz / 100 lb seed.**

### SOIL TREATMENT:

- **Apply at cultivation.**
  - **Chlorpyrifos**
    - **Chlorpyrifos 4E AG, 2 pt. (21 days) (RUP)**
    - **Warhawk, 6 pt. (21 days) (RUP)**
  - **Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. (30 days) (RUP)**
  - **ARMYWORM, CUTWORM:**
    - **Capture LFR, 3.4 fl oz (Pre-emergence) or 4 to 5.3 fl oz (Pre-plant incorporated). (RUP)**
  - **Chlorpyrifos**
    - **Govern, 1 to 2 pt. (21 days) (RUP)**
    - **Hatchet, 1 to 2 pt. (21 days) (RUP)**
    - **Lorsban 4 E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)**
    - **Nufos 4E, 1 to 2 pt. (21 days) (RUP)**
    - **Vulcan, 1 to 2 pt. (21 days) (RUP)**
    - **Whirlwind, 1 to 2 pt. (21 days) (RUP)**
    - **Chlorpyrifos + Gamma-cyhalothrin**
      - **Bolton, 9 to 23 fl oz. (21 days) (RUP)**
      - **Cobalt, 13 to 38 fl oz. (21 days) (RUP)**

- **_SEED CORN MAGGOT:**
  - **Lorsban 50 W, 2 oz/100 lb seed. (0 days) (RUP)**

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**Corn**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. **(RUP)** = Restricted Use Pesticide.

**NEMATODES**

Root-lesion, stunt, stubby-root, lance and dagger nematodes can reduce sweet corn yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the above plant-parasitic nematodes are present in population densities above the economic threshold for sweet corn, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-lesion, lance, stunt, dagger and stubby-root nematodes in sweet corn production.

**FALL SOIL FUMIGATION:**

- **1,3-D**
  - **Telone II (3 gal in-row for mineral soil) or Telone II (9-12 gal/A broadcast for mineral soil)**
  - Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations, soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**PREPLANT TREATMENT:**

- **Ethoprop**
  - **Mocap 15 G, broadcast. Apply 40 lb/A 3 days before planting to at-planting. Mix with the top 2-4 inches of soil. (RUP)**
  - **Mocap 15 G, band. Add 3/4 to 1 lb per 1,000 row ft in a band 12-15 inches on the row 3 days before planting to at-planting. Mix with the top 2-4 inches of soil. Rate per acre is dependent on row spacing. Rate would be 10-13.3 lb/A at 40-inch row spacings. (RUP)**

**INSECTS**

**SEED TREATMENT:** Treatments applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions.

- **CORN FLEA BEETLE, WIRE WORM, SEED CORN MAGGOT,**
  - **CUTWORM, CORN LEAF APHIDS:**
    - **Avicta, . See label for rates and application methods. (RUP)**
    - **Cruiser 5 FS, Purchase seed treated at 1.28 to 5.1 fl oz / 100 lb seed.**
  - **Pyraclostrobin**
    - **Cabrio, 12-16 oz. (0 days)**
    - **Merivon Xemium Brand Fungicide, 4 - 11 fl oz. (1 day)**
  - **Fluxapyroxad + Pyraclostrobin**
    - **Cabrio, 12-16 oz. (0 days)**
  - **Anthracnose (Colletotrichum spp.):**
    - **Fluxapyroxad + Pyraclostrobin**
    - **Cabrio, 12-16 oz. (0 days)**
  - **Fungi**
    - **Merivon Xemium Brand Fungicide, 4 - 11 fl oz. (1 day)**
    - **Fluxapyroxad + Pyraclostrobin**
    - **Cabrio, 12-16 oz. (0 days)**
CUTWORM, SEED CORN MAGGOT, WIREWORM:

**Bifenthrin**
- *Bifenture EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Brigade @ 2EC, 0.15 to 0.3 fl oz/1000 row ft. (RUP)
- *Capture 1.15 G (6.4 to 8 oz/1000 row ft.) or Capture 2 EC (0.3 fl oz/1000 row ft.) or Capture LFR (6.8 to 8.5 fl oz.) (RUP)
- *Empower, 6.4 to 8.0 oz/1000 row ft. (RUP)
- *Fanfare 2EC, 0.3 fl oz/1000 row ft. (RUP)
- *Tundra EC, 0.3 fl oz/1000 row ft. (RUP)

**Chlorpyrifos**
- *Chlorpyrifos 15G, 8 oz/1000 row ft. (21 days)
- *Lorsban 15 G, 8 oz/1000 row ft. banded. (RUP)
- *Saurus, 8 oz/1000 row ft. (21 days)
- *Force 3G, 4 to 5 oz/1000 row ft. (RUP)

**Lambda-cyhalothrin**
- *Lambda-Cy, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Warrior II with Zeon Technology (0.33 fl oz/1000 row ft.) or Warrior with Zeon Technology (0.66 fl oz/1000 row ft.) (21 days) (RUP)

**Mocap**
- *Mocap 15 G, 8 oz/1000 row ft. See label for application methods.

**Proaxis**
- *Proaxis, 0.66 fl oz/1000 row ft. (21 days) (RUP)

**Terbufos**
- *Counter 15-G Lock’n Load, or Counter 15G Smartbox (6 to 8 oz/1000 row ft.) or Counter 20G Smartbox (4.5 oz / 6 oz/1000 row ft.) (RUP)

**Thimet**
- *Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. Do not apply in furrow.

**Chlorpyrifos**
- *Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
- *Govern, 1 to 2 pt. (21 days) (RUP)
- *Hatchet, 1 to 2 pt. (21 days) (RUP)
- *Lorsban 4 E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- *Nufos 4E, 1 to 2 pt. (21 days) (RUP)
- *Vulcan, 1 to 2 pt. (21 days) (RUP)
- *Warhawk, 1 to 2 pt. (21 days) (RUP)
- *Whirlwind, 1 to 2 pt. (21 days) (RUP)

**Flea Beetle:**
- *Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. (RUP)

**CUTWORM:**

**Chlorpyrifos**
- *Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
- *Govern, 1 to 2 pt. (21 days) (RUP)
- *Hatchet, 1 to 2 pt. (21 days) (RUP)
- *Lorsban 4 E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- *Nufos 4E, 1 to 2 pt. (21 days) (RUP)
- *Vulcan, 1 to 2 pt. (21 days) (RUP)
- *Warhawk, 1 to 2 pt. (21 days) (RUP)
- *Whirlwind, 1 to 2 pt. (21 days) (RUP)

**Chlorpyrifos + Gamma-cyhalothrin**
- *Bolton, . . (21 days) (RUP)
- *Cobalt, . . (21 days) (RUP)
- *Rates dependent on row spacing.

**Lambda-cyhalothrin**
- *Lambda-Cy, 0.66 fl oz/1000 row ft. (21 days) (RUP)
- *Warrior II with Zeon Technology (0.33 fl oz/1000 row ft.) or Warrior with Zeon Technology (0.66 fl oz/1000 row ft.) (21 days) (RUP)

**Mocap**
- *Mocap 15 G, 8 oz/1000 row ft. See label for application methods.

**Proaxis**
- *Proaxis, 0.66 fl oz/1000 row ft. (21 days) (RUP)

**Terbufos**
- *Counter 15-G Lock’n Load, or Counter 15G Smartbox (6 to 8 oz/1000 row ft.) or Counter 20G Smartbox (4.5 oz / 6 oz/1000 row ft.) (RUP)

**Thimet**
- *Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. Do not apply in furrow.

**FOLIAR TREATMENT:**

**CUTWORM, ARMYWORM:** Apply when they appear. Repeat as needed.

* **Bifenthrin**
  - *Bifenture EC, 2.1 to 6.4 fl oz./1000 row ft. (1 day) (RUP)
  - *Brigade @ 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Capture 2 EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Fanfare 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - *Tundra EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

* **Permethrin**
  - *Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - *Perm-UP 25DF (6.4 to 12.8 oz.), or Perm-UP 3.2 EC (4 to 8 oz.) (1 day) (RUP)
  - *Pounce 1.5 G (6.7 to 13.3 lb.) or Pounce 25 WP (6.4 to 12.8 oz.) (1 day) (RUP)
  - *Belt SC, 2 to 3 fl oz. (1 day) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- *Hero (4 to 10.3 oz.), or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- *Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Chlorpyrifos**
- *Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
- *Govern, 1 to 2 pt. (21 days) (RUP)
- *Hatchet, 1 to 2 pt. (21 days) (RUP)
- *Lorsban 4 E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)

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*Materials marked with an asterisk are particularly recommended for problem infestations.
**Materials marked with an asterisk are particularly recommended for problem infestations.**

- *Nufos 4E*, 1 to 2 pt. (21 days) (RUP)
- *Vulcan*, 1 to 2 pt. (21 days) (RUP)
- *Warhawk*, 1 to 2 pt. (21 days) (RUP)
- *Whirlwind*, 1 to 2 pt. (21 days) (RUP)

**Chlorpyrifos + Gamma-cyhalothrin**

- *Bolton*, 9 to 18 fl oz. (21 days) (RUP)
- *Cobalt*, 13 to 26 fl oz. (21 days) (RUP)
- *Intrepid 2F*, 4 to 16 fl oz. (3 days)

**Lambda-cyhalothrin**

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- *Methylone*
- *Lannate LV* (0.75 to 1.5 pt.) or *Lannate SP* (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- *Nudrin LV* (0.75 to 1.5 pt.) or *Nudrin SP* (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- *Mustang Max*, 2.24 to 4 oz. (3 days) (RUP)
- *Penncap-M*, 2 to 3 pt. (12 days) (RUP)
- *Penncap-M* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvaloStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

**Pirimethrin**

- *Ambush 25 W*, 6.4 to 12.8 oz. (1 day) (RUP)
- *Perm-UP 25DF* (6.4 to 12.8 oz.) or *Perm-UP 3.2 EC* (4 to 8 oz.) (1 day) (RUP)
- *Pounce 25 WP*, 6.4 to 12.8 oz. (1 day) (RUP)
- *Proaxis*, 2.56 to 3.84 fl oz. (1 day) (RUP)
- *Carbaryl 4L*, 1 to 2 qt. (2 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (2 days)
- *Tundra Supreme*, 5.6 to 16.8 fl oz. (21 days) (RUP)

**European Corn Borer: For early season control, prior to tasseling. Treat if >15% of plants are infested. Direct granules into corn whorls.**

- *Avaunt*, 2.5 to 3.5 oz. (3 days) (RUP)
- *Chlorpyrifos* + *Zeta-Cypermethrin* (2.56 to 3.84 fl oz.) (1 day) (RUP)
- *DiPel ES*, 1.5 to 2.5 pt. (0 days)
- *KenTari*, 0.5 to 2 lb. (0 days)
- *Baythroid XL*, 1.6 to 2.8 fl oz. (0 days) (RUP)
- *Belt SC*, 2 to 3 fl oz. (1 day)

**Corn Flea Beetle: Apply when damage is first seen, especially if Stewart's wilt is present.**

- *Acetamiprid* + *Lambda-Cy*
  - *Assail 30 SG*, 4.0 to 5.3 (7 days)
  - *Assail 70WP*, 1.7 to 2.3 (7 days)
- *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)

**Bifenthrin**

- *Bifenture EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Brigade @ 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Capture 2 EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Fanfare 2EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)
- *Tundra EC*, 2.1 to 6.4 fl oz. (1 day) (RUP)

**Bifenthrin + Zeta-Cypermethrin**

- *Hero* (4 to 10.3 oz.) or *Hero EW* (4.5 to 11.2 oz.) (3 days) (RUP)
- *Steed*, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Carbaryl**

- *Carbaryl 4L*, 1 to 2 qt. (2 days)
- *Sevin 4 F* (1 to 2 qt.) or *Sevin 80 S* (1.25 to 2.5 lb.) or *Sevin XLR Plus* (1 to 2 qt.) (2 days)

**Chlorpyrifos**

- *Chlorpyrifos 4E AG*, 1 to 2 pt. (21 days) (RUP)
- *Goverm*, 1 to 2 pt. (21 days) (RUP)
- *Hatset*, 1 to 2 pt. (21 days) (RUP)
- *Lorsban 4E / Lorsban Advanced* (1 to 2 pt.) or *Lorsban 75 WG* (1.33 lb.) (21 days) (RUP)
- *Nufos 4E*, 1 to 2 pt. (21 days) (RUP)
- *Stallion*, 9.25 to 11.75 oz. (21 days) (RUP)
- *Vulcan*, 1 to 2 pt. (21 days) (RUP)
- *Warhawk*, 1 to 2 pt. (21 days) (RUP)
- *Whirlwind*, 1 to 2 pt. (21 days) (RUP)

**Chlorpyrifos + Gamma-cyhalothrin**

- *Bolton*, 9 to 18 fl oz. (21 days) (RUP)
- *Cobalt*, 13 to 26 fl oz. (21 days) (RUP)
- *Diazinon AG 500*, 1 pt. (0 days) (RUP)

**Esfenvalerate**

- *Adjourn*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvaloStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Lambda-Cyhalothrin* (RUP)

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)

**Warrior II* with Zeon Technology (1.28 to 1.92 fl oz.) or *Warrior* with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

**Intrepid 3.2, bda Supreme, 2.56 to 3.84 fl oz. (1 day) (RUP)**

**Lambda-Cyhalothrin**

- *Lambda-Cy*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Asana XL*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *S-FenvaloStar*, 5.8 to 9.6 fl oz. (1 day) (RUP)
- *Lambda-Cyhalothrin* (RUP)

- *Lambda-Cy*, 2.56 to 3.84 fl oz. (1 day) (RUP)
Corn

- Warhawk, 1 to 2 pt. (21 days) (RUP)
- Whirlwind, 1 to 2 pt. (21 days) (RUP)
- Chlorpyrifos + Gamma-cyhalothrin
- Bolton, 13 to 23 fl oz. (21 days) (RUP)
- Cobalt, 19 to 38 fl oz. (21 days) (RUP)
- Coragen, 3.5 to 5 fl oz. (1 day)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - S-FenvalaStar, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - Intrepid 2F, 4 to 16 fl oz. (3 days) (RUP)
- Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- Larvin 3.2, 20 to 30 fl oz. (0 days) (RUP)
- Methomyl
  - Lannate LV (0.75 to 1.5 pt.) or Lannate SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
  - Nudrin LV (0.75 to 1.5 pt.) or Nudrin SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- Mustang Max, 2.8 to 4 oz. (3 days) (RUP)
- Pennan-M, 2 to 3 pt. (12 days) Do not apply during pollination. (RUP)
- Permethrin
  - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (1 day) (RUP)
  - Pounce 1.5 G (6.7 to 13.3 lb.) or Pounce 25 WP (6.4 to 12.8 oz.) (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Radiant SC, 3 to 6 fl oz. (1 day; 3 days for forage or fodder)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Carbaryl 4L, 1.5 to 2 qt. (2 days)
- Sevin 4 F (1.5 to 2 qt.) or Sevin 80 S (1.88 to 2.5 lb.) or Sevin XLR Plus (1.5 to 2 qt.) (2 days)
- Spinosad
  - Blackhawk (2.2-3.3 oz/A) or Entrust (0.5 to 2 oz.) or Entrust SC (1.5 to 6 fl oz.) (28)
  - Tundra Supreme, 5.6 to 16.8 fl oz. (21 days) (RUP)

CORN EARWORM: Apply to silks when moths are active to prevent ear damage. Treat every 5 days if 2-6 moths per week are caught in pheromone traps, every 4 to 5 days if catch is 7 to 90 moths per week, and every 3 to 4 days if catch is >90 moths per week. Use the shorter intervals listed above if temperatures are >85.
* Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
* Bifenthrin
  - Bifenture EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - Brigade @ 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
* Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - S-FenvalaStar, 5.8 to 9.6 fl oz. (1 day) (RUP)
  - Larvin 3.2, 20 to 30 fl oz. (0 days) (RUP)
  - Mustang Max, 2.8 to 4 oz. (3 days) (RUP)
* Permethrin
  - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (1 day) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)
* Warrior with Zeon Technology, 2.6 to 3.8 fl oz. (1 day) (RUP)
* Avaint, 2.5 to 3.5 oz. (3 days)
  - Belt SC, 2 to 3 fl oz. (1 day)
  - Bifenthrin + Zeta-Cypermethrin
    - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Carbaryl
    - Carbaryl 4L, 1 to 2 qt. (2 days)
    - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (2 days)
- Chlorpyrifos
  - Chlorpyrifos 4E AG, 1.5 to 2 pt. (21 days) (RUP)
  - Goverm, 1.5 to 2 pt. (21 days) (RUP)
  - Hatchet, 1.5 to 2 pt. (21 days) (RUP)
  - Lorsban 4 E / Lorsban Advanced (1.5 to 2 pt.) or Lorsban 75 WG (1 to 1.33 lb.) (21 days) (RUP)
  - Nufos 4E, 1.5 to 2 pt. (21 days) (RUP)
  - Stallion, 9.25 to 11.75 oz. (21 days) (RUP)
  - Vulcan, 1.5 to 2 pt. (21 days) (RUP)
  - Warhawk, 1.5 to 2 pt. (21 days) (RUP)
  - Whirlwind, 1.5 to 2 pt. (21 days) (RUP)
  - Chlorpyrifos + Gamma-cyhalothrin
    - Bolton, 13 to 23 fl oz. (21 days) (RUP)
    - Cobalt, 19 to 38 fl oz. (21 days) (RUP)
    - Coragen, 3.5 to 5 fl oz. (1 day)
  - Diazinon AG 500, 1 to 1.25 qt. (7 days) (RUP)
  - DiPel ES, 2 to 4 pt. (0 days)
  - Endosulfan 3 EC, 2 qt. (17 days) (RUP)
  - Lambda-cyhalothrin
    - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
    - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
  - Methomyl
    - Lannate LV (0.75 to 1.5 pt.) or Lannate SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
    - Nudrin LV (0.75 to 1.5 pt.) or Nudrin SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
  - Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Radiant SC, 3 to 6 fl oz. (3 days)
  - Rimon 0.83EC, 9 to 12 fl oz. (1 day)
  - Carbaryl 4L, 1 to 2 qt. (2 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (2 days)
  - Spinosad
    - Blackhawk (2.2-3.3 oz/A) or Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
    - Tundra Supreme, 5.6 to 16.8 fl oz. (21 days) (RUP)
  - CORN ROOTWORM ADULTS: Apply as needed to protect silks, when beetle are active and feeding on silks.
  - Acetamiprid
    - Assail 30 SG, 4.5 to 5.3 oz/A. (7 days)
    - Assail T0WP, 1.9 to 2.3 oz/A. (7 days)
    - Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
  - Bifenthrin
    - Bifenture EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
    - Brigade @ 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
    - Capture 2 EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
    - Fanfare 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
    - Tundra EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
  - Bifenthrin + Zeta-Cypermethrin
    - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
    - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.
**Materials marked with an asterisk are particularly recommended for problem infestations.**

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**Carbaryl**
- Carbaryl 4L, 1 to 2 qt. (2 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (2 days)

**Chlorpyrifos**
- Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
- Govern, 1 to 2 pt. (21 days) (RUP)
- Hatchet, 1 to 2 pt. (21 days) (RUP)
- Lorsban 4E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)
- Nufos 4E, 1 to 2 pt. (21 days) (RUP)
- Stallion, 9.25 to 11.75 oz. (21 days) (RUP)
- Vulcan, 1 to 2 pt. (21 days) (RUP)
- Warhawk, 1 to 2 pt. (21 days) (RUP)
- Whirlwind, 1 to 2 pt. (21 days) (RUP)

**Chlorpyrifos + Gamma-cyhalothrin**
- Bolton, 9 to 18 fl oz. (21 days) (RUP)
- Cobalt, 13 to 26 fl oz. (21 days) (RUP)
- Diazinon AG 500, 0.5 to 1 pt. (0 days) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-Fenvalstar, 5.8 to 9.6 fl oz. (1 day) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.25 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

**Methomyl**
- Lannate LV (0.75 to 1.5 pt.) or Lannate SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- Nudrin LV (0.75 to 1.5 pt.) or Nudrin SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- Mustang Max, 2.24 to 4 oz. (3 days) (RUP)
- Penncap-M, 1 to 2 pt. (12 days) (RUP)

**Permethrin**
- Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (1 day) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Carbaryl 4L, 1 to 2 qt. (2 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (2 days)
- Tundra Supreme, 5.6 to 16.8 fl oz. (21 days) (RUP)

**CORN LEAF APHIDS: Apply when populations start to build, prevents sooty mold on ears at harvest.**

**Bifenthrin**
- Bifenthrin EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Brigade @ 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Capture 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Chlorpyrifos**
- Chlorpyrifos 4E AG, 1 to 2 pt. (21 days) (RUP)
- Govern, 1 to 2 pt. (21 days) (RUP)
- Hatchet, 1 to 2 pt. (21 days) (RUP)
- Lorsban 4E / Lorsban Advanced (1 to 2 pt.) or Lorsban 75 WG (0.67 to 1.33 lb.) (21 days) (RUP)

**Chlorpyrifos + Gamma-cyhalothrin**
- Bolton, 9 to 18 fl oz. (21 days) (RUP)
- Cobalt, 13 to 26 fl oz. (21 days) (RUP)
- Diazinon AG 500, 1 to 2 pt. (0 days) (RUP)
- Endosulfan 3 EC, 1.33 qt. (17 days) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-Fenvalstar, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Mustang Max, 2.8 to 4 oz. (3 days) (RUP)
- Penncap-M, 2 to 3 pt. (12 days) (RUP)
- Tundra Supreme, 5.6 to 16.8 fl oz. (21 days) (RUP)

**SAP BEETLE: These usually come in following damage by other insects or birds. Controlling damage will be the most effective solution. For short-term control, apply as needed.**

**Bifenthrin**
- Bifenthrin EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Brigade @ 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Capture 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (1 day) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (1 day) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Carbaryl**
- Carbaryl 4L, 1 to 2 qt. (2 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (2 days)

**Chlorpyrifos + Gamma-cyhalothrin**
- Bolton, 9 to 18 fl oz. (21 days) (RUP)
- Cobalt, 13 to 26 fl oz. (21 days) (RUP)
- Diazinon AG 500, 1 to 2 pt. (0 days) (RUP)
- Endosulfan 3 EC, 1.33 qt. (17 days) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-Fenvalstar, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Mustang Max, 2.8 to 4 oz. (3 days) (RUP)
- Penncap-M, 2 to 3 pt. (12 days) (RUP)
- Tundra Supreme, 5.6 to 16.8 fl oz. (21 days) (RUP)

**Always read and follow label instructions carefully.**

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*Materials marked with an asterisk are particularly recommended for problem infestations.*
Corn

- XenTari, 0.5 to 2 lb. (0 days)
- Baythroid XL, 1.6 to 2.8 ft oz. (0 days) (RUP)

Bifenthrin
- Capture 1.15 G, 3.5 to 8.7 lb. (1 day) (RUP)
- Empower, 3.5 to 8.7 lb. (1 day) (RUP)

Carbaryl
- Carbaryl 4L, 1 to 2 qt. (2 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (2 days)

Chlorpyrifos
- Saurus, 6 to 8 oz/1000 row ft. (21 days)
- Stallion, 9.25 to 11.75 oz. (21 days) (RUP)
- Coragen, 3.5 to 5 fl oz. (1 day)

Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (1 day) (RUP)

Methomyl
- Lannate LV (0.75 to 1.5 pt.) or Lannate SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- Nudrin LV (0.75 to 1.5 pt.) or Nudrin SP (0.25 to 0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)

Mustang Max, 2.8 to 4 oz. (3 days) (RUP)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Carbaryl 4L, 1 to 2 qt. (2 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (2 days)

Spinosad
- Blackhawk (2.2-3.3 oz/A) or Entrust (0.5 to 2 oz.) or Entrust SC (1.5 to 6 fl oz.) (7 days)

CUTWORM: Apply when they appear. Repeat as needed.
- Baythroid XL, 0.8 to 2.8 ft oz. (0 days) (RUP)
- DiPel/ES, 1.5 to 2.5 pt. (0 days)

Esfenvalerate
- Adjourn, 2.9 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 2.9 to 9.6 fl oz. (1 day) (RUP)
- S-FenvaloStar, 2.9 to 9.6 fl oz. (1 day) (RUP)

Methomyl
- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (0 days; 3 days for forage; 21 days for fodder) (RUP)

Mustang Max, 2.24 to 4 oz. (3 days) (RUP)
- Sevin 4 F, Sevin XLR Plus, 2 qt. (2 days; 14 days for forage; 48 days for fodder)

Phorate
- Thimet 20 G, 4.5 to 6.0 oz/1000 row ft. At planting treatment.

SEED TREATMENT:

DAMPING OFF (Pythium spp., Rhizoctonia solani): Treatments applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions.

- Captain 4 Flowable, 4 fl oz/100 lb seed.
- Fludioxonil + mefenoxam
- Maxim 4 FS, 0.08 fl oz/100 lb seed (Rhizoctonia). Commercial seed treatment plants only.
- Fludioxonil + mefenoxam
- Maxim XL, 0.167 to 0.334 fl oz/100 lb seed (Pythium + Rhizoctonia).
- Mefenoxam
- Apron XL LS, 0.32 to 0.64 oz/100 lb seed (Pythium).
- Metaxyl
- Allegiance-FL, 0.75 fl oz/100 lb seed (Pythium).
- Fludioxonil + mefenoxam
- Maxim XL, 0.167 to 0.334 fl oz/100 lb seed (Pythium + Rhizoctonia).
- Mefenoxam
- Apron XL LS, 0.32 to 0.64 oz/100 lb seed (Pythium).
- Metaxyl
- Allegiance-FL, 0.75 fl oz/100 lb seed.

SYSTEMIC DOWNY MILDEW:
- Mefenoxam
- Apron XL LS, 1.28 oz/100 lb seed.
- Metaxyl
- Allegiance-FL, 1.5 fl oz/100 lb seed.

FOLIAR TREATMENT:

CORN RUST (Puccinia sorghi): Apply when conditions favor disease.

Note: Do not feed treated forage to livestock.

- Azoxystrobin
- Quadris, 6.2 to 9.2 fl oz. (7 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

- Azoxystrobin + Propiconazole
- Quilt (10.5 - 14 fl oz at 14 day interval) or Quilt Xcel (10.5 - 14 fl oz) (14 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Cucumber

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES

Root-knot and root-lesion nematodes can reduce cucumber yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for cucumber, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot and root-lesion nematodes in cucumber production. Recent observations indicate that cucumber planted the year following a chemigated (metham) potato crop may provide benefits to the cucumber crop. Recent observations indicate that cucumber planted the year following a chemigated (metham) potato crop is recommended for problem infestations. The following nematicides are suitable for control of root-knot and root-lesion nematodes in cucumber production. Recent observations indicate that cucumber planted the year following a chemigated (metham) potato crop may provide benefits to the cucumber crop.

FALL SOIL FUMIGATION (BROADCAST):

1.3-D
- Telexone II, 9-18 gal/A (mineral soil).
Fumigate in the fall when soil temperatures at a 6-inch depth are above 50F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

PREPLANT NEMATICIDE TREATMENT:

- Ethoprop
  - Mocap 15 G, at 13 lb/A (7-foot row spacing) or 2.1 lb/1000 row feet in a band 12 to 15 inches wide on top of the row at or just before planting. Mix with top 2 to 4 inches of soil immediately after application. Do not use as a seed furrow treatment or allow granules to contact seed. (RUP)

Fluensulfone
- Nimitz 480EC, 3.5 - 5.0 pints/A. Apply broadcast and incorporate either mechanically or with water to a depth of 6-8 inches at least 7 days prior to transplanting or planting. Do not apply if heavy rainfall is expected within 48 hours of application. This material can be applied in bands or by drip but apparently is most effective if applied broadcast and incorporated. Do not apply to extremely cold soils (<40 F) as nematodes have to be active for the product to be effective. Product has not been evaluated in Michigan.

Oxamyl
- Vydate L, apply 2 gal (broadcast) or 1 gal (band) per acre. Apply before planting, incorporate 2-4 in into the soil. (RUP)

POST-PLANT TREATMENT:

Oxamyl
- Vydate L, 50 WDG, 2 gal/A 5-7 days after planting. Apply again 2-4 weeks after the first spray. Best used after a preplant treatment. Do not make more than 8 applications per season and do not apply more than 3 gal of Vydate L/A/year. (RUP)

INSECTS

SEED TREATMENT:

CUCUMBER BEETLE:
- Cruiser 5 FS, 4.8 to 6.4 oz. (21 days) See label for application methods.

SOIL TREATMENT:

APHIDS, FLEA BEETLE, LEAFHOPPER, THRIPS:
- Durivo, 10 to 13 fl oz. (30 days)
- Thiamefoxam
  - Platinum 5 to 11 fl oz. or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

SEED CORN MAGGOT:
- Athena, 6.5 to 17 fl oz. (RUP)
- Bifenthrin
  - Bifenture 10 DF, 8 to 16 oz/A.
  - Brigade WSB, 8 to 16 oz. (RUP)
  - Capturo LFR, 3.4 to 6.8 fl oz. (RUP)
Apply infurrow with seed or transplant.

CUTWORM, FLEA BEETLE LARVAE:
- Capture LFR, 6 oz. See label for application methods. (RUP)

CUCUMBER BEETLE:
- Admire Pro, 7.0 - 10.5 fl oz. (21 days)
- Belay 50 WDG, 4.8 to 6.4 oz. (7 days) See label for application methods
- Nuprid 2 F, 16 to 24 fl oz. (21 days)
- Scorpion 35SL, 9 to 10.5 fl oz. (21 days)
- Imidacloprid
  - Admire Pro, 7.0 - 10.5 fl oz. (21 days)
  - Belay 50 WDG, 4.8 to 6.4 oz. (7 days) See label for application methods
  - Nuprid 2 F, 16 to 24 fl oz. (21 days)
  - Scorpion 35SL, 9 to 10.5 fl oz. (21 days)
- Admire Pro, 7.0 - 10.5 fl oz. (21 days)
- Belay 50 WDG, 4.8 to 6.4 oz. (7 days) See label for application methods
- Nuprid 2 F, 16 to 24 fl oz. (21 days)
- Scorpion 35SL, 9 to 10.5 fl oz. (21 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Cucumber

**SQUASH BUG:**
- *Scorpion 35SL, 9 to 10.5 fl oz. (21 days)* See label for application methods

**APHIDS and THRIPS:**
- *Vertmark, 10-13.5 oz/A. (1)*

**ARMYWORM:**
- *Vertmark, 6.75-13.5 oz/A. (1)*

**CABBAGE LOOPERS:**
- *Vertmark, 6.75-13.5 oz/A. (1)*

**LEAF MINERS:**

**LEAFHOPPERS:**
- *Sivanto, 21 - 28 fl oz/A. (3 days)*

**WHITEFLIES:**
- *Sivanto, 21 - 28 fl oz/A. (3 days)*

**FOLIAR TREATMENT:** Cucumber plants may be sensitive to certain insecticide formulations. Make certain a problem exists before treatment. Read and observe restrictions on the label. To avoid killing bees, do not treat cucumbers during bloom. If treatment is necessary, see the Insecticide Effectiveness for bee toxicity.

**CUTWORM, ARMYPHOR:** Apply if needed to prevent >1-5% stand loss.
- *Athena, 7 to 17 fl oz. (7 days) (RUP)*
- *Bacillus thuringiensis*
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - XenTari, 0.5 to 2 lb. (0 days)
- *Bifenture SC, 1.5 fl oz. (1 day)*

**Bifenture**
- *Bifenture 10 DF, 8 to 16 oz/A. (3 days)*
- *Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)*
- *Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)*
- *Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)*
- *Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)*
- *Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)*
- *Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)*
- *Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)*

**Bifenture + Zeta-Cypermethrin**
- *Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)*
- *Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)*
- *Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)*

**Methomyl**
- *Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)*
- *Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)*
- *Pyrene, 1 to 12 fl oz. (0 days)*
- *Velona, 12 to 17 fl oz. (7 days)*

**STRIPED and SPOTTED CUCUMBER BEETLE:** Apply as soon as possible if numbers exceed 0.1 to 1 per plant. Repeat as needed. Use preplant Furadan treatment (above) in fields with severe problems.

**Acetamiprid**
- *Assail 30 SG (2.5 to 5.3 oz.) or Assail 70WP (1.1 to 2.3 oz.) (0 days)*

**Always read and follow label Instructions carefully**
Materials marked with an asterisk are particularly recommended for problem infestations.

** Aphids: Apply if needed.**
- Methomyl
- Lambda
- Gladiator
- Exirel
- Bifenthrin + Zeta
- Beleaf
- Belay
- Athena
- Acetamiprid
- Voliam
- Days)
- Pyrenone
- 1 to 12 oz. (0 days)
- Cararyl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
- Voliam Flexi, 4 to 7 oz. (1 day)

** APHIDS: Apply if needed.**
- Acetamiprid
  - Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1.1 to 1.7 oz.) (0 days)
- Actara, 1.5 to 3 oz. (0 days)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
- Beleaf 50 SG, 2 to 2.8 oz. (0 days)

** Bifenthrin**
- Bifenthrin 10 DF, 8 to 16 oz/A. (3 days)
- Bifenthrin EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

** Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Endigo ZC, 4.5 fl oz. (1 day) (RUP)
- Exirel, 13.5-20.5 oz/A, (1)
- Fulfill, 2.75 oz. (7 days) @ 1 oz. (RUP)
- Gladiator, 19 fl oz. (7 days) (RUP)

** Lambda-cyhalothrin**
- Lambda-Cy, 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.92 fl oz.) or Warrior with Zeon Technology (3.84 fl oz.) (1 day) (RUP)
- Malathion
  - Malathion 5 (1.5 pt.) or Malathion 5 EC (1.5 to 2 pt.) or Malathion 57 EC (1.5 pt.) or Malathion 8 (1.75 pt.) or Malathion 8 Aquamul (1 to 1.75 pt.) (1 day)

** Methomyl**
- Lannate LV (1.5 to 3 pt. (1.5 pt. 1 day; over 1.5 pt., 3 days) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days) (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt. 1 day; over 1.5 pt., 3 days) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days) (RUP)

** Permethrin**
- Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)
- Pounce 25 WP, 12.8 oz. (0 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Shivato, 21 - 28 fl oz/A.
- Voliam Flexi, 4 to 7 oz. (1 day)
- Vydate L, 2 to 4 pt. (1 day) (RUP)

** THRIPS: Apply when damage is seen. Repeat as needed.**
- Athena, 13.5 to 17 fl oz. (7 days) (RUP)
- Dinofuran
  - Scorpion 35SL, 2 to 7 fl oz. (1 day)
  - Venom, 1 to 4 oz. (1 day)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Exirel, 13.5-20.5 oz/A, (1)
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Malathion
  - Malathion 8 (1.75 pt.) or Malathion 8 Aquamul (1 to 1.75 pt.) (1 day)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Radiant SC, 6 to 10 fl oz. (1 day)
- Rimon 0.83EC, 12 fl oz. (1 day)
- Spinosad
  - Entrust (2 to 2.5 oz.) or Entrust SC (6 to 8 fl oz.) (1 day)
  - Vydate L, 2 to 4 pt. (1 day) (RUP)

** SQUASH BUG:**
- Acetamiprid
  - Assail 30 SG (5.3 oz.) or Assail 70WP (2.3 oz.) (0 days)
  - Athena, 7 to 17 fl oz. (7 days) (RUP)
  - Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
- Bifenthrin
  - Bifenthrin 10 DF, 8 to 16 oz/A. (3 days)
  - Bifenthrin EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Bifenthrin + Zeta-Cypermethrin
    - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
- Cararyl
  - Cararyl 4L, 1 qt. (3 days)
  - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
- Dinofuran
  - Scorpion 35SL, 2 to 7 fl oz. (1 day)
  - Venom, 3 to 4 oz. (1 day)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-FenvalaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Gladiator, 14 to 19 fl oz. (7 days) (RUP)

** Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.25 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- Mustang Max, 2.8 to 4 oz. (1 day) (RUP)
- Permethrin
  - Ambush 25 W, 12.8 oz. (0 days) (RUP)
  - Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)

* Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Cucumber

- Pounce 25 WP, 12.8 oz. (0 days) (RUP)
- Pyrenoone, 1 to 12 fl oz. (0 days)
- Rimon 0.83EC, 12 fl oz. (1 day)
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

SEED CORN MAGGOT:
- Empower, 3.5 to 8.7 lb. (3 days) (RUP)

LEAFHOPPERS:
- Acetamiprid
  - Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1.1 to 1.7 oz.) (0 days)
- Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
- Bifenthrin
  - Bifenture 10 DF, 8 to 16 oz/A. (3 days)
  - Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Carbaryl
  - Carbaryl 4L, 1 qt. (3 days)
  - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-Fenvalstar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)
- Malathion 8, 1.75 pt. (1 day)
- Mustang Max, 2.8 to 4 oz. (1 day) (RUP)
- Pyrenoone, 1 to 12 oz fl. (0 days)
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
- Sivanto, 21 - 28 fl oz/A.
- Vetrica, 14 to 17 fl oz. (7 days)

ARMYWORM:
- Avant, 3.5 to 6 oz. (3 days)
- Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biobit HP, 0.5 to 2 lb. (0 days)
  - DiPel DF, 1 to 2 lb. (0 days)
  - Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
  - Coragen, 3.5 to 5 fl oz. (1 day)
  - Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)
  - Exirel, 7-13.5 oz/A. (1)
  - Gladiator, 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 10 fl oz. (3 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Spinosad
  - Entrust (1.25 to 2.5 oz.) or Entrust SC (4 to 8 fl oz.) (1 day)

CUTWORM:
- Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
- Empower, 3.5 to 8.7 lb. (3 days) (RUP)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-Fenvalstar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Gladiator, 6 to 19 oz fl. (7 days) (RUP)
- Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- Malathion 8, 1.75 pt. (1 day)
- Mustang Max, 1.28 to 4 oz. (1 day) (RUP)
- Permethrin
  - Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
  - Perm UP 25DF (6.4 to 12.8 oz.) or Perm UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

CABBAGE LOOPERS:
- Exirel, 10-17 oz/A. (1)

WHITEFLIES:
- Sivanto, 21 - 28 fl oz/A.

MITES
Apply when needed. Usually a problem only in hot, dry weather.
- Abamectin
  - Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
- Bifenazate
  - Acramite 50WS, 0.75 to 1 lb. (3 days)
- Bifenthrin
  - Bifenture EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Bifenture 10 DF, 12.8 to 16 oz/A. (3 days)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Bifenthrin + Avermectin
  - Athena, 13.5 to 17 fl oz. (7 days) (RUP)
  - Bifenthrin + Zeta-Cypermethrin
  - Hero (10.3 oz.) or Hero EW (11.2 oz.) (3 days) (RUP)
- Etoxazole
  - Zeal, 2 to 3 oz. (7 days)
- Fenpropathrin
  - Danitol 2.4 EC, 10 2/3 fl oz. (7 days) (RUP)
  - Malathion
  - Malathion 5 (1.5 pt.) or Malathion 5 EC (1.5 to 2 pt.) or Malathion 8 (1.75 pt.) or Malathion 8 Aquamul (1 to 1.75 pt.) (1 day)
  - Spiromesifen
  - Oberon 2 SC, 7 to 8.5 fl oz. (7 days)
- Zeta-Cypermethrin + Avermectin
  - Gladiator, 19 fl oz. (7 days) (RUP)

DISEASES

SEED TREATMENT:
- Damping OFF (Pythium spp., Rhizoctonia solani): Use only as directed; over-treatment may cause injury.
- Captan
  - Captan 4 Flowable, 3.2 fl oz/100 lb seed.

*Materials marked with an asterisk are particularly recommended for problem infestations.
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**FOLIAR TREATMENT:**

- *Ametoctradin + Dimethomorph*
- *Cyflufenamid*
- *Sovran*, 3.2 to 4.8 oz. (0 days)

**DIP APPLICATION:**

- *Fludioxonil*
- *Mefenoxam*
- *Metalaxyl*
- *Thiram*

**SEEDBED PREPARATION:**

- *1,3 Dichloropropene/chloropicrin*
- *Cuprofix*
- *ManKocide*
- *Count N*

**SEEDBED PREPARATION:**

- *Thiophanate-Methyl*
- *Pyraclostrobin/Boscalid*

**PREPLANT SOIL FUMIGATION:**

- *Meten Potassium*
- *Metam Sodium*
- *Metalaxyl*

**PREPLANT TREATMENT:**

- *Fludioxonil*
- *Mefenoxam*
- *Metalaxyl*
- *Thiram*

**DRIP APPLICATION:**

- *Fludioxonil*
- *Mefenoxam*
- *Metalaxyl*
- *Thiram*

**FOLIAR TREATMENT:**

- *Ametoctradin + Dimethomorph*
- *Cyflufenamid*
- *Sovran*, 3.2 to 4.8 oz. (0 days)

**PREPARED FOLIAR TREATMENTS:**

- *Mancozeb + Copper Hydroxide*
- *Cuprofix*
- *Cortoase*

**PREPARED DIP TREATMENTS:**

- *Nufarm*
- *Kresoxim-methyl*
- *Presidio*

**PREPARED SEEDBED TREATMENTS:**

- *Fludioxonil*
- *Mefenoxam*
- *Metalaxyl*
- *Thiram*

**PREPARED TREATMENTS:**

- *Ametoctradin + Dimethomorph*
- *Cyflufenamid*
- *Sovran*, 3.2 to 4.8 oz. (0 days)

**PREPARED TREATMENTS:**

- *Ametoctradin + Dimethomorph*
- *Cyflufenamid*
- *Sovran*, 3.2 to 4.8 oz. (0 days)
**Materials marked with an asterisk are particularly recommended for problem infestations.**

### Cucumber

- **Metrafenone**
  - *Vivando*, 15.4 fl oz. (0 day)
- **Neem Oil**
  - *Trilogy*, 2 pt. (0 days)
- **Potassium Bicarbonate**
  - *Armicarb*, 100, 2.5 to 5 lb. (0 days)
- **Sulfur**
  - *Kumulus* DF, 2 to 6 lb. (0 days)
  - *Micro Sulf*, 2 to 4 lb. (0 days)
  - *Microthiol* Disperss, 2 to 4 lb. (0 days)
  - *Thiolux*, 2 to 6 lb. (0 days)
- **Tebuconazole**
  - *Orius* 3.6F, Tebuzel 3.6, 4-6 fl oz. (7 days) 12 hr REI.
  - *Trifumizole*
  - *Procure* 480 SC, 4 to 8 fl oz every 7-14 days. (0 days)

#### SCAB (Cladosporium cucumerinum): Treat every 7 days after plants are 2 to 3 inches tall.
- **Chlorothalonil**
  - *Bravo Ultrex*, *Equus* DF, 1.8 to 2.7 lb. (0 days)
  - *Bravo Weather Stik*, *Echo* 720, *Equus* 720 SST, 2 to 3 pt. (0 days)
  - *Echo 90 DF*, 1.6 to 2.4 lb every 7 days. (0 days)
- **Mancozeb**
  - *Dithane* DF Rainshield, *Dithane* M-45, 2 to 3 lb. (5 days)
  - *Dithane* F-45 Rainshield, 1 3/5 to 2 2/5 qt. (5 days)
  - *Manzate Max*, 1.6 to 2.4 qt. (5 days)
  - *Manzate Pro-Stick*, 2 to 3 lb, 7- to 10-day intervals. (5 days)
  - Maximum 24 in/year.
  - *Penncozeb* 75 DF, *Penncozeb* 80WP, 1 1/2 to 3 lb. (5 days)
  - *ManKocide*, 2-3 lb. (5 days)
- **Neem Oil**
  - *Trilogy*, 2 pt. (0 days)
  - *Potassium phosphite/chlorothalonil*
  - *Catamaran*, 6 pt. (1 day)

#### ALTERNARIARIA LEAF BLIGHT (Alternaria cucumerinii): Treat plants after vine tip when conditions favor disease and continue at 7 to 10 day intervals.
- **Azoxystrobin**
  - *Quadris*, 11.0 to 15.4 fl oz. (1 day)
  - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with another fungicide that has a different mode of action.
- **Azoxystrobin + Chlortalidone**
  - *Quadris* Opti, 3.2 pt every 7 - 14 days. (1 day)
- **Azoxystrobin + Difenoconazole**
  - *Quadris* Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
- **Chlorothalonil**
  - *Bravo Ultrex*, *Equus* DF, 1.8 to 2.7 lb every 7 days. (0 days)
  - *Bravo Weather Stik*, *Echo* 720, *Equus* 720 SST, 2 to 3 pt. (0 days)
  - *Echo 90 DF*, 1.6 to 2.4 lb. (0 days)
- **Difenoconazole + Cyprodinil**
  - *Inspire Super*, 16 to 20 fl oz. (7 days)
- **Fluxapyroxad + Pyraclostrobin**
  - *Mervion* Xemium Brand Fungicide, 4 - 5.5 fl oz. (0 days)
- **Mancozeb**
  - *Koverall*, 2 - 3 lb. (5 days)
  - *Manzate Max*, 1.6 to 2.4 qt. (5 days)
  - *Penncozeb* 75 DF, *Penncozeb* 80WP, 1 1/2 to 3 lb. (5 days)

#### Pyraclostrobin
- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- **Pyraclostrobin/Boscalid**
  - *Pristine*, 12.5 to 18.5 oz. (0 days)
  - *Bacillus amyloliquefaciens*
  - *Senrif*, 4 - 16 fl oz. (0 day)
  - *Boscalid*
  - *Endura*, 6.5 oz. (0 days)
- **Potassium Ammonium Carbonate**
  - *Copper Count N*, 1 1/2 to 2 qt. (0 days)
- **Copper Hydroxide**
  - *Champ DP Dry Prill*, 1 1/3 lb. (0 days)
  - *Champ Formula 2 F*, 1 1/3 pt. (0 days)
  - *Champ WG*, 1 1/2 to 2 lb. (0 days)
  - *Champion WP*, 1.5 to 3 lb. (0 days)
  - *Kocide 2000*, 1 1/2 lb. (0 days)
  - *Kocide 3000*, 0.5-1.25 lb. (0 day)
  - *Nu-Cop 3 L*, 1 1/3 to 2 2/3 pt. (0 days)
- **Copper Hydroxide + Copper Oxchloride**
  - *Badge SC* (1 to 2.5 pt) or *Badge X2* (0.5 to 2.5 lb) (0 days)
- **Copper Sulfate**
  - *Cuprofix Ultra 40 Disperss*, 1 to 2 lb. (0 days)
- **Famoxadone + Cymoxanil**
  - *Tanox*, 8 oz. (3 days)
  - *Mancozeb + Copper Hydroxide*
  - *ManKocide*, 2-3 lb. (5 days)
  - *Mancozeb + Zoxamide*
  - *Gavel 75 DF*, 1.5 - 2.0 lb. (5 days)
- **Neem Oil**
  - *Trilogy*, 2 pt. (0 days)
  - *Penthionypyrad*
  - *Fontelis*, 12 - 16 fl oz. (1 day)
- **Potassium Bicarbonate**
  - *Amistar*, 2.5 to 5 lb. (0 days)
- **Potassium phosphite/chlorothalonil**
  - *Catamaran*, 6 pt. (1 day)
  - *Zoxamide + chlorothalonil*
  - *Zing!* 16.5 fl oz. (0 days)

#### ANTHRACNOSE (Colletotrichum lagenarium): Treat after flowering when conditions are favorable for disease development.
- **Azoxystrobin**
  - *Quadris*, 11.0 to 15.4 fl oz. (1 day)
  - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- **Azoxystrobin + Chlortalidone**
  - *Quadris* Opti, 3.2 pt every 7 - 14 days. (1 day)
- **Azoxystrobin + Difenoconazole**
  - *Quadris* Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
- **Chlorothalonil**
  - *Bravo Ultrex*, *Equus* DF, 1.4 to 1.8 lb. (0 days)
  - *Bravo Weather Stik*, *Echo* 720, *Equus* 720 SST, 1.5 to 2 pt. (0 days)
  - *Echo 90 DF*, 1.6 to 2.4 lb. (0 days)
- **Difenoconazole + Cyprodinil**
  - *Inspire Super*, 16 to 20 fl oz. (7 days)
  - *Fluxapyroxad + Pyraclostrobin*
  - *Mervion* Xemium Brand Fungicide, 5.5 fl oz. (0 days)
- **Mancozeb**
  - *Dithane* DF Rainshield, *Dithane* M-45, 2 to 3 lb, 7- to 10-day intervals. (5 days)

Always read and follow label Instructions carefully
• Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt, 7- to 10-day intervals. (5 days)
• Koverall, 2 - 3 lb. (5 days)
• Manzate Max, 1.6 to 2.4 qt. (5 days)
• Manzate Pro-Stick, 2 to 3 lb, 7- to 10-day intervals. (5 days)
• Penncozeb 75 DF (1 2/3 to 3 lb, 7- to 10-day intervals) or Penncozeb 80WP (1 1/2 to 3 lb) (5 days)

* Pyraclostrobin
  • Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
  • Pyraclostrobin/Boscalid
    • Pristine, 18.5 oz. (0 days)
    • Thiophanate-Methyl
      • Cercobin 4.1F, 10.9 fl oz. (1 day)
      • Topsin 4.5 FL, 10 fl oz. (1 day)
      • Topsin M 70 WSB, 0.5 lb. (1 day)

**Bacillus amyloliquefaciens**
  • Senf, 4 - 16 fl oz. (0 day)
  • Copper Ammonium Carbonate
    • Copper Count N, 1 1/2 to 2 qt. (0 days)
  • Copper Hydroxide
    • Champ DP Dry Prill, 1 1/3 lb. (0 days)
    • Champ Formula 2 F, 1 1/3 pt. (0 days)
    • Champ WG, 1 1/2 to 2 lb. (0 days)
    • ChampION, 0.5 to 1.25 lb. (0 days)
    • Kocide 2000, 1 1/2 lb. (0 days)
    • Kocide 3000, 0.5-1.25 lb. (0 day)
    • Nu-Cop 3 L, 1 1/3 to 2 1/3 pt. (0 days)
  • Copper Hydroxide + Copper Oxycide
    • Badge SC, 1 to 1.8 pt. (0 days)
  • Copper Oxycide + Copper Sulfate
    • Crop 53, 1 1/2 to 2 qt. every 7 days. (0 days)
  • Copper Sulfate
    • Basic Copper 53, Basicop, 2 lb. (0 days)
    • Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)
  • Difenconazole + Cyprodinil
    • Inspire Super, 16 to 20 fl oz. (7 days)
  • Farnoxdine + Cymoxanil
    • Taros, 8 oz. (3 days)
  • Mancozeb + Copper Hydroxide
    • ManKocide, 2-3 lb. (5 days)
  • Neem Oil
    • Trilogy, 2 pt. (0 days)
    • Potassium phosphate/chlorothalonil
      • Catamaran, 4 pt. (1 day)
      • Zoxamide + chlorothalonil
    • Zing!, 36 fl oz. (0 days)

**ANGULAR LEAF SPOT (Pseudomonas lachrymans):** Spray every 7 days, starting before the first fruit form. The disease is likely to be more serious in high-population plantings (40,000 plants/A or more). Under these conditions spray every 3 or 4 days to protect fruit at all stages of development.

**Copper Ammonium Carbonate**
  • Copper Count N, 1 1/2 to 2 qt. (0 days)

**Copper Hydroxide**
  • Champ DP Dry Prill, 1 1/3 lb. (0 days)
  • Champ Formula 2 F, 1 1/3 pt. (0 days)
  • Champ WG, 1 1/2 to 2 lb. (0 days)
  • ChampION, 0.5 to 1.25 lb. (0 days)

*Champion WP (1 1/2 to 3 lb) or Nu-Cop 50 DF (1 1/2 to 2 lb) (0 days)

**Copper Sulfate**
  • Kocide 2000, 1 1/2 lb. (0 days)
  • Kocide 3000, 0.5-1.25 lb. (0 day)
  • Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

**Copper Hydroxide + Copper Oxycide**
  • Badge SC (1 to 2.5 pt) or Badge X2 (0.5 to 1.25 lb) (0 days)
  • Basic Copper 53, Basicop, 2 lb. (0 days)
  • Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)
  • Mancozeb + Copper Hydroxide
    • ManKocide, 2 to 2.5 lb. (5 days)

**Neem Oil**
  • Trilogy, 2 pt. (0 days)

**BELLY ROT (Rhizoctonia solani):**

* Thiophanate-Methyl
  • Cercobin 4.1F, 10.9 fl oz. (1 day)
  • Topsin 4.5 FL, 10 fl oz. (1 day)
  • Topsin M 70 WSB, 0.5 lb. (1 day)

**Azoxystrobin**
  • Quadris, 11.0 to 15.4 fl oz. (1 day)
  Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Azoxystrobin + Chlorothalonil**
  • Quadris Opti, 3.2 pt see label for interval. (1 day)

**DOWNY MILDEW (Pseudoperonospora cubensis):** Treat plants at first sign of disease and repeat at 14-day intervals.

* Ametocardin + Dimethomorph
  • Zampro, 14 fl oz. (0 days)
  • Cyazofamid
  • Ranman 400SC, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)
  • Propamocarb
    • Previcur Flex, 1.2 pt every 7 - 14 days. (2 days)

**Azoxystrobin**
  • Quadris, 11.0 to 15.4 fl oz. (1 day)
  Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Azoxystrobin + Chlorothalonil**
  • Quadris Opti, 3.2 pt every 7 - 14 days. (1 day)

**Bacillus amyloliquefaciens**
  • Senf, 4 - 16 fl oz. (0 day)

**Chlorothalonil**
  • Bravo Ultra, Equus DF, 1.4 to 1.8 lb. (0 days)
  • Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)

**Copper Ammonium Carbonate**
  • Copper Count N, 1 1/2 to 2 qt. (0 days)

**Copper Hydroxide**
  • Champ DP Dry Prill, 1 1/3 lb. (0 days)
  • Champ Formula 2 Flowable, 1 1/3 pt. (0 days)
  • Champ WG, 1 1/2 to 2 lb. (0 days)
  • ChampION, 0.5 to 1.25 lb. (0 days)
  • Kocide 3000, 0.5-1.25 lb. (0 day)
  • Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

**Copper Hydroxide + Copper Oxycide**
  • Badge SC (1 to 2.5 pt) or Badge X2 (0.5 to 1.25 lb) (0 days)

**Copper Sulfate**
  • Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Cucumber

**Copper Sulfate**
- Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)

**Cymoxanil**
- Curzate 60 DF, 3.2 to 5 oz. (3 days)

**Dimethomorph**
- Forum, 6 fl oz. (0 days)

**Famoxadone + Cymoxanil**
- Tanos, 8 oz. (3 days)

**Fenamidine**
- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (14 days)

**Fluopicolide**
- Presidio, 3-4 fl oz. (2 days)

**Fluxapyroxad + Pyraclostrobin**
- Merivon Xemium Brand Fungicide, 5.5 fl oz. (0 days)

Suppression only

**Fosetyl-Aluminum**
- Aliette WDG, 2 to 5 lb, 7 to 14 day intervals. (0 days) Do not tank mix with copper fungicides.

**Mancozeb**
- Dithane DF Rainshield, Dithane M-45, 2 to 3 lb, 7- to 10-day intervals. (5 days)
- Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt, 7- to 10-day intervals. (5 days)
- Koverall, 2 - 3 lb. (5 days)
- Manzate Max, 1.6 to 2.4 qt. (5 days)
- Manzate Pro-Stick, 2 to 3 lb, 7- to 10-day intervals. (5 days) Maximum 24 lb/season.

- Penncozeb 75 DF, Penncozeb 80WP, 1 1/2 to 3 lb. (5 days)

- Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days)

- Mancozeb + Zoxamide
- Gavel 75 DF, 2.0 lb. (5 days)

**Mandipropamid**
- Revus, 8 fl oz. (0 day)

**Mefenoxam + Chlorothalonil**
- Ridomil Gold Bravo, 2 lb. (7 days) Maximum 4 applications. Do not apply to mature or senescent plants.

**Mefenoxam + Copper Hydroxide**
- Ridomil Gold Copper, 2 lb. (5 days) Maximum 4 applications.

**Mefenoxam + Mancozeb**
- Ridomil Gold MZ, 2 1/2 lb. (5 days) Maximum 4 applications.

**Mono-, dibasic sodium salts of phosphorous acid**
- Fosphite, 1 to 3 qt per 100 gal (ground) or 10 gal (aerial) of water. (0 days)

**Mono-, dibasic sodium, potassium and ammonium phosphites**
- Phostrol, 2.5 to 5 pt every 7 - 14 days. (0 days)
- Prophyt, 2 to 4 pt. (0 days)

**Neem Oil**
- Trilogy, 2 pt. (0 days)

**Potassium Bicarbonate**
- Armicarb 100, 2.5 to 5 lb. (0 days)

**Potassium phosphate/chlorothalonil**
- Catamaran, 4 pt. (1 day)

**Pyraclostrobin**
- Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

**Pyraclostrobin/Boscalid**
- Pristine, 12.5 to 18.5 oz. (0 days)

**Trifloxystrobin**
- Flint, 4 oz. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season. Alternate with Ridomil Gold Bravo. 12 hr REI.

Zoxamide + chlorothalonil
- Zing!, 36 fl oz. (0 days)

**Note:** Most fungicides that protect against Alternaria and gummy stem blight may also provide limited downy mildew protection.

**GUMMY STEM BLIGHT or BLACK ROT (Didymella bryoniae also called Mycosphaerella melonis): Begin treatment at the 2-leaf stage.**

**Azoxystrrobin**
- Quadris, 11.0 to 15.4 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Azoxystrrobin + Chlorothalonil**
- Quadris Opt, 3.2 pt every 7 - 14 days. (1 day)

**Azoxystrrobin + Difenonazonale**
- Quadris Top, 12 to 14 fl oz. (1 day)

**Chlorothalonil**
- Bravo Ultra, Equus DF, 1.8 to 2.7 lb. (0 days)
- Bravo Weather Stik, or Echo 720 (2 to 3 pt, 7-day intervals) or Equus 720 SST (2 to 3 pt every 7 days) (0 days)
- Echo 90 DF, 1.6 to 2.4 lb every 7 days. (0 days)

**Mancozeb**
- Dithane DF Rainshield, Dithane M-45, 2 to 3 lb, 7- to 10-day intervals. (5 days)
- Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt, 7- to 10-day intervals. (5 days)
- Koverall, 2 - 3 lb. (5 days)
- Manzate Max, 1.6 to 2.4 qt. (5 days)
- Manzate Pro-Stick, 2 to 3 lb, 7- to 10-day intervals. Maximum 24 lb/season.

- Penncozeb 75 DF, Penncozeb 80WP, 1 1/2 to 3 lb. (5 days)

**Pyraclostrobin**
- Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

**Pyraclostrobin/Boscalid**
- Pristine, 12.5 to 18.5 oz. (0 days)

**Thiophanate-Methyl**
- Cercobin 4.1F, 10.9 fl oz. (1 day)
- Topsis 4 F.L, 10 fl oz. (1 day)
- Topsis M 70 WSB, 0.5 lb. (1 day)

**Bacillus amyloliquefaciens**
- Senfet, 4 - 16 fl oz. (0 day)

**Bacillus subtilis**
- Serenade ASO, 2 - 6 qts. (0 days)

**Boscalid**
- Endura, 6.5 oz. (0 days)

**Copper Ammonium Carbonate**
- Copper Count N, 1 1/2 to 2 qt. (0 days)

**Copper Hydroxide**
- Champ DP Dry Prill, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champ WG, 1 1/2 to 2 lb. (0 days)
- ChampION, 0.5 to 1.25 lb. (0 days)
- Champion WP, 1.5 to 3 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

**Copper Hydroxide + Copper Oxycyloride**
- Badge SC (1 to 2.5 pt) or Badge X2 (0.5 to 1.25 lb) (0 days)

**Copper Sulfate**
- Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label Instructions carefully
Difenconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz. (7 days)
- Kresoxim-methyl
- Sovran, 4.8 oz. (0 days)
Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days)
Penthiopyrad
- Fontelis, 12 - 16 fl oz. (1 day)
Potassium phosphate/chlorothalonil
- Catamaram, 6 pt. (1 day)
Tebuconazole
- Onus 3.6F, Tebuozel 3.6, 8 fl oz. (7 days) Approved for gummy stem blight. Suppression only.

FRUIT ROT (Phytophthora spp., Pythium spp.): Initiate treatment at flowering. If possible, tank-mix products with a labeled copper product.

* Dimethomorph
  - Forum, 6 fl oz. (0 days)
* Mancozeb + Zoamide
  - Gavel 75 DF, 1.5-2.0 lb. (5 days)
* Mandipropanid
  - Revus, 8 fl oz. (0 day)
Amelotracidin + Dimethomorph
- Zampro, 14 fl oz. (0 days)
Cyazofamid
- Ranman 400SC, 2.75 fl oz every 7 to 10 days. (0 days)
Famoxadone + Cymoxanil
- Tanos, 8-10 oz every 5-7 days. (3 days)
Fosetyl-Aluminum
- Aliette WDG, 2 to 5 lb. 7-14-day intervals (Phytophthora). (0 days) Do not tank mix with copper fungicides.
Mancozeb
- Manzate Max, 1.2 to 2.4 qt. (5 days)
- Penconezb 75 DF (1 1/2 to 3 lb, 7-10 intervals (Pythium)) or Penconezb 80WP (1 1/2 to 3 lb, 7-10 intervals (Pythium)) (5 days)
Mono-, dibasic sodium salts of phosphorous acid
- Fosphite, 1 to 3 qt per 100 gal (ground) or 10 gal (aerial) of water. (0 days)
Mono-, dibasic, potassium and ammonium phosphites
- Phostrol, 2.5 to 5 pt every 7-14 days. (0 days)
- Prophyt, 6 pt. (0 days)

Note: Fungicides applied to control downy mildew may have limited efficacy against Phytophthora crown and fruit rot.

PHYTOPHTHORA CROWN and FRUIT ROT (Phytophthora spp.):

* Fluopicolide
  - Presidio, 3-4 fl oz. (2 days)

Eggplant

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES

PREPLANT NEMATICIDE TREATMENT:

Fluensulfone
- Nimix 480EC, 3.5 - 5.0 pints/A. apply broadcast and incorporate either mechanically or with water to a depth of 6-8 inches at least 7 days prior to transplanting or planting. Do not apply if heavy rainfall is expected within 48 hours of application. This material can be applied in bands or by drip but apparently is most effective if applied broadcast and incorporated. Do not apply to extremely cold soils (<40 F) as nematodes have to be active for the product to be effective. Product has not been evaluated in Michigan.

SOIL TREATMENT AT PLANTING:

Oxamyl
- Vydate L, . Apply 1 gal/A as a band treatment prior to transplanting and incorporate. Apply 4 pts/A as a foilar spray 2-3 weeks after transplanting and again 4 weeks after the first foliar treatment. Do not apply more than 3 gal (24 pts) of Vydate L/year. (RUP)

INSECTS

SOIL TREATMENT:

COLORADO POTATO BEETLE, APHIDS, FLEA BEETLE: Apply where high potato beetle, aphid, or flea beetle numbers are expected. Apply in a band prior to transplanting or in a drench at transplanting.

* Imidacloprid. Additional generic brands available.
  - Admire Pro, 7 to 10.5 fl oz. (21 days) Consult label for rotation restrictions and application methods.
  - Nuprid 2 F, 16 to 24 fl oz.
* Thiamectoxam
  - Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.
  - Belay 50 WDG, 4.8 to 6.4 oz. See label for application methods.
  - Durivo, 10 to 13 fl oz. (30 days)
COLORADO POTATO BEETLE, FLEA BEETLE:

Dinofuran
- Scorpion 35SL, 9 to 10.5 fl oz. (21 days)
- Venom, 5 to 6 oz. (21 days)
Cutworm: Capture LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

Armyworm:
- Verimark, 5-10 oz/A. (1)
Flea beetle, leafminers, loopers, aphids, whitefly, thrips:
- Verimark, 6.75-13.5 oz/A. (1)
Tomato Fruitworm, Tomato Pinworm:
- Verimark, 5-10 oz/A. (1)
Leafhoppers, aphids, psyllid, whiteflies:
- Sivanto, 21 - 28 fl oz/A.

FOLIAR TREATMENT:

Cutworm: Apply when damage is first seen, usually soon after transplanting.

* Baythroid XL, 2.1 to 2.8 fl oz. (7 days) (RUP)
* Percup UP 3.2 EC, 4 to 8 oz. (3 days) (RUP)
* Warnor with Zeon Technology, 2.6 to 3.8 fl oz. (5 days) (RUP)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Bacillus thuringiensis
  - Biobit HP, 0.5 to 1 lb. (0 days)
  - DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - XenTari, 0.5 to 1.5 lb. (0 days)
  - Beil SC, 1.5 fl oz. (1 day)
  - Bifenthrin
    - Bifenture 10 DF, 5.3. (7 days)
    - Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (7 days) (RUP)
    - Empower, 3.5 to 8.7 lb. (7 days) (RUP)
    - Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
    - Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

* Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Eggplant

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Description</th>
<th>Rate</th>
<th>Days</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifenthrin + Imidacloprid</td>
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<tr>
<td>• Brigadier, 5.1 to 9.85 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Swagger, 10.2 to 19.7 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>Bifenthrin + Zeta-Cypermethrin</td>
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<tr>
<td>• Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.)</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Steed, 3.5 to 4.7 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>Carbaryl</td>
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<tr>
<td>• Carbaryl 4L, 2 qt. (3 days)</td>
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<tr>
<td>• Sevin 4 F (2 qt.) or Sevin 80 S (2.5 lb.) or Sevin 80 WSP (2.5 lb.) or Sevin XLR Plus (2 qt.)</td>
<td>(3 days)</td>
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<tr>
<td>• Confirm 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season).</td>
<td>(7 days)</td>
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<td>• Endigo ZC, 4 to 4.5 fl oz.</td>
<td>(5 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Gladiator, 10 to 19 fl oz.</td>
<td>(RUP)</td>
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<tr>
<td>• Intrepid 2F, 4 to 8 fl oz (early-season applications to small, young crops)</td>
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<tr>
<td>• Actara, 2 to 3 oz.</td>
<td>(0 days)</td>
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<tr>
<td>• Carbaryl 4L, 2 qt. (3 days)</td>
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<tr>
<td>• Sevin 4 F (2 qt.) or Sevin 80 S (2.5 lb.) or Sevin 80 WSP (2.5 lb.) or Sevin XLR Plus (2 qt.)</td>
<td>(7 days)</td>
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<tr>
<td>• Velica, 12 to 17 fl oz.</td>
<td>(1 day)</td>
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<td>COLORADO POTATO BEETLE:</td>
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<tr>
<td>• Abamectin</td>
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<tr>
<td>• Agri-Mek 0.15 EC (6 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.)</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<td>• Acrathrin</td>
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<tr>
<td>• Assail 30 SG (1.5 to 2.5 oz.) or Assail 70WP (0.6 to 1.1 oz.)</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Actara, 2 to 3 oz.</td>
<td>(0 days)</td>
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<tr>
<td>• Athena, 7 to 17 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Baythroid XL, 1.6 to 2.8 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Belay 50 WDG, 1.6 to 2.1 oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>Bifenthrin</td>
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<tr>
<td>• Bifenture 10 DF, 5.3.</td>
<td>(7 days)</td>
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<td>• Bifenture EC, 2.1 to 6.4 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 12.8 oz.)</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<td>• Capture 2 EC, 2.1 to 6.4 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Discipline 2EC, 2.1 to 6.4 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Fanfare 2EC, 2.1 to 6.4 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Sniper, 2.1 to 6.4 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Tundra EC, 2.1 to 6.4 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>Bifenthrin + Imidacloprid</td>
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<tr>
<td>• Brigadier, 5.1 to 9.85 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Swagger, 10.2 to 19.7 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>Bifenthrin + Zeta-Cypermethrin</td>
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<tr>
<td>• Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.)</td>
<td>(3 days)</td>
<td>(RUP)</td>
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<tr>
<td>• Steed, 3.5 to 4.7 fl oz.</td>
<td>(7 days)</td>
<td>(RUP)</td>
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<tr>
<td>Carbaryl</td>
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<tr>
<td>• Carbaryl 4L, 1 to 2 qt.</td>
<td>(3 days)</td>
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<tr>
<td>• Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.)</td>
<td>(3 days)</td>
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<tr>
<td>• Coragen, 3.5 to 5 fl oz.</td>
<td>(1 day)</td>
<td>Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.</td>
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</tbody>
</table>

*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label Instructions carefully.
• Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)
  Carbaryl
  • Carbaryl 4L, 0.5 to 1 qt. (3 days)
  • Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)
  Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)
  Dinofuran
  • Scorpion 35SL, 2 to 7 fl oz. (1 day)
  • Venom, 1 to 4 oz. (1 day)
  Do not use if neonicitinoids were used at planting.
  Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)
  Esfenvalerate
  • Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)
  • Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
  • S-FenvaloStar, 5.8 to 9.6 fl oz. (1 day) (RUP)
  • Gladiator, 10 to 19 fl oz. (7 days) (RUP)
  Kryocide, 8 to 16 lb. (14 days)
  Lambda-cyhalothrin
  • Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
  • Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)
  • Leverage 360, 4.1 fl oz. (7 days) (RUP)
  • Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
  Permethrin
  • Ambush 25 W, 6.4 to 12.8 oz. (3 days) (RUP)
  • Perm-UP 25DF (9.6 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (3 days) (RUP)
  • Pounce 25 WP, 6.4 to 9.6 oz. (3 days) (RUP)
  Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)
  • Pyreneone, 1 to 12 fl oz. (0 days)
  • Carbaryl 4L, 0.5 to 1 qt. (3 days)
  • Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)
  • Volar Flexi, 4 to 7 oz. (1 day)
  Aphids: Apply when needed.
  • Acetamiprid
  • Assail 30 SG (2 to 4 oz.) or Assail 70WP (0.8 to 1.7 oz.) (7 days)
  • Actara, 2 to 3 oz. (0 days) Do not apply if a neonicotinoid was used at planting.
  • Imidacloprid, Additional generic brands available.
  • Admire Pro, 1.3 to 2.2 fl oz. (0 days)
  • Nuprid 1.6 F, 3.6 to 6.2 fl oz. (0 days)
  Do not use if neonicotinoids were used at planting. Do not apply more than 19.2 oz/acre per season.
  • Athena, 7 to 17 fl oz. (7 days) (RUP)
  • Baythroid XL, 1.6 to 2.8 fl oz. (7 days) (RUP)
  • Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
  • Beleaf 50 SG, 2 to 2.8 oz. (0 days)
  Bifenthrin + Imidacloprid
  • Brigadier, 3.8 to 9.85 fl oz. (7 days) (RUP)
  • Swagger, 7.6 to 19.7 fl oz. (7 days) (RUP)
  • Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)
  • Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)
  • Exirel, 13.5-20.5 oz/A. (1)
  • Fulfill, 2.75 oz. (0 days) May require 5 to 7 days for aphid mortality
  • Gladiator, 14 to 19 fl oz. (7 days) (RUP)
  • Leverage 360, 3.8 to 4.1 fl oz. (7 days) (RUP)
  • Malathion
  • Malathion 5, or Malathion 5 EC (1 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 (0.75 to 3.5 pt.) or Malathion 8 Aquamul (0.75 to 1.56 pt.) (3 days)
  Methomyl
  • Lannate LV (0.75 to 3 pt.) or Lannate SP (0.25 to 1 lb.) (5 days) (RUP)
  • Nudrin LV (0.75 to 3 pt.) or Nudrin SP (0.25 to 1 lb.) (5 days) (RUP)
  Movento, 4 to 5 fl oz. (1 day) Must be tank mixed with adjuvant having spreading and penetrating properties.
  Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
  Pyreneone, 1 to 12 fl oz. (0 days)
  • Sivanto, 7 - 12 fl oz/A.
  • Volar Flexi, 4 to 7 oz. (1 day)
  • Vydate L, 2 to 4 pt. (1 day) (RUP)

ARMYWORM:
  • Exirel, 7-13.5 oz/A. (1)

TOMATO FRUITWORM:
  • Exirel, 7-13.5 oz/A. (1)

THrips:
  • Exirel, 13.5-20.5 oz/A. (1)

LEAFHOPPERS:
  • Sivanto, 7 - 10.5 fl oz/A.
  • PSYLD:
    • Sivanto, 10.5 - 14 fl oz/A.

WHITIEFLIES:
  • Sivanto, 10.5 - 14 fl oz/A.

mites

Apply if needed to avoid foliar injury.

Abamectin
  • Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)

Bifenthrin
  • Bifenture EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
  • Bifenture 10 DF, 12.8 to 16 oz/A. (7 days)
  • Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (7 days) (RUP)
  • Capture 2 EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
  • Discipline 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
  • Fantasea 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
  • Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)
  • Tundra EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

Bifenthrin + Avermectin
  • Athena, 13.5 to 17 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
  • Hero (10.3 oz.) or Hero EW (11.2 oz.) (7 days) (RUP)

Etoxazole
  • Zea, 2 to 3 oz. (7 days)

Fenpyroximate
  • Portal, 2 pt. (1 day)

Malathion
  • Malathion 5, or Malathion 5 EC (1 pt.) or Malathion 8 (0.75 to 3.5 pt.) or Malathion 8 Aquamul (0.75 to 1.56 pt.) (3 days)

Naled
  • Dibrom 8 Emulsive, 1 to 2 pt. (1 day) (RUP)

Oxamyl
  • Vydate L, 2 to 4 pt. (1 day) (RUP)

Spiromesifen
  • Oberon 2 SC, 7 to 8.5 fl oz. (7 days)

Zeta-Cypermethrin + Avermectin
  • Gladiator, 19 fl oz. (7 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Eggplant

DISEASES

SEED TREATMENT:

DAMPING OFF (Pythium spp., Phytophthora spp., Rhizoctonia solani): Apply to seed as slurry or dust. Use only as directed; overtreatment may cause injury.

  * Fungonil + mfenoxam
  * Maxim XL, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia, Fusarium).

Mafenoxam

  * Apron XL, 0.085 - 0.64 fl oz/100 lb seed (Pythium).

Thiram

  * 42-S Thiram, Thiram 480DP, 6 1/2 fl oz/100 lb seed.
  * Thiram 50 WP Dyed, 6 oz/100 lb seed.

SEEDBED TREATMENT:

DAMPING OFF (Pythium spp.), CROWN ROT (Phytophthora capsici): Ridomil must be applied to the soil before the plants are infected with Phytophthora to obtain satisfactory disease control.

Mafenoxam

  * Ridomil Gold SL, 1 pt. (7 days)
  * Ridomil Gold WSP, 1 lb. (7 days)
  * Ultra Flourish, 2 pt. (7 days)

Incorporate mechanically before planting or move into root zone after planting with 1/2 to 1 inch sprinkler water. For banded applications, use 12 to 16 inch band.

After initial application, 2 supplemental post-directed applications at 1 lb (Ridomil Gold WSP) or 1 pt (Ridomil Gold EC) should be made at 30-day intervals. Spray should be directed at the base of the plants and cover 6 to 8 inches of soil on either side of the plants. Ridomil Gold must be moved into the root zone mechanically or by sprinkler irrigation. Spray may be applied with liquid fertilizer shanked in as a band treatment to either side of the plant. The foliar blight phase of Phytophthora cannot be controlled with foliar applications of Ridomil Gold. Note: Use limit of active ingredient/crop on label.

PREPLANT SOIL FUMIGATION:

FUSSARIUM, VERTICILLIUM WILT, PHYTOPHTHORA spp: Preplant treatment (production fields). Most fungicides applied to the soil to control disease organisms will also control soil insects, nematodes and weed seeds.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

1.3 Dichloropropane/chloropicrin

  * Telone C35, 13-35 gal. (RUP)
  * Sectagon-K54, 30-60 gal. (RUP)
  * Sectagon 42, 37.5-75 gal. (RUP)

DRIP APPLICATION:

PHYTOPHTHORA CROWN ROT (Phytophthora spp.):

  * Fluopicolide
  * Presidio, 3-4 fl oz. (2 days)
  * Amanotrdain + Dimethomorph
  * Zampro, 14 fl oz. (4 days)
  * Mfenoxam
  * Ridomil Gold SL, 1 pt. (7 days)

FOLIAR TREATMENT:

ALTERNARIA BLIGHT (Alternaria melongenae), ANTHRACNOSE (Colletotrichum melongenae): Treat every 7 to 10 days after disease first appears.

  * Azoxystrobin, Anthracnose only.
  * Quadris, 6.2 to 15.4 fl oz. (0 days)
  * Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

  * Boscalid
  * Endura, 2.5 to 3.5 oz (alternaria blight only), (0 days)

  * Fluxapyroxad + Pyraclostrobin
  * Phaxor Xemium Brand Fungicide, 4 - 8 fl oz. (0 days)
  * Trifloxystrobin
  * Flint, 2 to 3 oz (Alternaria) 3 to 5 oz (Anthracnose), (3 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

Bacillus amyloliquefaciens

  * Sentril, 4 - 16 fl oz. (0 day)

Copper Ammonium Carbonate

  * Copper Count N, 2 qt. (0 days)

Copper Hydroxide

  * Champ DP Dry Prill, 1 1/3 lb. (0 days)
  * Champ Formula 2 F (1 1/3 pt) or Nu-Cop 3 L (1 1/3 to 2 pt) (0 days)

  * Champ WG, 1.58 lb. (0 days)
  * ChampION, 0.75 to 1.5 lb. (0 days)
  * Kocide 2000, 1 1/2 lb. (0 days)
  * Kocide 3000, 0.75-1.5 lb. (0 day)
  * Nu-Cop 50 DF, 1 1/2 lb. (0 days)

Copper Hydroxide + Copper Oxychloride

  * Badge SC, 1.5 pt. (0 days)
  * Badge X2, 0.75 lb. (0 days)

Copper Sulfate

  * Cuprofix Ultra 40 Disperss, 1.25 lb. (0 days)

Penthiopyrad

  * Fontelis, 16 - 24 fl oz. (0 days)

Pyraclostrobin

  * Cinno, 8 to 12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

PHOMOPSIS BLIGHT (Phomopsis vexans): Treat every 7 to 10 days after disease first appears.

Copper Ammonium Carbonate

  * Copper Count N, 2 qt. (0 days)

Copper Hydroxide

  * Champ DP Dry Prill, 1 1/3 lb. (0 days)
  * Champ Formula 2 F (1 1/3 pt) or Nu-Cop 3 L (1 1/3 to 2 pt) (0 days)

  * Champ WG, 1.58 lb. (0 days)
  * ChampION, 0.75 to 1.5 lb. (0 days)
  * Kocide 2000, 1 1/2 lb. (0 days)
  * Kocide 3000, 0.75-1.5 lb. (0 day)
  * Nu-Cop 50 DF, 1 1/2 lb. (0 days)

Copper Hydroxide + Copper Oxychloride

  * Badge SC, 1.5 pt. (0 days)
  * Badge X2, 0.75 lb. (0 days)

Copper Sulfate

  * Cuprofix Ultra 40 Disperss, 1.25 lb. (0 days)

PHOTOPHTHORA CROWN ROT:

  * Dimethomorph
  * Forum, 6 fl oz. (0 days)

* Materials marked with an asterisk are particularly recommended for problem infestations.
**Materials marked with an asterisk are particularly recommended for problem infestations.**

Garden Greens

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

### INSECTS

#### PLANTING TREATMENT:

**APHIDS:**
- Imidacloprid. See label for application methods.
- Advion Pro, 4.4 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 10 to 24 oz. (21 days)

**CABBAGE MAGGOT:**
- Lorsban 15 G (4.6 to 9.2 oz /1,000 row ft.) or Lorsban 4 E / Lorsban Advanced (1.6 to 2.75 fl oz / 1,000 row ft.) Apply in a 4-inch band over row at time of seeding. Use only as directed.
- Brassica greens only. (RUP)

**APHIDS, CABBAGE "WORM", FLEA BEETLE, LOOPERS:**
- Durivo, 10 to 13 fl oz. (30 days)

**APHIDS and FLEA BEETLE:**
- Belay 50 WDG, 4.8 to 6.4 oz.
- Thiamethoxam
  - Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

**FOLIAR TREATMENT:**

**FLEA BEETLE:** Apply when damage is first seen on young plants. Repeat as needed.
- Actara, 1.5 to 3 oz. (7 days)
- Asana XL, 5.8 to 9.6 oz. (7 days) Collards only. (RUP)
- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
- Bifenthrin
  - Bifenture EC, 2.1 to 6.4 oz. (7 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brassica greens only.

**Carbaryl**
- Carbaryl 4L, 0.5 to 1 qt. (14 days)
- Sevin 80 S (1/4 lb) or Sevin XLR Plus (1 qt) (14 days)

**Cypermethrin**
- Ammo 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (1 day) (RUP)
- Brassica greens only.
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)

**Imidacloprid**
- Advion Pro, 1.3 fl oz. (7 days)
- Nuprid 1.6 F, 3.8 to 7.6 oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.
- Leverage 360, 3 fl oz. (7 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
- Pyrenone, 1 to 2 oz fl. (0 days)

**CUTWORM, LOOPERS:** Apply as needed.
- Ambush 25 W, 6.4 to 12.8 oz. (1 day) Non-Brassica greens only. (RUP)
- ...
**Garden Greens**

- **Nuprid Max**, 2.24 to 4 oz. (1 day) (RUP)
- **Permethrin**
  - **Perm-UP 25DF** (6.4 to 12.8 oz.) or **Perm-UP 3.2 EC** (4 to 8 fl oz) (1 day) (RUP)
  - **Pounce 25 WP**, 6.4 to 12.8 oz. (1 day) (RUP)

**LOOPERS:**

- **Avaunt**, 2.5 to 3.5 oz. (3 days)
- **Belt SC**, 1.5 fl oz. (1 day)
- **Biobit HP**, 0.5 to 1 lb. (0 days)
- **Dibrom 8 Emulsive**, 2 pt. (1 day) Collards and kale only. (RUP)
- **Gladiator**, 14 to 19 fl oz. (7 days) (RUP)
- **Intrepid 2F**, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- **Mustang Max**, 3.2 to 4 oz. (1 day) (RUP)
- **Permethrin**
  - **Perm-UP 25DF** (3.2 to 12.8 oz.) or **Perm-UP 3.2 EC** (2 to 8 fl oz.) (1 day) (RUP)
  - **Pounce 25 WP**, 3.2 to 12.8 oz. (1 day) (RUP)
- **Spinosad**
  - **Entrust (1 to 2 oz.)** or **Entrust SC (3 to 6 fl oz.)** (1 day)

**MITES**

May be a problem in hot, dry weather.

- **Abamectin**
  - **Agri-Mek 0.15 EC** (8 to 16 fl oz.) or **Agri-Mek SC (1.75 to 3.5 fl oz.)** (7 days) Use with a non-ionic surfactant. (RUP)
- **Bifenthrin**
  - **Bifenture EC**, 5.1 to 6.4 oz. (7 days) (RUP)
  - **Fanfare 2EC**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Sniper**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Bifenthrin**
  - **Bifenture EC**, 5.1 to 6.4 oz. (7 days) (RUP)
  - **Fanfare 2EC**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Sniper**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Bifenthrin**
  - **Bifenture EC**, 5.1 to 6.4 oz. (7 days) (RUP)
  - **Fanfare 2EC**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Sniper**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Mustang SC**, 1.6 to 2.1 oz. (7 days) (RUP)
  - **Cypermethrin**
  - **Bifenture 10 DF**, 6.4 to 12.8 oz. (7 days) (RUP)
  - **Fanfare 2EC**, 6.4 oz. (7 days) (RUP)
  - **Sniper**, 6.4 oz. (7 days) (RUP)
  - **Bifenthrin**
  - **Bifenture EC**, 5.1 to 6.4 oz. (7 days) (RUP)
  - **Fanfare 2EC**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Sniper**, 5.12 to 6.4 fl oz. (7 days) (RUP)
  - **Cypermethrin**
  - **Cypermethrin**
  - **Avaunt**, 2.5 to 3.5 oz. (3 days)
  - **Mustang Max**, 3.2 to 4 oz. (1 day) (RUP)
  - **Belt SC**, 1.5 fl oz. (1 day)

**SEED TREATMENT:**

DAMPING OFF (Rhizoctonia spp., Pythium spp.):

- **Capitan**
  - **Capitan 4 Flowable**, 12 fl oz/100 lb seed. Swiss chard
  - **Fludioxonil**
  - **Maxim 4 FS**, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia). Commercial seed treatment plants only. Collards, endive, kale, Swiss chard.
- **Mefenoxam**
  - **Apron XL**, 0.085 - 0.64 fl oz/100 lb seed (Pythium).
  - **Thiram**
  - **42-S Thiram**, Thiram 50 WP Dyed, 8 oz/100 lb seed.

**SEEDBED TREATMENT:**

CLUBROOT (Plasmodiophora brassicae):

- **Fluazinam**
  - **Omega 500 F**, 2.6 pt. (50 days)

**PREPLANT INCORPORATED:**

DAMPING OFF (Pythium spp.):

- **Mefenoxam**, Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate

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Always read and follow label Instructions carefully.
mechanically before planting or water into seed zone after planting with 1/2 to 1 in. of sprinkler irrigation. Endive and Swiss chard only.

- Ridomil Gold GR, 20 to 40 lb.
- Ridomil Gold WSP, 1 to 2 lb.

**TRANSPLANT DRENCH:**

**CLUBROOT (Plasmodiophora brassicae):**
- Fluzinam
  - Omega 500 F, 6.45 fl oz. (50 days)

**FOLIAR TREATMENT:**

**BOTRYTIS GRAY MOLD (Botrytis spp.):** Apply 7 days following transplanting. Repeat applications when plants are half, mature. Do not apply to wilted plants or seedlings. Phenthiopyrad
- Fontelis, 14 - 30 fl oz. (3 days)

**DOWNY MILDEW (Peronospora parasitica):** Apply as needed to maintain control.

- *Fosetyl- Aluminum
  - Aliette WDG, 2 to 5 lb at 7- to 21-day intervals. (3 days) Collards, kale, mustard greens, endive, escarole, Swiss chard. **Note:** Do not tank mix with copper fungicides.

- Acibenzerol-S-methyl
  - Actigard, 1 oz per 20 gal (ground) or 10 gal (aerial) of water. (7 days) Do not apply more than 4 applications per crop per year.

- Ametoctradin + Dimethomorph
  - Zampro, 14 fl oz. (0 days)

**Dimethomorph**
- Forum, 6 fl oz. (7 days)
- Mandipropamid
- Revis, 8 fl oz. (1 day)

**Mono-, dibasic sodium salts of phosphorous acid**
- Fosphite, 1 to 3 qt per 100 gal (ground) or 10 gal (aerial) of water. (0 days)

**Mono-, dibasic sodium, potassium and ammonium phosphites**
- Phostrol, 2.5 to 5 pt every 7 - 21 days. (0 days)

**Note:** Fungicides that protect against Alternaria also provide limited downy mildew protection.

**CERCOSPORA LEAF SPOT (Cercospora beticola):**

- *Azoxystrobin
  - Quadris, 6.2 to 15.4 fl oz. (0 days)
  Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

- Difenoconazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)

- Trifloxystrobin
  - Flint, 2 to 3 oz. (7 days) Swiss chard only.
  Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

- Azoxystrobin + Difenoconazole
  - Quadris Top, 12 to 14 fl oz. (1 day)

**Penthiopyrad**
- Fontelis, 14 - 30 fl oz. (3 days)

**Pyraclostrobin**
- Cabrio, 12-16 oz. (3 days) Do not apply more than one application before alternating with another chemical.

**Tebuconazole**
- Orus 3.6F, Tebuozol 3.6, 3-4 fl oz. (7 days) Maximum 16 fl oz/acre/season. 12 hr REI.

**ALTERNARIA LEAF SPOT (Alternaria cucumerina):**

- *Azoxystrobin
  - Quadris, 6.2 to 15.4 fl oz. (0 days)
  Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

- Difenoconazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)

**Copper Hydroxide**
- Kocide 2000, 3/4 to 1 1/2 lb. (0 days) Mustard greens and Collards only.
- Kocide 3000, 0.5-0.75 lb. (0 day)

**Copper Hydroxide + Copper Oxycinlode**
- Badge SC, 1 to 1.8 pt. (0 days)
- Badge X2, 0.5 to 0.75 lb. (0 day)

**Copper Sulfate**
- Cuprifax Ultra 40, 0.75 to 1.25 lb. (0 days)
- Switch 62.5 WG, 11 to 14 oz. (7 days)

**Penthiopyrad**
- Fontelis, 14 - 30 fl oz. (3 days)

**Pyraclostrobin**
- Cabrio, 12-16 oz. (3 days) Do not apply more than one application before alternating with another chemical.

**Tebuconazole**
- Orus 3.6F, Tebuozol 3.6, 3-4 fl oz. (7 days) Maximum 16 fl oz/acre/season. 12 hr REI.

**Garlic**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

**SOIL TREATMENT:**

**BULB and STEM NEMATODE: Garlic is an excellent host for the bulb and stem nematode but there are no labeled chemical options for its control on this crop. If garlic plantings exhibit symptoms, submit leaves and stem nematode but there are no labeled chemical options for its control on this crop. If garlic plantings exhibit symptoms, submit leaves for nematode analyses. If bulb and stem nematodes are detected, a management plan will be provided. These nematodes can be difficult to detect in the soil, so it is always best plant tissue samples are submitted for proper diagnoses.

**INSECTS**

**SOIL TREATMENT:**

**THRIPS:**
- Admire Pro, 14 fl oz. (21 days) See label for application methods.

**FOLIAR TREATMENT:**

**LOOPERS, ARMYWORM:** Apply as needed.

- *Permethrin
  - Ambush 25 W, 9.6 to 19.2 oz. (1 day) (RUP)
  - Perm-UP 3.2 EC (6 to 12 oz) or Pounce 25 WP (9.6 to 19.2 oz) (1 day) (RUP)

- Bacillus thuringiensis
- Agree WG, 1 to 2 lb. (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Pyrene, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)

*Materials marked with an asterisk are particularly recommended for problem infestations.
**Lettuce**

**Materials marked with an asterisk are particularly recommended for problem infestations.**

**APHIDS:** Apply as needed.

**Cypermethrin**
- **Ammo 2.5 EC,** 2.5 to 5 fl oz. (7 days) (RUP)
- **Cypermethrin,** 2.5 to 5 fl oz. (7 days) (RUP)
- **Holster,** 2 to 5 fl oz. (7 days) (RUP)
- **UP-Cyde 2.5 EC,** 2.5 to 5 fl oz. (7 days) (RUP)

**Malathion**
- **Malathion 5,** Malathion 5 EC, or **Malathion 57 EC** (1.5 to 2 pl.) or **Malathion 8 Aquamul** (1 to 1.5 pl.) (3 days)
- **Mustang Max,** 2.24 to 4 oz. (7 days) (RUP)
- **Pyrene, 1 to 12 fl oz.** (0 days)

**THRIPS:** Apply as needed.

**Acetamiprid**
- **Assail 30 SG** (5 to 8 oz.) or **Assail 70WP** (2.1 to 3.4 oz.) (7 days)

**Cypermethrin**
- **Ammo 2.5 EC,** 4 to 5 fl oz. (7 days) (RUP)
- **Cypermethrin,** 4 to 5 fl oz. (7 days) (RUP)
- **Holster,** 4 to 5 fl oz. (7 days) (RUP)
- **UP-Cyde 2.5 EC,** 4 to 5 fl oz. (7 days) (RUP)
- **Exirel,** 13.5-20.5 oz/A. (1)

**Lambda-cyhalothrin**
- **Lambda-Cy,** 2.56 to 3.84 fl oz. (14 days) (RUP)
- **Warrior II with Zeon Technology** (1.28 to 1.92 fl oz.) or **Warrior** with Zeon Technology (2.56 to 3.84 fl oz.) (14 days) (RUP)

**Malathion**
- **Malathion 5,** Malathion 5 EC, or **Malathion 57 EC** (1.5 to 2 pl.) or **Malathion 8 Aquamul** (1 to 1.5 pl.) (3 days)
- **Mustang Max,** 2.88 to 4 oz. (7 days) (RUP)

**Permethrin**
- **Ambush 25 W,** 9.6 to 19.2 oz. (1 day) (RUP)
- **Perm-UP 3.2 EC** (6 to 12 oz) or **Pounce 25 WP** (9.6 to 19.2 oz) (1 day) (RUP)
- **Proaxis,** 2.56 to 3.84 fl oz. (14 days) (RUP)
- **Pyranone,** 1 to 12 fl oz. (0 days)
- **Radiant SC,** 6 to 10 fl oz. (1 day)

**ARMYWORM:**

**Bacillus thuringiensis**
- **Biolit HP,** 0.5 to 2 lb. (0 days)
- **DiPel DF,** 1 to 2 lb. (0 days)
- **XenTari,** 0.5 to 2 lb. (0 days)
- **Coragen,** 3.5 to 5 fl oz. (1 day)

**Cypermethrin**
- **Ammo 2.5 EC,** 2.5 to 5 fl oz. (7 days) (RUP)
- **Cypermethrin,** 2.5 to 5 fl oz. (7 days) (RUP)
- **Holster,** 2 to 5 fl oz. (7 days) (RUP)
- **UP-Cyde 2.5 EC,** 2.5 to 5 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- **Lambda-Cy,** 2.56 to 3.84 fl oz. (14 days) (RUP)
- **Warrior II with Zeon Technology** (1.28 to 1.92 fl oz.) or **Warrior** with Zeon Technology (2.56 to 3.84 fl oz.) (14 days) (RUP)

**Methomyl**
- **Lannate LV** (1.5 pt.) or **Lannate SP** (0.5 lb.) (7 days) (RUP)
- **Nudrin LV** (1.5 pt.) or **Nudrin SP** (0.5 lb.) (7 days) (RUP)
- **Mustang Max,** 2.24 to 4 oz. (7 days) (RUP)

**LOOPERS:**

**Bacillus thuringiensis**
- **Biolit HP,** 0.5 to 1 lb. (0 days)
- **DiPel DF,** 0.5 to 1 lb. (0 days)
- **XenTari,** 0.5 to 1.5 lb. (0 days)

**LEAFMINERS:**

**Exirel,** 13.5-20.5 oz/A. (1)

**DISEASES**

**PLANTING TREATMENT:**

**DAMPING OFF** (*Pythium spp.***):
- **Mefenoxam.** Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. or sprinkler irrigation.
- **Ridomil Gold SL,** 0.5-1 pt.
- **Ultra Flourish,** 1 to 2 pt.

**WHITE ROT** (*Sclerotium cepivorum*): Apply as an in-furrow spray at planting.
- **Boscalid**
- **Endura,** 6.8 oz. (7 days)

**Iprodione**
- **Iprodione 4L AG,** **Rovral 4 Flowable,** 4 pt. **Note:** See label for permissible crop rotation.
- **Meteor,** 4 pt. (0 days)

**Thiophanate-Methyl**
- **Topsin 4.5 FL,** 40 fl oz.

**PENICILLIUM CLOVE ROT:**

**Thiophanate-Methyl**
- **Cercobin 4.1F,** 21.8 fl oz/100 gal. Completely immerse garlic cloves in suspension for minimum 5 minutes prior to planting.

**FOLIAR TREATMENT:**

**BOTRYTIS LEAF BLIGHT** (*Botrytis spp.*):
- **Azoxystrobin**
- **Quadris,** 9.0 to 15.5 fl oz. (0 days)

**Do not apply more than one foliar application of Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.**
- **Boscalid**
- **Endura,** 6.8 oz. (7 days)

**Chlorothalonil**
- **Bravo Ulfre,** 0.9 to 2.7 lb. (7 days)
- **Bravo Weather Stik,** **Echo 720,** **Équus 720 SST,** 1 to 3 pt. (7 days)
- **Bravo ZN,** 1 1/2 to 4 1/4 pt. (7 days)
- **Echo 90 DF,** 7/8 to 1 5/8 lb. (7 days)
- **Équus DF,** 0.9 to 2.7 lb. (7 days)
- **Mancozeb**
- **Dithane DF Rainshield,** **Dithane M-45,** 3 lb. (7 days)
- **Dithane F-45 Rainshield,** 2.4 qt. (7 days)
- **Koverall,** 3 lb. (7 days)
- **Manzate Max,** 1.6 to 2.4 qt. (7 days)
- **Manzate Pro-Stick,** 3 lb. (7 days) Do not apply to exposed bulbs.
- **Penncozeb 75 DF,** **Penncozeb 80WP,** 2 to 3 lb. (7 days)
- **Pyraclostrobin/Boscalid**
- **Pristine,** 14.5 to 18.5 oz. (7 days)

**Always read and follow label Instructions carefully**
*Materials marked with an asterisk are particularly recommended for problem infestations.

Difenoconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz. (7 days)

Fluxapyroxad + Pyraclostrobin
- Merivon Xemium Brand Fungicide, 8 to 11 fl oz. (7 days)

Mancozeb + Zoxamide
- Gavel 75 DF, 1.5 - 2.0 lb. (7 days)

Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 pt. (7 days) Maximum 4 applications.
- Mefenoxam + Copper Hydroxide
- Ridomil Gold Copper, 2 lb. (10 days) Maximum 4 applications.

Mefenoxam + Mancozeb
- Ridomil Gold MZ, 2 1/2 lb. (7 days) Maximum 4 applications.

Ametenclor + Dimethomorph
- Zamp, 14 fl oz. (0 days)

Azoxystrobin
- Quadris Opti, 2.4 to 3.6 pt. (7 days)

Azoxystrobin + Chlorothalonil
- Quadris Opti, 2.4 to 3.6 pt. (7 days)

Chlorothalonil, Downy mildew suppression.
- Bravo Ultrex, 0.9 - 2.7 lb every 7 to 10 days. (7 days)

Chlorothalonil, Downy mildew suppression.
- Bravo Weather Stik, Echo 720, Equus 720 SST, 1 to 3 pt. (7 days) Downy mildew suppression.

Chlorothalonil, Downy mildew suppression.
- Bravo ZN, 1 1/2 to 4 1/4 pt. (7 days)

Copper Hydroxide + Copper Oxycyde
- Badge SC, 1.5 pt. (0 days)

Copper Hydroxide + Copper Oxycyde
- Famoxadone + Cymoxanil
- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

Fenamidone
- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (14 days)

Fluxapyroxad + Pyraclostrobin
- Merivon Xemium Brand Fungicide, 8 to 11 fl oz. (7 days) Suppression only

Mancozeb + Zoxamide
- Gavel 75 DF, 1.5 - 2.0 lb. (7 days)

Mandipropamid
- Revus, 8 fl oz. (7 days)

Mono- dibasic sodium, potassium and ammonium phosphites
- Prophyt, 4 pt. (0 days)

Neem Oil
- Trilogy, 2 pt. (0 days)

Potassium phosphate/chlorothalonil
- Catamaran, 4-7 pt. (7 days)

Pyraclostrobin
- Cabrio, 12 oz (suppression). (7 days) Do not apply more than one application before alternating with another chemical.

Pyrimethalin
- Scala, 18 fl oz. (7 days) 12 hr REI.

Zoxamide + chlorothalonil
- Zing!, 30 fl oz. (7 days)

BACTERIAL BLIGHT (Erwinia carotovora subsp. carotovora, Pseudomonas spp.): Apply at 7 to 10 day intervals when plants are 4-6 in. tall. Can cause foal phytotoxicity.

Copper Hydroxide
- Champ DP Dry Prill, 2/3 to 1 lb. (0 days)

Champ Formula 2 F, 2/3 to 1 pt. (0 days)

Kocide 3000, 0.75-1.5 lb. (0 day)

Copper Hydroxide + Copper Oxycyde
- Badge SC, 1.5 pt. (0 days)

Copper Sulfate
- Cuprofix Ultra 40 Dispers, 1.25 to 2.5 lb. (0 days)

Famoxadone + Cymoxanil
- Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

DOWNY MILDEW (Peronospora destructor): Apply after the 4-leaf stage.

* Dimethomorph
- Forum, 6 fl oz. (0 days)

* Mancozeb
- Dithane DF Rainshield, Dithane M-45, 3 lb. (7 days)

Dithane F-45 Rainshield, 2.4 qt. (7 days)

Koverall, 3 lb. (7 days)

Manzeo Max, 1.6 to 2.4 qt. (7 days)

Manzeo Pro-Stick, 3 lb. (7 days) Do not apply to exposed bulbs.

Penncroze 75 DF, Penncroze 80WP, 2 to 3 lb. (7 days)

* Mefenoxam + Chlorothalonil

* Ridomil Gold Bravo, 2.5 pt. (7 days) Maximum 4 applications.

* Mefenoxam + Copper Hydroxide

* Ridomil Gold Copper, 2 lb. (10 days) Maximum 4 applications.

* Mefenoxam + Mancozeb

* Ridomil Gold MZ, 2 1/2 lb. (7 days) Maximum 4 applications.

Ametenclor + Dimethomorph
- Zamp, 14 fl oz. (0 days)

Azoxystrobin
- Quadris, 9.0 to 15.5 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
SOIL TREATMENT:

LEEK TREATMENT:

NEMATODES

Leeks

SOIL TREATMENT:

SEED TREATMENT:

FOLIAR TREATMENT:

INSECTS

DISEASES

SOIL TREATMENT:

GREENHOUSE PREPLANT INCORPORATION:

FOLIAR TREATMENT:

THRIPS:

Leeks

Leeks are hosts for root-knot nematodes. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). Management of root-knot nematodes can be accomplished by using crop rotation. The benefits of utilizing nematicides for leeks grown in Michigan are undetermined at this time.

INSECTS

SEED TREATMENT: None presently registered.

SOIL TREATMENT:

ONION MAGGOT:

CUTWORM, ARMYWORM: Apply banded over the row.

FOLIAR TREATMENT:

THRIPS:

THRIPS:

FLOREX:

DISEASES

SOIL TREATMENT:

GREENHOUSE PREPLANT INCORPORATION:

FOLIAR TREATMENT:

BACTERIAL BLIGHT (Erwinia carotovora subsp. carotovora, Pseudomonas spp.): Apply at 7 to 10 day intervals when plants are 4-6 in. tall. Can cause foliar phytotoxicity.

Copper Hydroxide

Champ DP Dry Prill, 2/3 to 1 lb. (0 days)

Champ Formula 2 F, 2/3 to 1 pt. (0 days)

Famoxadone + Cymoxanil

Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

BOTRYTIS LEAF BLIGHT (Botrytis squamosa): Apply every 7 to 10 days after the 4 leaf stage.

* Azoxystrobin

* Quadris, 9.0 to 15.5 fl oz. (0 days)
Do not apply more than one foliar application of Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

*Azoxystrobin + Difencnazoalex*  
- **Quadris Top**, 12 to 14 fl oz. (7 days)

*Chlorothalonil*  
- **Bravo Ultra**, 1.4 to 2.7 lb every 7 - 10 days. (14 days)
- **Bravo Weather Stik, Echo 720, Equus 720 SST**, 1.5 to 3 pt every 7 to 10 days. (14 days)
- **Bravo ZN**, 2 1/4 to 4 1/4, (14 days)
- **Echo 90 DF**, 1 1/4 to 2 1/2 lb. (14 days)
- **Equus DF**, 1.4 to 2.7 lb. (14 days)

*Difenoconazole + Cyprodinil*  
- **Inspire Super**, 16 to 20 fl oz. (7 days)

*Pyraclostrobin/Boscalid*  
- **Pristine**, 14.5 to 18.5 oz. (7 days)

Azoxystrobin + Chlorothalonil  
- **Quadris Opti**, 1.6 to 3.2 pt. (7 days)

Azoxystrobin + Propiconazole  
- **Quilt** (14 to 27.5 fl oz (suppression)) or **Quilt Xcel** (17.5 to 26 fl oz) (14 days)

Boscalid  
- **Endura**, 6.8 oz. (7 days)

Mefenoxam + Chlorothalonil  
- **Ridomil Gold Bravo**, 2.5 pt. (14 days)

Neem Oil  
- **Trilogy**, 2 pt. (0 days)

Penthiopyrad  
- **Fontelis**, 16 - 24 fl oz. (3 days)

Potassium phosphite/chlorothalonil  
- **Catamarn**, 4-7 pt. (14 days)

Propiconazole  
- **Propimax EC**, 4 to 8 fl oz. (14 days)
- **Tilt**, 4-8 fl oz. (14 days)

Pyraclostrobin  
- **Cabrio**, 12 oz (suppression). (7 days) Do not apply more than one application before alternating with another chemical.

Pyrimethanil  
- **Scala**, 9 to 18 fl oz. (7 days)

**DOWNY MILDEW (Peronospora destructor)**: Apply every 7 to 10 days after the 4 leaf stage.

*Dimethomorph*  
- **Forum**, 6 fl oz. (0 days)

*Mefenoxam + Chlorothalonil*  
- **Ridomil Gold Bravo**, 2.5 pt. (14 days) Maximum 3 applications.

*Mefenoxam + Copper Hydroxide*  
- **Ridomil Gold Copper**, 2 lb. (7 days) Maximum 3 applications.

Ametoctradin + Dimethomorph  
- **Zampro**, 14 fl oz. (0 days)

Azoxystrobin  
- **Quadris**, 9.0 to 15.5 fl oz. (0 days)

Famoxadone + Cymoxanil  
- **Taros**, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

Fenamidone  
- **Reason 500 SC**, 5.5 fl oz every 5 to 10 days. (7 days)

Mandipropamid  
- **Revus**, 8 fl oz. (7 day)

Neem Oil  
- **Trilogy**, 2 pt. (0 days)

Potassium phosphite/chlorothalonil  
- **Catamarn**, 4-7 pt. (14 days)

Pyraclostrobin  
- **Cabrio**, 12 oz. (7 days) Do not apply more than application before alternating with another chemical.

**Note**: Most fungicides that protect against purple blotch or Botrytis leaf blight may also provide limited downy mildew protection.

**PURPLE BLOTCH (Alternaria porri)**:

*Azoxystrobin + Chlorothalonil*  
- **Quadris Opti**, 1.6 to 3.2 pt. (7 days)

Azoxystrobin + Difencnazoalex  
- **Quadris Top**, 12 to 14 fl oz. (7 days)

Azoxystrobin + Propiconazole  
- **Quilt**, 14 to 27.5 fl oz. (14 days)
- **Quilt Xcel**, 14 to 21 fl oz. (14 days)

*Pyraclostrobin*  
- **Cabrio**, 8 to 12 oz. (7 days)

Azoxystrobin  
- **Quadris**, 6 to 12 oz. (0 days)

Boscalid  
- **Endura**, 6.8 oz. (7 days)

Chlorothalonil  
- **Echo 90 DF**, 1 1/4 to 2 1/2 lb. (14 days)

Equus DF, 1.4 to 2.7 lb. (14 days)

Famoxadone + Cymoxanil  
- **Taros**, 8 oz. (1 day) Apply as preventative and tank mix.

Fenamidone  
- **Reason 500 SC**, 5.5 fl oz. (7 days)

Mefenoxam + Chlorothalonil  
- **Ridomil Gold Bravo**, 2.5 pt. (14 days)

Potassium phosphite/chlorothalonil  
- **Catamarn**, 4-7 pt. (14 days)

Propiconazole  
- **Propimax EC** (4 to 8 fl oz) or **Tilt** (4-8 fl oz) (14 days)

Pyraclostrobin/Boscalid  
- **Pristine**, 10.5 to 18.5 oz. (7 days)

Pyrimethanil  
- **Scala**, 18 fl oz. (7 days)

**Lettuce**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Root-knot and root-lesion can reduce lettuce yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for lettuce, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot and root-lesion nematodes in lettuce production.

*Materials marked with an asterisk are particularly recommended for problem infestations.
**FALL SOIL FUMIGATION (BROADCAST):**
Fumigate in the fall when soil temperatures at a 6 inch depth are above 50°F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations, soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

1,3-D
- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).

**INSECTS**

**SOIL TREATMENT:**

Fumigants in target zone for required time periods. This is effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**FLEA BEETLE:**
Scorpion 35SL, 9 to 10.5 fl oz. (21 days) See label for application methods.

**APHIDS:**
- Imidacloprid
- Admire Pro, 4.4 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 10 to 24 fl oz. (21 days)

**LEAFHOPPERS:**
- Dinotefuran
- Verimark, 6.75-13.5 oz/A. (0 days)

**LEAFMINERS:**
- Scorpion 35SL (9 to 10.5 fl oz) or Venom (5 to 6 oz) (21 days)
- Dinotefuran
- Admire Pro, 4.4 to 10.5 fl oz. (21 days)
- Nuprid 2 F, 10 to 24 fl oz. (21 days)

**ARMYWORM:**
- VeniMark, 5-10 oz/A. (0 days)

**DIAMONDBACK MOTH:**
- Verimark, 5-10 oz/A. (0 days)

**PLANTING TREATMENT:**

**APHIDS, LEAFHOPPER, FLEA BEETLE:**
- Belay 50 WDG, 4.8 to 6.4 oz. See label for application methods.

**THIAMETHOXAM**
- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

**APHIDS, ARMYWORM, CABBAGE LOOPERS, FLEA BEETLE:**
- Dunvo, 10 to 13 fl oz. (30 days)

**ARMYWORM, CABBAGE LOOPERS:**
- Coragen, 3.5 to 5 fl oz. (1 day) See label for application methods.

**ARMYWORM, COTTON LOOPERS:**
- Capture LFR, 3.4 to 6.8 fl oz. Head lettuce only. See label for application methods. (RUP)

**ARMYWORM, COTTON LOOPERS, DIAMONDBACK MOTH:**
- Verimark, 5-10 oz/A. (0 days)

**LOOPERS, APHIDS, LEAFMINERS:**
- Verimark, 6.75-13.5 oz/A. (0 days)

**FOLIAR TREATMENT:**

**CUTWORM, ARMYWORM:**
- Apply when damage is first seen and repeat as needed.
- Permethrin
- Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 fl oz.) (1 day) (RUP)
- Pounce WP, 6.4 to 12.8 oz. (1 day) (RUP)
- Athena, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)
- Belt SC, 1.5 fl oz. (1 day)

**BIFENTHRIN:**
- Head lettuce only.
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**BIFENTHRIN + IMIDACLOPRID:**
- Head lettuce only.
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**BIFENTHRIN + ZETA-CYPERMETHRIN**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) Head lettuce only. (RUP)
- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Pyrene, 1 to 12 fl oz. (0 days)
- Vetica, 12 to 17 fl oz. (7 days)

**ASTER LEAFHOPPERS:**
- Acephate, Crisphead type only.
- Acephate 90 WDG (0.55 to 1.11 lb.) or Acephate 90 WSP (0.5 to 1.1 lb.) or Acephate 97 (0.5 to 1 lb.) or Acephate 97 UP (0.5 to 1 lb.) (21 days)
- Bracket 97, 8 to 16 oz. (21 days)
- Orthene 97, 8 to 16 oz. (21 days)

**ADD NO MORE THAN 2.13 lb PER SEASON.**
- Actara, 1.5 to 3 oz. (7 days)
- Athena, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)
- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)

**BIFENTHRIN:**
- Head lettuce only.
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**BIFENTHRIN + IMIDACLOPRID:**
- Head lettuce only.
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**BIFENTHRIN + ZETA-CYPERMETHRIN**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) Head lettuce only. (RUP)
- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Pyrene, 1 to 12 fl oz. (0 days)
- Vetica, 12 to 17 fl oz. (7 days)

**Carbaryl**
- Carbaryl 4L, 0.5 to 2 qt. (14 days)
- Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin 80 WSP (0.67 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (14 days)

**Materials marked with an asterisk are particularly recommended for problem infestations.**

*Always read and follow label instructions carefully.*
**Cypermethrin.** Head lettuce only.
- Amo 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)
- Cypermethrin, 2.5 to 5 fl oz. (5 days) (RUP)
- Holster, 2.5 to 5 fl oz. (5 days) (RUP)
- UP-Cycle 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)

**Dimethoate**
- Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 pt., (14 days) Leaf lettuce only.

**Dinotefuran**
- Scorpion 35SL, 2 to 5.25 fl oz. (7 days)
- Venom, 1 to 3 oz. (7 days)
- Endico ZC, 4 to 4.5 fl oz. (7 days) (RUP)

**Imidacloprid**
- Admire Pro, 1.3 fl oz. (7 days)
- Nuprid 1.6 F, 3.6 fl oz. (7 days)

**Lambda-Cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

**Leverage 360,** 3 fl oz. (7 days) (RUP)

**Malathion**
- Malathion 5, Malathion 5 EC, Malathion 57 EC, or Malathion 8 (2 pt.) or Malathion 8 Aquamul (1.25 to 1.88 pt.) (7 days) for head lettuce & 14 days for leaf lettuce for Malathion 5 EC & 8; 14 days for all others)

**Methomyl**
- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) Head lettuce only. (RUP)

**Permethrin**
- Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)
- Proxaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Carbaryl 4L, 0.5 to 2 qt. (14 days)
- Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin 80 WSP (0.67 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (14 days)
- Torac, 14-0-21.0 oz/A. (1) Do not make more than 2 applications per crop cycle and no more than 4 applications per year. Allow at least 14 days between applications.
- Volica, 14 to 17 fl oz. (7 days)
- Volam Flexi, 4 to 7 oz. (7 days)

**APHIDS:**
- *Acetamiprid*
  - Assail 30 SG (2 to 4 oz.) or Assail 70 WP (0.8 to 1.7 oz.) (7 days)
- *Fulfil.*, 2.75 oz. (0 days)
- Acephate, Chrispead headonly.
  - Acephate 90 WDG (0.55 to 1.11 lb.) or Acephate 90 WSP (0.5 to 1.1 lb.) or Acephate 97 (0.5 to 1 lb.) or Acephate 97 UP (0.5 to 1 lb.) (21 days)
  - Bracket 97, 8 to 16 oz. (21 days)
  - Orthene 97, 8 to 16 oz. (21 days)
  - Do not apply more than 2.13 lb per season.
- Actara, 1.5 to 3 oz. (7 days)
- Athena, 7 to 17 fl oz. (7 days) Head lettuce only. (RUP)
- Belay, 80 WDG, 1.6 to 2.1 oz. (7 days)

**Beleaf 50 SG,** 2 to 2.8 oz. (0 days)

**Bifenthrin.** Head lettuce only.
- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Fentari 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Imidacloprid.** Head lettuce only.
- Brigade, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 7.6 to 12.2 fl oz. (7 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)

**Diazinon**
- Diazinon AG 500 (0.5 to 1 pt) or Diazinon AG600 (6.5 to 12.75 fl oz.) (14 days) (RUP)

**Dimethoate**
- Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 pt., (14 days) Leaf lettuce only.
- Endico ZC, 4 to 4.5 fl oz. (7 days) (RUP)
- Exirel, 13.5-20.5 oz/A. (1)
- Imidacloprid, Additional generic brands available.
  - Admire Pro, 1.3 oz (7 days)
  - Nuprid 1.6 F, 3.8 fl oz. (7 days)
  - Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.
- Leverage 360, 3 fl oz. (7 days) (RUP)

**Malathion**
- Malathion 5, Malathion 5 EC, Malathion 57 EC, or Malathion 8 (2 pt.) or Malathion 8 Aquamul (1.25 to 1.88 pt.) (7 days) for head lettuce & 14 days for leaf lettuce for Malathion 5 EC & 8; 14 days for all others)

**Methomyl**
- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Volica, Flexi, 4 to 7 oz. (7 days)

**TARNISHED PLANT BUG.** Head lettuce only.
- Athena, 13.5 to 17 fl oz. (7 days) Head lettuce only. (RUP)
- Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
- Beleaf 50 SG, 2 to 2.8 oz. (0 days)

**Bifenthrin.** Head lettuce only.
- Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Fentari 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

*Always read and follow label instructions carefully.*

*Materials marked with an asterisk are particularly recommended for problem infestations.*
Lettuce

Bifenthrin + Imidacloprid. Head lettuce only.
- Brigadier, 3.8 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 7.6 to 12.2 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (10.3 oz.) or Hero EW (11.2 oz.) (7 days) Head lettuce only. (RUP)

Carbaryl
- Carbaryl 4L, 1 to 2 qt. (14 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)

Cypermethrin. Head lettuce only.
- Ammo 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)
- Cypermethrin, 2.5 to 5 fl oz. (5 days) (RUP)
- Holster, 2.5 to 5 fl oz. (5 days) (RUP)
- UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)

Endigo ZC, 4 to 4.5 fl oz. (7 days) (RUP)

Lamba-cyhalothrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
Proaxis, 2.56 to 3.84 fl oz. (1 day) (RUP)
Pyreneone, 1 to 12 fl oz. (0 days)
Carbaryl 4L, 1 to 2 qt. (14 days)
Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)

CATERPILLARS: Caterpillars (mainly cabbage loopers), are usually controlled with aster leafhopper program, but damage potential may require additional treatments.

Acephate, Crisphead type only.
- Acephate 90 WDG (1.1 lb). or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (21 days)
- Bracket 97, 16 oz. (21 days)
- Orthene 97, 16 oz. (21 days)

Athena, 2 to 7 oz (7 days) Head lettuce only. (RUP)
Avant, 2.5 to 3.5 oz. (3 days)

Bacillus thuringiensis
- Agree WG, 0.5 to 2 lb. (0 days)
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- XenTia, 0.5 to 1.5 lb. (0 days)
- Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
- Belt SC, 1.5 oz. (1 day)

Bifenthrin, Head lettuce only.
- Bifenture 10 DF, 2 to 6.4 oz/A. (7 days)
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

Bifenthrin + Imidacloprid. Head lettuce only.
- Brigadier, 5.1 to 6.1 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 12.2 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) Head lettuce only. (RUP)

Carbaryl
- Carbaryl 4L, 1 to 2 qt. (14 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)
- Confirm 2F, 6 to 8 fl oz. (7 days)
- Coragen, 3.5 to 5 fl oz. (1 day) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.

Cypermethrin. Head lettuce only.
- Ammo 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)
- Cypermethrin, 2.5 to 5 fl oz. (5 days) (RUP)
- Holster, 3.75 to 5 fl oz. (5 days) (RUP)
- UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)

Esfenvalerate
- Adjourn, 4.8 to 9.6 fl oz. (7 days) (RUP)
- Asana XL, 4.8 to 9.6 fl oz. (7 days) (RUP)
- S-FenvalStar, 4.8 to 9.6 fl oz. (7 days) (RUP)

Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Kryocide, 8 to 20 lb. (14 days)
- Larvin 3.2, 16 to 30 oz. (14 days) (RUP)
- Leverage 360, 3 fl oz. (7 days) (RUP)

Malathion
- Malathion 5, or Malathion 5 EC (3 pt.) or Malathion 57 EC (2.5 to 3 pt.) or Malathion 8 (2 pt.) or Malathion 8 Aquamul (1.88 pt.) (7 days for head lettuce & 14 days for leaf lettuce for Malathion 5 EC & 8, 14 days for all others)

Methomyl
- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

Mustang Max, 3.2 to 4 oz. (1 day) (RUP)

Permethrin
- Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
- Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 fl oz.) (1 day) (RUP)
- Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)
- Proclaim, 3.2 to 4.8 oz. (7 days) Head Lettuce only. (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Carbaryl 4L, 1 to 2 qt. (14 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)

Spinosad
- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
- Vetica, 12 to 17 fl oz. (7 days)
- Voliam Flexi, 4 to 7 oz. (7 days)

VEGETABLE LEAFMINER: Apply as soon as visible mines appear and repeat every 7 days as needed.

Abamectin
- Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
- Athena, 13.5 to 17 fl oz. (7 days) Head lettuce only. (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) Head lettuce only. (RUP)
- Coragen, 5 to 7.5 fl oz. (1 day)

Dimethoate
- Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 pt. (14 days) Leaf lettuce only.

Dinotefuran
- Scorpion 3SSL, 2 to 5.25 fl oz. (7 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
• Venom, 1 to 3 oz. (7 days)

**Exirel, 13.5-20.5 oz/A. (1)**

*Materials marked with an asterisk are particularly recommended for problem infestations.

**SUPPRESSION ONLY**

**FLEA BEETLE:**
- **Bifenthrin**
  - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3 2 EC (4 to 8 oz.) (1 day) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)
- **Pyreneone, 1 to 12 fl oz. (0 days)**
  - Radiant SC, 6 to 10 fl oz. (1 day)
- **Spinosad**
  - Entrust (2 to 3 oz.) or Entrust SC (6 to 10 fl oz.) (1 day)
- **Belay, 10.2 to 12.2 fl oz. (7 days)** Head lettuce only. (RUP)
- **Actara, 3.5 to 6.4 fl oz. (7 days)**

**CUTWORM:**
- **Bacillus thuringiensis**
  - Biobit HP, 0.5 to 1 lb. (0 days)
  - XenTari, 0.5 to 1.5 lb. (0 days)
  - Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
- **Cypermethrin**
  - Ammo 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)
  - Cypermethrin, 2.5 to 5 fl oz. (5 days) (RUP)
  - Holster, 2.5 to 5 fl oz. (5 days) (RUP)
  - UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (5 days) (RUP)
- **Empower, 3.5 to 8.7 lb. (7 days)** Head lettuce only. (RUP)
- **Lambda-cyhalothrin**
  - Lambda-Cy, 1.92 to 3.2 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (1 day) (RUP)
- **Methomyl**
  - Lannate LV (1.5 pt.), or Lannate SP (0.5 lb.) (7 days) (RUP)
  - Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (7 days) (RUP)
  - Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
  - Proaxis, 1.92 to 3.2 fl oz. (1 day) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (7 days) Head lettuce only. (RUP)

**SUPPRESSION ONLY**

**Torac, 21 oz/A. (1)** Do not make more than 2 applications per crop cycle and no more than 4 applications per year. Allow 14 days between applications.

**FLEA BEETLE:**
- **Exirel, 13.5-20.5 oz/A. (1)**

**Armyworm**
- **Acephate**
  - Acephate 90 WDG (1.1 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1 lb.) or Acephate 97 UP (1 lb.) (21 days)
  - Bracket, 97, 16 oz. (21 days)
  - Orthene 97, 16 oz. (21 days)
- **Avant, 3.5 to 6 oz. (3 days)**
- **Bacillus thuringiensis**
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biobit HP, 0.5 to 2 lb. (0 days)
  - DiPel DF (1 to 2 lb.) or DiPel ES (2 to 4 pt.) (0 days)
  - XenTari, 0.5 to 2 lb. (0 days)
  - Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
  - Confirm 2F, 6 to 8 fl oz. (7 days)
- **Cypermethrin**
  - Ammo 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)
  - Cypermethrin, 3.75 to 5 fl oz. (5 days) (RUP)
  - Holster, 3.75 to 5 fl oz. (5 days) (RUP)
  - UP-Cyde 2.5 EC, 3.75 to 5 fl oz. (5 days) (RUP)
  - Endigo ZC, 4 to 4.5 fl oz. (7 days) (RUP)
  - Exirel, 7-13.5 oz/A. (1)
  - Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications) (1 day)
- **Lamda-cyhalothrin**
  - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
  - XLR Plus, 0.5 to 2 lb. (0 days)
  - Lannate LV (1.5 pt., 2.1 to 6.4 fl oz. (0 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
SEED TREATMENT:

SLUGS

Lettuce recommended for problem infestations.

THRIPS:

CABBAGE LOOPERS:

DIAMONDBACK MOTH:

Thiram, Mefenoxam

Deadline

Malathion

Bifenthrin + Zeta

Bifenthrin + Avermectin

Abamectin

Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)

Bifenthrin

Bifenture EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

Bifenture 10 DF, 12.8 to 16 oz/A. (7 days)

Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (7 days) (RUP)

Capture 2 EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

Discipline 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

Fanfare 2EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)

Tundra EC, 5.12 to 6.4 fl oz. (7 days) (RUP)

Bifenthrin + Avermectin

Athena, 13.5 to 17 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin

Hero (10.3 oz.) or Hero EW (11.2 oz.) (7 days) (RUP)

Malathion

Malathion 5 EC (2 pt.) or Malathion 57 EC (1.5 to 2 pt.) or Malathion 8 (2 pt.) or Malathion 8 Aquamil (1.88 pt.) (7 days for head lettuce & 14 days for leaf lettuce for Malathion 5 EC & 8; 14 days for all others)

SLUGS

Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb) Apply between rows. Avoid contact to edible product.

DISEASES

SEED TREATMENT:

DAMPING OFF (Rhizoctonia spp., Pythium spp. Botrytis spp.):

Fludioxonil

Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia). Commercial seed treatment plants only.

Mefenoxam

Apron XL, 0.085 - 0.64 fl oz/100 lb seed.

Thiram

42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 8 oz/100 lb seed.

SEEDBED TREATMENT:

DAMPING OFF SEED and CROWN ROTs (Rhizoctonia spp., Botrytis spp., Sclerotinia sclerotiorum):

Note: For seedbed protection programs, sterilize seedbed with steam or Chemicals (see Appendix A). Follow recommended procedures carefully.

PLANTING TREATMENT:

PYTHIUM DAMPING OFF:

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting with 1/2 to 1 in. of sprinkler irrigation.

- Ridomil Gold GR, 20 to 40 lb.
- Ridomil Gold WSP, 1 to 2 lb.
- Ultra Flourish, 2-4 pt.

DRIP APPLICATION:

DOWNY MILDEW (Peronospora effusa):

- Flupicucarb
- Presidio, 3-4 fl oz. (2 days)

FOLIAR TREATMENT:

DROP (Sclerotinia sclerotiorum or Sclerotinia minor):

- Boscalid

- Endura, 8 to 11 oz. (14 days)

Fluxapyroxad + Pyraclostrobin

- Merivon Xemium Brand Fungicide, 8 to 11 fl oz. (1 day)

Iprodione

- Meteor, 1.5 - 2.0 pt. (14 days)

- Rovral 4 Flowable, 1 1/2 to 2 pt. (14 days) Apply at 3-leaf stage to just after thinning and again in 10 days. Make a third application 10 days later if conditions for disease remain favorable.

Note: See label for permissible crop rotations.

Penthiopyrad

- Fontelis, 16 - 24 fl oz. (3 days)

BOTTOM ROT (Rhizoctonia solani):

- Boscalid

- Endura, 8 to 11 oz (bottom rot suppression). (14 days)

Iprodione

- Meteor, 1.5 - 2.0 pt. (14 days)

- Rovral 4 Flowable, 1 1/2 to 2 pt. (14 days) Apply at 3-leaf stage to just after thinning and again in 10 days. Make a third application 10 days later if conditions for disease remain favorable.

Note: See label for permissible crop rotations.

DOWNY MILDEW (Bremia lactucae):

- Dimethomorph

- Forum, 6 fl oz. (0 days)

- Famoxadone + Cymoxanil

- Tanos, 8 to 10 oz. (3 days)

- Fosetyl-Aluminum

- Aliette WDG, 2 to 5 lb at 7- to 21-day intervals. (3 days) Do not make more than 7 applications per season. Do not tank mix with copper fungicides.

Ametoctradin + Dimethomorph

- Zampro, 14 fl. oz. (0 days)

Azoxystrobin

- Quadris, 12.0 to 15.5 fl oz every 7 - 14 days. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

*Materials marked with an asterisk are particularly recommended for problem infestations.
Melons

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES

Muskmelons and watermelons are hosts for root-knot and lesion nematodes. These nematodes can reduce melon yields but yield losses in Michigan have not been documented. If you suspect nematodes are reducing melon yields collect root and soil samples for analyses as described in Appendix C. If the numbers of nematodes recovered from those samples exceed damage thresholds, control options will be suggested. Vydate 2L is labeled for use in melons.

PREPLANT NEMATICIDE TREATMENT:

Fluensulfone
- Nimitz 480EC, 3.5 - 5.0 pints/A. apply broadcast and incorporate either mechanically or with water to a depth of 6-8 inches at least 7 days prior to transplanting or planting. Do not apply if heavy rainfall is expected within 48 hours of application. This material can be applied in bands or by drip but apparently is most effective if applied broadcast and incorporated. Do not apply to extremely cold soils (<40 F) as nematodes have to be active for the product to be effective. Product has not been evaluated in Michigan.

INSECTS

SEED TREATMENT:

CUCUMBER BEETLE:
- Cruiser 5 FS. See label for rates and application methods.

SOIL TREATMENT:

APHIDS, FLEA BEETLE, LEAFHOPPER, THRIPS:
- Durivo, 10 to 13 fl oz. (30 days)
- Thiamethoxam
  - Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz) (30 days) See label for application methods.
- THRIPS, LEAFHOPPERS, SQUASH BUG:
  - Venom, 5 to 6 oz. (21 days) See label for application methods.
- CUTWORM:
  - Capture LFR, 3.4 to 6.8 fl oz. (RUP)
  - Diazinon
    - Diazinon 50 W (4 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) Use only as directed. (RUP)

SEED CORN MAGGOT:
- Athena, 8.5 to 17 fl oz. (RUP)
- Bifenthrin. See label for application methods.
  - Bifenture 10 DF, 8 to 16 oz/A. (3 days)
  - Brigade WSB, 8 to 16 oz. (RUP)
  - Capture LFR, 3.4 to 6.8 fl oz. (RUP)

FLEA BEETLE LARVAE:
- Capture LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

APHIDS, CUCUMBER BEETLES, LEAFHOPPERS, THRIPS:
- Belay 50 WDG, 4.8 to 6.4 oz. See label for application methods
- Imidacloprid
  - Admire Pro, 7 to 10.5 fl oz. (21 days)
  - Nuprid 2 F, 16 to 24 fl oz. (21 days)
  - Scorpion 35SL, 9 to 10.5 fl oz. (21 days)

ARMYWORM:
- Verimark, 6.75-13.5 oz/A. (1)

APHIDS and THRIPS:
- Verimark, 13.5-20.5. (1)

LEAFHOPPERS:
- Sivanto, 21 - 28 fl oz/A.

WHITEFLIES:
- Sivanto, 21 - 28 fl oz/A.

FOLIAR TREATMENT: Melon plants may be sensitive to certain insecticide formulations. Make certain a problem exists before treatment. Read and observe restrictions on the label. To avoid killing bees, do not treat melons during bloom.

CUTWORM, ARMYWORM: Apply if >1% of plants are injured.
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Bacillus thuringiensis
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - XenTari, 0.5 to 2 lb. (0 days)
- Belt SC, 1.5 fl oz. (1 day)
- Bifenthrin
  - Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
**Melons**

- **Bifenthrin + Zeta-Cypermethrin**
  - Bifenture 10 DF, 8 to 16 oz/A. (3 days)
  - Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)

- **Methomyl**
  - Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
  - Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
  - Mustang Max, 2.8 to 4 oz. (1 day) (RUP)

- **Permethrin**
  - Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
  - Pyreneone, 1 to 12 fl oz. (0 days)
  - Rimon 0.83EC, 9 to 12 fl oz. (1 day)
  - Carbarly 4L, 1 qt. (3 days)
  - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

- **Flea BEETLE: Apply if needed.**
  - Actara, 1 to 3 oz. (0 days)
  - Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
  - Carbarly
    - Carbarly 4L, 1 qt. (3 days)
    - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
  - Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
  - Exirel, 13.5-20.5 oz/A. (1)
  - Kyocide, 8 to 16 lb. (14 days)

- **Lambda-cyhalothrin**
  - Lambda-Cy, 2.96 to 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

- **Methomyl**
  - Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
  - Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
  - Mustang Max, 2.8 to 4 oz. (1 day) (RUP)

- **Materials marked with an asterisk are particularly recommended for problem infestations.**

*Always read and follow label Instructions carefully.*
Materials marked with an asterisk are particularly recommended for problem infestations.

**APHIDS:**
- Bifenthrin
- Belay
- Athena
- Actara
- Sivanto
- Pyrenone
- Mustang
- Dimethoate
- Dibrom
- Diazinon
- Cararyl
- Cararyl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

**Diazinon**
- Diazinon 50 W (0.5 to 1.5 lb.) or Diazinon AG 500 (0.5 to 1.5 pt.) (3 days) Diazinon 50 W for honeydew melons only. (RUP)

**Dimethoate**
- Dimethoate 4 EC (1 pt.) or Dimethoate 400 (0.5 to 1 pt.) or Dimethoate 4E (0.5 to 1 pt.) (3 days) Dimethoate 4EC not for use on watermelons.

**Dinotefuran**
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

**Malathion**
- Malathion 5 (2.25 pt for watermelons; 1.6 pt for all others) or Malathion 57 EC (2 pt for watermelons; 1.6 pt for all others) or Malathion 8 Aquaml (1.5 pt for watermelons only) (1 day)

**Mustang Max**, 2.8 to 4 oz. (1 day) (RUP)

**Permethrin**
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Cararyl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
- Sivanto, 21-28 fl oz/A.
- Vetica, 14 to 17 fl oz. (7 days)

**APHIDS:**

**Acetamiprid**
- Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1.1 to 1.7 oz.) (0 days)
- Actara, 1.5 to 3 oz. (0 days)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
- Beleaf 50 SG, 2 to 2.8 oz. (0 days)
- Bifenthrin
  - Bifenthrin EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz (3 days) (RUP)
  - Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Bifenture 10 DF, 8 to 16 oz/A. (3 days)

**Diazinon**
- Diazinon 50 W (0.5 to 1.5 lb.) or Diazinon AG 500 (0.5 to 1.5 pt.) (3 days) Diazinon 50 W for honeydew melons only. (RUP)
- Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)

**Dimethoate**
- Dimethoate 4 EC (1 pt.) or Dimethoate 400 (0.5 to 1 pt.) or Dimethoate 4E (0.5 to 1 pt.) (3 days) Dimethoate 4EC not for use on watermelons.
- Endigo ZC, 4.5 fl oz. (1 day) (RUP)
- Exirel, 13.5-20.5 oz. (1)
- Fullfill, 2.75 to 5.5 oz. (7 days) May require 5 to 7 days for aphid mortality.
- Gladiator, 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.92 fl oz.) or Warrior with Zeon Technology (3.84 fl oz.) (1 day) (RUP)

**Malathion**
- Malathion 5 (1.5 to 2.0 pt for watermelons; 1.6 pt for all others) or Malathion 57 EC (1.5 pt.) or Malathion 8 Aquaml (1.5 pt for watermelons; 1 pt for all others) (1 day)

**Methomyl**
- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Sivanto, 21-28 fl oz/A.
- Voleem Flexi, 4 to 7 oz. (1 day)
- Vydate L, 2 to 4 pt. (1 day) (RUP)

**THRIPS:** Apply when damage is seen. Repeat as needed.
- Athena, 13.5 to 17 fl oz. (7 days) (RUP)

**Diazinon**
- Diazinon 50 W (0.5 to 1.5 lb.) or Diazinon AG 500 (0.5 to 1.5 pt.) (3 days) Diazinon 50 W for honeydew melons only. (RUP)

**Dimethoate**
- Dimethoate 4 EC (1 pt.) or Dimethoate 400 (0.5 to 1 pt.) or Dimethoate 4E (0.5 to 1 pt.) (3 days) Dimethoate 4EC not for use on watermelons.

**Dinotefuran**
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Exirel, 13.5-20.5 oz/A, (1)
- Exirel, 13.5-20.5 oz. (1)
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Malathion 8 Aquaml, 1 pt - not for watermelons. (1 day)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Radiant SC, 6 to 10 fl oz. (3 days)
- Rimon 0.83EC, 12 fl oz. (1 day)
- Spinosad
  - Entrust (2 to 2.5 oz.) or Entrust SC (6 to 8 fl oz.) (3 days)
  - Vydate L, 2 to 4 pt. (1 day) (RUP)

**SQUASH BUG:**

**Acetamiprid**
- Assail 30 SG (5.3 oz.) or Assail 70WP (2.3 oz.) (0 days)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
Melons

Materials marked with an asterisk are particularly recommended for problem infestations.

**Bifenthrin**
- Bifenture 10 DF, 8 to 16 oz/A. (3 days)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Carbaryl**
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

**Dinotefuran**
- Scorpion 3SSL, 2 to 7 fl oz. (1 day)
- Venom, 3 to 4 oz. (1 day)
- Endigo EC, 4 to 4.5 fl oz. (1 day) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvalaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- Mustang Max, 2.8 to 4 oz. (1 day) (RUP)

**Permethrin**
- Ambush 25 W, 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)
- Pounce 25 WP, 12.8 oz. (0 days) (RUP)
- Rimon 0.83EC, 12 fl oz. (0 days)
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

**SQUASH VINE BORER:**
- Acetamiprid
  - Assail 30 SG (5.3 oz.) or Assail 70WP (2.3 oz.) (0 days)
  - Athena, 7 to 17 fl oz. (7 days) (RUP)
- Belt SC, 1.5 fl oz. (1 day)

**Bifenthrin**
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - Bifenture 10 DF, 8 to 16 oz/A. (3 days)
  - Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvalaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- Mustang Max, 2.8 to 4 oz. (1 day) (RUP)

**Permethrin**
- Ambush 25 W, 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Vetica, 12 to 17 fl oz. (7 days)

**SEED CORN MAGGOT:**
- Empower, 3.5 to 8.7 lb. (3 days) (RUP)

**ARMYWORM:**
- Avaunt, 3.5 to 6 oz. (3 days)
- Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biorbit HP, 0.5 to 2 lb. (0 days)
  - DiPel DF, 1 to 2 lb. (0 days)
- Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
- Coragen, 3.5 to 5 fl oz. (1 day)
- Exirel, 7-13.5 oz/A. (1)
- Gladiator, 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 10 fl oz. (3 days)
- Radiant SC, 5 to 10 fl oz. (3 days)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)

**Spinosad**
- Entrust (1.25 to 2.5 oz.) or Entrust SC (4 to 8 fl oz.) (3 days)

**CUTWORM:**
- Baythroid XL, 0.8 to 16 fl oz. (0 days) (RUP)
- Empower, 3.5 to 8.7 lb. (3 days) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvalaStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Gladiator, 6 to 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
- Mustang Max, 1.28 to 4 oz. (1 day) (RUP)

**Permethrin**
- Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

**WHITEFLIES:**
- Acetamiprid
  - Assail 30 SG, 2.5 to 5.3 oz. (0 days)
  - Assail 70WP, 1.1 to 2.3 oz/A. (0 days)
- Exirel, 13.5-20.5 oz. (1)
- Portal, 2 pt. (3 day) Do not apply more than 4 pt per acre per crop per cycle
- Sivanto, 21 - 28 fl oz/A.

*Materials marked with an asterisk are particularly recommended for problem infestations.*
**Materials marked with an asterisk are particularly recommended for problem infestations.**

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**SWEET POTATO WHITEFLY, SILVER LEAF WHITEFLY:**

- **Acetamiprid**
  - Assail 30 SG, 2.5 to 5.3 oz. (0 days)
  - Assail 70WP, 1.1 to 2.3 oz. (0 days)

**MITES**

Apply when needed. Watermelons are particularly susceptible. Usually a problem only in hot, dry weather.

- **Abamectin**
  - Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
  - Bifenture EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Bifenture 10 DF, 12.8 to 16 oz/A. (3 days)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Disciple 2EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (3 days) (RUP)
  - Bifenture + Avermectin
    - Athena, 13.5 to 17 fl oz. (7 days) (RUP)
    - Bifenture + Zeta-Cypermethrin
      - Hero (10.3 oz.) or Hero EW (11.2 oz.) (3 days) (RUP)
  - Dazoxalone
    - Dazoxalone W 50 W (1 lb) or Dazoxalone AG 500 (1 pt) (3 days) (RUP)
  - Etoxazole
    - Zeal, 2 to 3 oz. (7 days)
  - Fenthion
    - Danitol 2.4 EC, 10 2/3 fl oz. (7 days) (RUP)
  - Fenpyroximate
    - Portal, 2 pt. (3 day) Do not apply more than 4 pt per acre per crop per cycle
  - Malathion
    - Malathion 5 (1.5 to 2.0 pt for watermelons; 1.6 pt for all others) or Malathion 57 EC (1.5 pt) or Malathion 8 Aquamul (1.5 pt for watermelons; 1 pt for all others) (1 day)
  - Naled
    - Dibrom 8 Emulsive, 1 pt. (1 day) (RUP)
  - Spiromesifen
    - Oberon 2 SC, 7 to 8.5 fl oz. (7 days)
  - Zeta-Cypermethrin + Avermectin
    - Gladiator, 19 fl oz. (7 days) (RUP)

**SLUGS**

- Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb) Apply between rows. Avoid contact with edible product.

**DISEASES**

**SEED TREATMENT:**

- **Damaging OFF** *(Pythium spp., Rhizoctonia solani):* If possible, buy treated seed. Use only as directed; over-treatment may cause injury.
  - **Captain**
    - Captain 4 Flowable, 2 fl oz/100 lb seed.
  - **Flusilazole**
    - Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia).
    - Thiram
      - 42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 4 1/2 oz/100 lb seed.

**SEEDBED PREPARATION:**

- **DAMPING OFF, ROOT ROT** *(Pythium spp., Rhizoctonia solani):* Grow transplants in disease-free soil (sterilized) and fumigate fields before planting. To sterilize soil use steam or fumigate with Chemicals suggested for seedbed sterilization in Appendix A. Follow manufacturer's recommendations for use with particular crops. Avoid planting until soil is free of fumigant.

**SOIL INJECTION:**

**VINE DECLINE:**

- **Fludioxonil**
  - Cannonball, 0.25 to 0.5 lb. (14 days) Shanked in prior to planting or transplanting. Follow up with drip applications.
  - Cannonball WG, Cannonball WP, 4 to 8 oz. (14 days) Shanked in prior to planting or transplanting. Follow up with drip applications.

**PREPLANT SOIL FUMIGATION:**

- **DAMPING OFF, ROOT ROTS** *(Phytophthora spp., Pythium spp., Rhizoctonia solani), FUSARIUM WILT* or **ROOT ROT** *(Fusarium oxysporum):* See bulletin E-2099. This protects plants grown from seed or transplanted in the field.

**PREPLANT TREATMENT:**

**GREENHOUSE PREPLANT INCORPORATION:**

- **Gliocladium virens GL-21**
  - SoilGard 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

**DRIP APPLICATION:**

**DOWNY MILDEW** *(Pseudoperonospora cubensis), PHYTOPHTHORA BLIGHT** *(Phytophthora capsici):*

- **Amelotin + Dimethomorph**
  - Presidio, 3-4 fl oz. (2 days)
  - Zampiro, 14 fl oz. (0 days)
- **Fluopicolide**
  - Presidio, 3-4 fl oz. (2 days)
  - Zampiro, 14 fl oz. (0 days)

**VINE DECLINE:**

- **Fludioxonil**
  - Cannonball, 0.25 to 0.5 lb. (14 days)
  - Cannonball WG, Cannonball WP, 4 to 8 oz. (14 days)
**PYTHIUM ROOT ROT:**
- Mefenoxam
- Ridomil Gold SL, 0.25-0.4 pt. (5 days)

**FOLIAR TREATMENT:**

**POWDERY MILDEW (Sphaerotheca fuliginea, Erysiphe cichoracearum):**
- Azoxystrobin + Difenoconazole
  - Quadris Top, 12 to 14 fl oz. (1 day) one application before alternating with another chemical.

- Cyufenamid
  - Torro, 3.4 oz. (0 day)

- Fluopyram + Trifloxystrobin
  - Luna Sensation, 4 - 7.6 fl oz. (0 days) Watermelon only.

- Kresoxim-methyl
  - Sovran, 3.2 to 4.8 oz. (0 days)

- Myclobutanil
  - Rally 40 WSP, 2.5 to 5 oz. (0 days)

- Penthionydrad
  - Fontelis, 12 - 16 fl oz. (1 day)

- Pyraclostrobin
  - Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

- Pyraclostrobin/Boscalid
  - Pristine, 12.5 to 18.5 oz. (0 days) To avoid crop injury, do not add adjuvants.

- Quinoxynen
  - Quintec, 4 to 6 fl oz. (3 days)

- Thiophanate-Methyl
  - Cercobin 4.1F, 10.9 fl oz. (1 day)

- Topsin 4.5 FL, 10 fl oz. (1 day)

- Topsin M 70 WP, Topsin M WSB, 0.5 lb. (1 day)

- Trifloxystrobin
  - Flint, 1 1/2 to 2 oz, 7- to 14 day intervals. (0 days) Maximum 2 consecutive applications, 4 applications/year and 16 oz/season.

**Azoxystrobin**
- **Quadris**, 11.0 to 15.5 fl oz. (1 day)
  Do not apply more than one folic application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Azoxystrobin + Chlorothalonil**
- **Quadris Opti**, 3.2 pt. (1 day)

**Bacillus subtilis**
- Serenade ASO, 2 - 6 qt. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.

**Bacillus subtilis**
- Serenade Max, 1 - 3 lb. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.

**Boscalid**
- Endura, 6.5 oz. (0 days) Suppression.

**Chlorothalonil**
- Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)

- Bravo Weather Stik, Echo 720 (2 to 3 pt, 7 day intervals) or Equus 720 SST (2 to 3 pt every 7 days) (0 days)

- Echo 90 DF, 1 5/8 to 2 1/2 lb. (0 days)

**Copper Ammonium Carbonate**
- Copper Count N, 1 1/2 to 2 qt. (0 days)

**Copper Hydroxide**
- Champ DP Dry Prill, 1 1/3 lb. (0 days)

- Champ Formula 2 F, 1 1/3 pt. (0 days)

- Champion WP, 1.5 to 3 lb. (0 days)

- Kocide 2000, 1 1/2 lb. (0 days)

- Kocide 3000, 0.5-1.25 lb. (0 day)

- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

- Copper Hydroxide + Copper Oxychloride
  - Badge SC, 1 to 2.5 pt. (0 days)

- Copper Sulfate
  - Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)

- Difenoconazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)

- Neem Oil
  - Trilogy, 2 pt. (0 days)

- Potassium Bicarbonate
  - Amicar 100, 2.5 to 5 lb. (0 days)

- Sulfur
  - Kumulus DF, 20 to 25 lb. Do not use on sulfur-sensitive varieties. (0 days)

- Microthiol Disperss, 5 to 10 lb. (0 days)

- Thiolux, 20 to 25 lb. (0 days)

- Tebuconazole
  - Orius 3.6F, Tebuzol 3.6, 4-6 fl oz. (7 days)

- Triflumizole
  - Procure 480 SC, 4 to 8 fl oz. (0 days)

**ALTERNARIA LEAF BLIGHT (Alternaria cucumenn):**
- Azoxystrobin + Chlorothalonil
- Quadris Opti, 3.2 pt. (1 day)

- Azoxystrobin + Difenoconazole
  - **Quadris Top**, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

- Chlorothalonil
  - Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)

- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)

- Echo 90 DF, 1 5/8 to 2 1/2 lb. (0 days)

- Difenoconazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)

- Mancozeb
  - Dithane DF Rainshied, Dithane M-45, Dithane WSP, 2 to 3 lb. (5 days)

- Dithane F-45 Rainshied, 1 3/5 to 2 2/5 qt. (5 days)

- Koveral (2 - 3 lb) or Penncozeb 75 DF (2 to 3 lb) (5 days)

- Manzate Max, 1.6 to 2.4 qt. (5 days)

- Manzate Pro-Stick, 2 to 3 lb. (5 days)

- Pyraclostrobin
  - Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

- Pyraclostrobin/Boscalid
  - Pristine, 12.5 to 18.5 oz. (0 days) See label for use of adjuvants.

**Azoxystrobin**
- **Quadris**, 11.0 to 15.5 fl oz. (1 day) Do not apply more than one folic application of Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Boscalid**
- Endura, 6.5 oz. (0 days)

**Copper Ammonium Carbonate**
- Copper Count N, 1 1/2 to 2 qt. (0 days)

**Copper Hydroxide**
- Champ DP Dry Prill, 1 1/3 lb. (0 days)

- Champ Formula 2 F, 1 1/3 pt. (0 days)

- Champion WP, 1.5 to 3 lb. (0 days)

- Kocide 2000, 1 1/2 lb. (0 days)

- Kocide 3000, 0.5-1.25 lb. (0 day)

- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label Instructions carefully.
Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt. (0 days)
Copper Sulfate
- Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)
Famoxadone + Cymoxanil
- Tanos, 8 oz. (3 days)
Fenamidone
- Reason 500 SC, 5.5 fl oz. (14 days)
Fluopyram + Trifloxystrobin
- Luna Sensation, 7.6 fl oz. (0 days) Watermelon only.
Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.
Mancozeb + Zoxamide
- Gavel 75 DF, 1.5 - 2.0 lb. (5 days) Some cantaloupe varieties are sensitive to Gavel.
Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt. (0 days)
Neem Oil
- Trilogy, 2 pt. (0 days)
Penthiopyrad
- Fontelis, 12 - 16 fl oz. (1 day)
Potassium Bicarbonate
- Armicarb 100, 2.5 to 5 lb. (0 days)
Potassium phosphate/chlorothalonil
- Catamaran, 6 pt. (1 day)
SCAB (Cladosporium cucumerinum): Treat every 7 days beginning after the plants have flowered.
* Chlorothalonil
- Bravo Ultra, Equus DF, 1.8 to 2.7 lb. (0 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
- Echo 90 DF, 1 1/2 to 2 1/2 lb. (0 days)
* Mancozeb
- Dithane DF Rainshield (2 to 3 lb (watermelon)) or Dithane M-45 (2 to 3 lb (watermelon)) or Dithane WSP (2 to 3 lb (watermelon)) (5 days)
- Dithane F-45 Rainshield, 1.6 to 2.4 qt (watermelon). (5 days)
Copper Ammonium Carbonate
- Copper Count N, 1 1/2 to 2 qt. (0 days)
Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.
Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt. (0 days)
Neem Oil
- Trilogy, 2 pt. (0 days)
Potassium Bicarbonate/chlorothalonil
- Catamaran, 6 pt. (1 day) May result in sunburn of watermelon fruit surfaces. See label.
ANTHRACNOSE (Colletotrichum lagernarium): Treat every 7 to 14 days after flowering.
* Azoxystrobin
- Quadris, 11.0 to 15.5 fl oz. (1 day)
Do not apply more than one foliar application of Amistar and Quadris or other streptomycin fungicide before alternating with a fungicide that has a different mode of action.
* Azoxystrobin + Chlorothalonil
- Quadris Opti, 3.2 pt. (1 day)
* Azoxystrobin + Difenconazole
- Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
* Chlorothalonil
- Bravo Ultra, Equus DF, 1.4 to 1.8 lb. (0 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)
- Echo 90 DF, 1 1/4 to 1 5/8 lb. (0 days)
Mancozeb
- Dithane DF Rainshield, Dithane M-45, Dithane WSP, 2 to 3 lb. (5 days)
- Dithane F-45 Rainshield, 1 3/5 to 2 2/5 qt. (5 days)
- Koverall (2 - 3 lb) or Penncozeb 75 DF (2 to 3 lb) (5 days)
- Manzate Max, 1.6 to 2.4 qt. (5 days)
- Manzate Pro-Stick, 2 to 3 lb. (5 days)
Pyraclostrobin
- Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
Pyraclostrobin/Boscalid
- Pristine, 18.5 oz. (0 days) See label for use of adjuvants.
* Thiophanate-Methyl
- Cercatin 4.1F, 10.9 fl oz. (1 day)
- Topspin 4.5 FL, 10 fl oz. (1 day)
- Topspin M 70 WP, Topspin M WSB, 0.5 lb. (1 day)
Copper Ammonium Carbonate
- Copper Count N, 1 1/2 to 2 qt. (0 days)
Copper Hydroxide
- Champion WP, 1.5 to 3 lb. (0 days) Watermelon.
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)
Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt. (0 days)
Copper Oxycilline + Copper Sulfate
- C-O-C-S WDG, 1 to 2 lb. (0 days)
Copper Sulfate
- Basic Copper 53, 2 lb. (0 days)
- Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)
Difenconazole + Cyprodinil
- Inspire Super, 6 to 9 fl oz. (7 days)
Famoxadone + Cymoxanil
- Tanos, 8 oz. (3 days)
Fluopyram + Trifloxystrobin
- Luna Sensation, 7.6 fl oz. (0 days) Watermelon only.
Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days)
Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt. (0 days)
Neem Oil
- Trilogy, 2 pt. (0 days)
Potassium Bicarbonate
- Catamaran, 6 pt. (1 day) May result in sunburn of watermelon fruit surfaces. See label.
ANGULAR LEAF SPOT (Pseudomonas lachrymans): Copper may be used for control of this bacterial disease. Spray every 7 days, starting before the first fruit form and continue to protect fruit at all stages of development.
Copper Ammonium Carbonate
- Copper Count N, 1 1/2 to 2 qt. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Copper Hydroxide
- Champ DP Fertilizer, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, 1.5 to 3 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cap 3 L, 1 1/3 to 2 2/3 pt. (0 days)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt. (0 days)

Copper Sulfate
- Basic Copper 53, Basicop, 2 lb. (0 days)
- Cupropex Ultra 40 Dispers, 1 to 2 lb. (0 days)

Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days)

Neem Oil
- Trilogy, 2 pt. (0 days)

DOWNY MILDEW (Pseudoperonospora cubensis): Treat plants when in the 2-leaf stage and continue at 7-14 day intervals.
* Ametoctradin + Dimethomorph
* Zampor, 14 fl. oz. (0 days)
* Chlorothalonil
* Bravo Ultrex, Equus DF, 1.4 to 1.8 lb. (0 days)
* Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)
* Echo 90 DF, 1 1/4 to 1 5/8 lb. (0 days)
* Cyzofamid
* Ranman 400SC, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)
* Cymoxanil
* Curzate 60 DF, 3 to 5 oz. (3 days)
* Farnoxadone + Cymoxanil
* Tanos, 8 oz. (3 days)
* Mancozeb
* Dithane DF Rainshied, Dithane M-45, Dithane WSP, 2 to 3 lb. (5 days)
* Dithane F-45 Rainshied, 1 3/5 to 2 2/5 qt. (5 days)
* Koverall (2-3 lb) or Penncozeb 75 DF (2 to 3 lb) (5 days)
* Manzate Max, 1.6 to 2.4 qt. (5 days)
* Manzate Pro-Stick, 2 to 3 lb. (5 days)
* Mancozeb + Zoxamide
* Gavel 75 DF, 1.5-2.0 lb. (5 days) Some cantaloupe varieties are sensitive to Gavel.
* Propamocarb
  - Previcur Flex, 1.2 pt every 7 - 14 days. (2 days)
  - Propamocarb
  - Previcur Flex, 1.2 pt every 7 - 14 days. (2 days)

Azoxystrobin
* Quadris, 11.0 to 15.5 fl oz. (1 day)
Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
* Azoxystrobin + Chlorothalonil
* Quadris Opti, 3.2 pt. (1 day)
* Azoxystrobin + Difenconazole
* Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

Copper Hydroxide + Copper Oxychloride
* Badge SC, 1 to 2.5 pt. (0 days)

Dimethomorph
* Forum, 6 fl oz. (0 days)

Fenamidine
* Reason 500 SC, 5.5 fl oz. (14 days)

Fluopicolide
* Presidio, 3-4 fl oz. (2 days)

Fosetyl-Aluminum
* Aliette WDG, 2 to 5 lb. 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.

Mancozeb + Copper Hydroxide
* ManKocide, 2-3 lb. (5 days) Some cantaloupe varieties are sensitive to ManKocide.

Mandiproamid
* Revus, 8 fl oz. (0 day)

Mefenoxam + Chlorothalonil
* Ridomil Gold Bravo, 2.5 pt. (0 days) Maximum 4 applications.
* Mefenoxam + Copper Hydroxide
* Ridomil Gold Copper, 2 lb. (5 days) Maximum 4 applications.

Mefenoxam + Mancozeb
* Ridomil Gold MZ, 2 1/2 lb. (5 days) Maximum 4 applications.

Monosodium salt of phosphorous acid
* Fosphite, 1 to 3 qt. (0 days)

Potassium phosphate/chlorothalonil
* Catamaran, 4 pt. (1 day) May result in sunburn of watermelon fruit surfaces. See label.

Pyraclostrobin
* Cabrio, 8 to 12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

Pyraclostrobin/Bosalid
* Pristine, 12.5 to 18.5 oz. (0 days) See label for use of adjuvants.

Trifloxystrobin
* Flint, 4 oz, 7- to 14-day intervals. (0 days) Maximum 1 consecutive application, 4 applications/year and 16 oz/season. Alternate with Ridomil Gold Bravo.

Note: Most fungicides that protect against Alternaria may also provide limited downy mildew protection.

GUMMY STEM BLIGHT or BLACK ROT (Didymella bryoniae also called Mycosphaerella melonis): Begin at the 2-leaf stage and apply every 7 days.

* Azoxystrobin
  * Quadris, 11.0 to 15.5 fl oz. (1 day)
Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
* Azoxystrobin + Chlorothalonil
* Quadris Opti, 3.2 pt. (0 days)
* Azoxystrobin + Difenconazole
* Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

Chlorothalonil
* Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)
* Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
* Echo 90 DF, 1 5/8 to 2 1/2 lb. (0 days)

Mancozeb
* Dithane DF Rainshied, Dithane M-45, Dithane WSP, 2 to 3 lb. (5 days)
* Dithane F-45 Rainshied, 1 3/5 to 2 2/5 qt. (5 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
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**Phytophthora Crown and Fruit Rot**
- Mandipropamid
- Fosetyl
- Fluopicolide
- Ametoctradin + Dimethomorph
- Pyraclostrobin
- Thiophanate-Methyl
- Cercobin 4.1F
- Topsin 4.5 FL
- Topsin M 70 WP, Topsin M WSB, 0.5 lb.
- Bosalid
- Endura, 6.5 oz.
- Copper Ammonium Carbonate
- Copper Count N, 1 1/2 to 2 qt.
- Copper Hydroxide
- Champ DP Dry Prill, 1 1/3 lb.
- Champ Formula 2 F, 1 1/3 pt.
- Champion WP, 1.5 to 3 lb.
- Kocide 2000, 1 1/2 lb.
- Kocide 3000, 0.5-1.25 lb.
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt.
- Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt.
- Copper Sulfate
- Cuprofix Ultra 40 Disperss, 1 to 2 lb.
- Difenconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz.
- Kresoxin-methyl
- Sovran, 4.8 oz.
- Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb.
- Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt.
- Penthiopyrad
- Fontelis, 12 - 16 fl oz.
- Potassium phosphate/chloropropham
- Catamaran, 6 pt.
- Sovran, 4.8 oz.
- Mocap + Copper Hydroxide
- Mefenoxam + Chlorothalonil
- Pristine, 12.5 to 18.5 oz.
- Orinoid Gold Bravo, 2.5 to 3.25 pt.
- Pentiopyrad
- Cuprofix Ultra 40 Disperss, 1 to 2 lb.
- Difenconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz.
- Kresoxin-methyl
- Sovran, 4.8 oz.
- Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb.
- Some cantaloupe varieties are sensitive to ManKocide.
- Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt.
- Penthiopyrad
- Cuprofix Ultra 40 Disperss, 1 to 2 lb.
- Difenconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz.
- Kresoxin-methyl
- Sovran, 4.8 oz.
- Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb.
- Some cantaloupe varieties are sensitive to ManKocide.
- Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt.

**Phytophthora CROWN and FRUIT ROT (Phytophthora spp.):**
- Dimethomorph
- Forum, 6 fl oz.
- Famoxadone + Cymoxanil
- Tanos, 8 - 10 oz every 5 - 7 days.
- Mancozeb + Zoxamide
- Gavel 75 DF, 1.5-2.0 lb.
- Some cantaloupe varieties are sensitive to Gavel.
- Ametoctradin + Dimethomorph
- Zampro, 14 fl oz.
- Cyazofamid
- Ranman 400SC, 2.75 fl oz every 7 to 10 days.
- Flupyradroxyl
- Presidio, 3-4 fl oz.
- Fosetyl-Aluminum
- Aliette WDG, 2 to 5 lb, 7- to 14-day intervals.
- Do not tank mix with copper fungicides.
- Mandipropamid
- Revus, 8 fl oz.

*Copper, Copper Hydroxide + Copper Oxychloride, Copper Ammonium Carbonate, and Copper Sulfate are formulated with copper phosphates.*

Mint

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**Nematodes**
Root-lesion, false root-lesion and needle nematodes can cause reduction in yields, especially in the presence of the Verticillium wilt fungus. Fields should be tested for nematodes prior to planting. If any of these nematodes exceed damage threshold estimates, soil fumigation in the fall may be recommended.

**Fall Soil Fumigation (Broadcast):**
- Telone II, 25 gal/A (muck soil).
- Fumigate in the fall when soil temperatures at an 8-inch depth are above 50°F. Inject the fumigant to a depth of 6 inches and seal the soil with a drag immediately after application.
- Use soil fumigants only as directed on the label.
- Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

**Preplant Treatment:**

- Ethoprop
  - Mocap 15 G (Apply 40 lbs/A.) or Mocap 6EC (Apply 4 quarts in 20-30 gallons of water per acre.) Broadcast over the entire field using ground equipment. Incorporate during or immediately following application to a depth of 2-4 inches by mechanical means OR immediately irrigate with 1-2 inches of water. Repeat irrigation before the soil dries. For establishment of new mint. Do not harvest within 225 days of application. Only 1 application per year. (RUP)

**Insects**

**Soil Treatment:**

- Mint Root Borer: Ethoprop
  - Mocap 15 G (20 lb.) or Mocap 6EC (2 qt.) (225 days) See label for application methods. (RUP)

**Foliar Treatment:**

- Mint Root Borer: Chlorpyrifos
  - Chlorpyrifos 4E AG, 4 pt. (90 days) (RUP)
  - Govern, 4 pt. (90 days) (RUP)
  - Hatchet, 4 pt. (90 days) (RUP)
  - Lorsban 4E / Lorsban Advanced (2 to 4 pt.) or Lorsban 75 WG (2.67 lb.) (90 days) (RUP)
  - Nufos 4E, 4 pt. (90 days) (RUP)
  - Vulcan, 4 pt. (90 days) (RUP)
  - Warhawk, 4 pt. (90 days) (RUP)

Note: Most fungicides applied to control downy mildew may have limited efficacy against Phytophthora crown and fruit rot.
Mint

- Whirlwind, 4 pt. (90 days) (RUP)
  Apply post-harvest when larvae are present. Follow with at least 1 inch of irrigation.
- Coragen, 3.5 to 5 fl oz. (3 days)
- Voliam Flexi, 4 to 5 oz. (7 days)

MINT FLEA BEETLE: Apply prior to egg-laying activity (July 20 to August 10) if needed to control adult stage, which will reduce root-damaging populations of larvae the following year. Three applications, 7 to 10 days apart, may be needed to control severe infestations (common only in older fields). Timing is critical.
- Actara, 1.5 to 3 oz. (7 days)
- Malathion
  - Malathion 5, or Malathion 5 EC (1.5 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 (1 pt.) or Malathion 8 Aquamul (0.94 pt.) (7 days)
- Methomyl
  - Lannate LV (2.25 to 3 pt.) or Lannate SP (0.75 to 1 lb.) (14 days) (RUP)
  - Nudrin LV (2.25 to 3 pt.) or Nudrin SP (0.75 to 1 lb.) (14 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Voliam Flexi, 2 to 4 oz. (7 days)

CUTWORM, LOOPERS: Apply before worms are 3/4 inch long for best results.
- Acephate
  - Acephate 90 WDG (1.11 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1.1 lb.) or Acephate 97 UP (1 lb.) (14 days)
  - Bracket 97, 1 lb. (14 days)
  - Orthene 97, 1 lb. (14 days)
- Avaunt, 3.5 oz. (7 days)
- Bacillus thuringiensis
- Methomyl
  - Lannate LV (3 pt.) or Lannate SP (1 lb.) (14 days) (RUP)
  - Nudrin LV (3 pt.) or Nudrin SP (1 lb.) (14 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
  - Radiant SC, 4 to 12 fl oz. (7 days)
- Spinosad
  - Entrust (1.25 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (7 days)
- Voliam Flexi, 4 to 5 oz. (7 days)

APHIDS: Apply when damage is first seen or when insects are noticeable.
- Acephate
  - Acephate 90 WDG (1.11 lb.) or Acephate 90 WSP (1.1 lb.) or Acephate 97 (1.1 lb.) or Acephate 97 UP (1 lb.) (14 days)
  - Bracket 97, 1 lb. (14 days)
  - Orthene 97, 1 lb. (14 days)
- Actara, 1.5 to 3 oz. (7 days)
- Malathion
  - Malathion 5, or Malathion 5 EC (1.5 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 Aquamul (0.94 pt.) (7 days)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Voliam Flexi, 2 to 4 oz. (7 days)

LOOPERS:
- Bacillus thuringiensis
  - Biobit HP, 0.5 to 1 lb. (0 days)
  - DiPel DF, 0.5 to 1 lb. (0 days)

- XenTari, 0.5 to 1.5 lb. (0 days)
  Confirm 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)

CUTWORM:

- Chlorpyrifos
- Chlorpyrifos 4E AG, 2 to 4 pt. (90 days) (RUP)
- Govern, 2 to 4 pt. (90 days) (RUP)
- Hatchet, 2 to 4 pt. (90 days) (RUP)
- Lorsban 4 E / Lorsban Advanced (2 to 4 pt.) or Lorsban 75 WG (1.33 to 2.67 lb.) (90 days) (RUP)
- Nufor 4E, 2 to 4 pt. (90 days) (RUP)
- Vulcan, 2 to 4 pt. (90 days) (RUP)
- Whirlwind, 2 to 4 pt. (90 days) (RUP)

MITES
Apply if needed.
- Abamectin
  - Agri-Mek 0.15 EC (8 to 12 fl oz.) or Agri-Mek SC (1.75 to 2.5 fl oz.) (28 days) Use with a non-ionic surfactant. (RUP)
- Bifenthrin
  - Acramite 4SC (12 to 24 fl oz.) or Acramite 50WS (0.75 to 1 lb.) (7 days)
- Etoxazole
  - Xasan, 2 to 3 oz. (7 days)
  - Fenpyroximate
  - Portal, 1 to 2 pt. (1 day)
  - Malathion
  - Malathion 5, or Malathion 5 EC (1.5 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 Aquamul (0.94 pt.) (7 days)

DISEASES

PREPLANT SOIL FUMIGATION:

- VERTICILLIUM WILT (Verticillium dahliae): See Bulletin E-2099. Apply as a broadcast or row treatment, placing the fumigant at least 12 to 14 inches below the final soil surface.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.
- 2,3-Dichloropropene/chloropicrin
  - Telone C35, 13-35 gal. (RUP)
  - Metam Potassium
  - Sectagon-K54, 30-60 gal. (RUP)
  - Metam Sodium
  - Sectagon 42, 37.5-75 gal. (RUP)

FOLIAR TREATMENT:

- MINT RUST (Puccinia menthae): Apply to plants 4 to 8 inches tall at 7 to 10 day intervals. Do not apply more than 3 times. Do not feed hay to livestock.
  - Azoxystrobin + Propiconazole
  - Quilt (14 fl oz) or Quilt Xcel (10.5 - 14 fl oz) (7 days)

  - Azoxystrobin
  - Quadris, 6 to 15.5 fl oz. (0 days fresh; 7 days processed) Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
  - Chlorothalonil
  - Bravo Ultrex, 1.2 lb. (80 days)
  - Bravo Weather Stik, Echo 720, Equus 720 SST, 1 3/8 pt. (80 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.

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Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES

Northern root-knot, root-lesion, onion bloat, common needle and stubby-root nematodes can reduce onion yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for onions, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of northern root-knot, root-lesion, onion bloat and stubby-root nematodes in onion production.

FALL SOIL FUMIGATION (BROADCAST):

1-3-D

- Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil). Fumigate in the fall when soil temperatures at a 6-inch depth are above 50°F. Inject the fumigant to a soil depth of 6 to 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In limited situations soil fumigants can be applied in the spring in Michigan. Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

AT-PLANTING TREATMENT:

Oxamyl

- Vydate L, 3/4 to 1 gal per acre. Apply at planting as an in-furrow drench using 100-150 gallons of water per acre or 1-1/2 to 2 gal per acre as an in-furrow band using 20-50 gallons of water per acre or 1/2 to 1 gal/A as an in-furrow spray followed by 1 to 2 postemergence band treatments at 1/2 to 1 gal/A in a minimum of 20 gal water per acre. Do not apply within 14 days of harvest. Do not apply more than 2.14 gal of Vydate L/acre/season. Do not use on green onions. (RUP)

INSECTS

SEED TREATMENT:

ONION MAGGOT: Trigard-treated seed is available as a pelleted or film-coated seed. Check with your seed supplier.

AT-PLANTING TREATMENT:

ONION MAGGOT: Apply to open furrow immediately after seeding but before furrow is closed. Use on dry bulb onions only.

- Chlorpyrifos
  - Chlorpyrifos 15G (3.7 oz/1000 row ft.) or Chlorpyrifos 4E AG (1.1 fl oz/1000 row ft.) (60 days) (RUP)
  - Goverm, 32 fl oz. (60 days) (RUP)
  - Hatchet, 32 fl oz. (60 days) (RUP)
  - Lorsban 15G (3.7 oz/1000 row ft.) or Lorsban 4E / Lorsban Advanced (32 fl oz.) or Lorsban 75 WG (1.33 lb.) (RUP)
  - Nufos 4E, 32 fl oz. (60 days) (RUP)
  - Saurus, 3.7 oz/1000 row ft. (60 days)
  - Vulcan, 32 fl oz. (60 days) (RUP)
  - Warhawk, 1.1 fl oz/1000 row ft. (60 days) (RUP)
  - Whirlwind, 32 fl oz. (60 days) (RUP)

THRIPS:

- Admire Pro, 14 fl oz (21 days)

LEAF MINERS, THRIPS, WHITEFLIES:

- Scorpion 35SL, 8.75 to 10.5 fl oz/A (1 day)

LEAF MINERS:

FOLIAR TREATMENT:

ONION MAGGOT: Apply as a directed spray or drench in a minimum of 100 gallons of water to the base of onion seedlings or transplants during peak egg laying of the onion maggot adults. Proper timing is critical.

- Cypermethrin
  - Amin 2.5 EC, 2.5 to 5 fl oz. (7 days) (RUP)
  - Cypermethrin, 2.5 to 5 fl oz. (7 days) (RUP)
  - Holstar, 2.5 to 5 oz fl. (7 days) (RUP)
  - UP-Cyde 2.5 EC, 2.5 to 5 fl oz. (7 days) (RUP)

Lambda-cyhalothrin

- Lambda-Cy, 1.92 to 3.2 fl oz. (14 days) (RUP)
  - Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (14 days) (RUP)

Lorsban 4 E / Lorsban Advanced, 1 qt. (60 days) Use on dry bulb onions only. Maximum of 2 applications, maximum of 1 application if Lorsban 4 E or 15 G was used at planting (Special Michigan SLN label). (RUP)

Malathion

- Malathion 5, or Malathion 5 EC (1.5 to 2.5 pt.) or Malathion 57 EC (2.5 pt.) or Malathion 8 (2 pt.) or Malathion 8 Aquamul (1.5 pt.) (3 days)

- Mustang Max, 2.24 to 4 oz. (7 days) (RUP)

Permethrin

- Perm-UP 25DF (8.6 to 19.2 oz.) or Perm-UP 3.2 EC (4 to 12 oz.) (1 day) (RUP)

Proaxis, 1.92 to 3.2 fl oz. (14 days) (RUP)

Pyreneone, 1 to 2 fl oz. (0 days)

THRIPS: Usually appear around mid-summer. Damage is most severe on the new growth. Dry growing conditions usually intensify the problem. Treat when damage becomes visible or numbers exceed 10 to 15 per plant. Repeat as needed.

* Movento, 5 fl oz/A. (7 days) Movento must be tank-mixed with a penetrating adjuvant. Use for the first two applications in the season, applied one week apart.

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully
Onions

- Materials marked with an asterisk are particularly recommended for problem infestations.

Abamectin
- Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (30 days) Use with a non-ionic surfactant. (RUP)

Acetamiprid
- Assail 30 SG (5 to 8 oz.) or Assail 70WP (2.1 to 3.4 oz.) (7 days)

Cypermethrin
- Ammo 2.5 EC, 4 to 5 fl oz. (7 days) (RUP)
- Cypermethrin, 4 to 5 fl oz. (7 days) (RUP)
- Holster, 4 to 5 fl oz. (7 days) (RUP)
- UP-Cyde 2.5 EC, 4 to 5 fl oz. (7 days) (RUP)

Diazinon AG 500, 0.5 to 1 pt. (10 days) (RUP)

Exirel, 13.5-20.5 oz/A. (1)

Lambda-cyhalothrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (14 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (14 days) (RUP)

Malathion
- Malathion 5, or Malathion 5 EC (1.5 to 2 pt.) or Malathion 57 EC (1.5 pt.) or Malathion 8 Aquamul (1 to 1.56 pt.) (3 days)

Methomyl
- Lannate LV (3 pt.) or Lannate SP (1 lb.) (7 days) (RUP)
- Nudrin LV (3 pt.) or Nudrin SP (1 lb.) (7 days) (RUP)

Mustang Max, 2.88 to 4 oz. (7 days) (RUP)

Parathion-methyl
- Methyl 4 EC, 1 pt. (15 days) (RUP)
- Penncape-M, 2 pt. (15 days) (RUP)

Permethrin
- Ambush 25 W, 9.6 to 19.2 oz. (1 day) (RUP)
- Perm-UP 25DF (9.6 to 19.2 oz.) or Perm-UP 3.2 EC (6 to 12 oz.) (1 day) (RUP)
- Pounce 25 WP, 9.6 to 19.2 oz. (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (14 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)

Regardless of application method of SCORPION do not exceed 15 fl oz/A per crop season

Scorpion 35SL, 5.25 to 7 fl oz/A. (1 day)

Vydame L, 1 to 2 pt. (14 days) Dry bulb onions only. (RUP)

**ARMYWORM:**

**Bacillus thuringiensis**
- Agree WG, 1 to 2 lb. (0 days)
- Biobit HP, 0.5 to 2 lb. (0 days)
- DiPel DF, 1 to 2 lb. (0 days)
- XenTari, 0.5 to 2 lb. (0 days)

Coragen, 3.5 to 5 fl oz. (1 day)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (14 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (14 days) (RUP)

**Methomyl**
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (7 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (7 days) (RUP)

Permethrin
- Ambush 25 W, 9.6 to 19.2 oz. (1 day) (RUP)
- Perm-UP 3.2 EC, 6 to 12 oz. (1 day) (RUP)
- Pounce 25 WP, 9.6 to 19.2 oz. (1 day) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (14 days) (RUP)

Radiant SC, 5 to 10 fl oz. (1 day)

Spinosad
- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)

**CUTWORM:**

**Bacillus thuringiensis**
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF, 0.5 to 1 lb. (0 days)
- XenTari, 0.5 to 1.5 lb. (0 days)

**Lambda-cyhalothrin**
- Lambda-Cy, 1.92 to 3.2 fl oz. (14 days) (RUP)
- Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (14 days) (RUP)

**Methomyl**
- Lannate LV (3 pt.) or Lannate SP (1 lb.) (7 days) (RUP)
- Nudrin LV (3 pt.) or Nudrin SP (1 lb.) (7 days) (RUP)

Permethrin
- Ambush 25 W, 6.4 to 19.2 oz. (1 day) (RUP)
- Perm-UP 3.2 EC, 4 to 12 oz. (1 day) (RUP)
- Pounce 25 WP, 6.4 to 19.2 oz. (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (14 days) (RUP)

**FLEA BEETLE, LEAFHOPPERS:**

Scorpion 35SL, 3.5 to 7 fl oz/A. (1 day) Regardless of application method of SCORPION do not exceed 15 fl oz/A per crop season.

**GRASSHOPPERS:**

Scorpion 35SL, 3.5 to 7 fl oz/A. (1 day)

**STINK BUGS:**

Scorpion 35SL, 5.25 to 7 fl oz/A. (1 day) Regardless of application method of Scorpion do not exceed 15 fl oz/A per crop season.

**LEAFMINERS:**

Exirel, 13.5-20.5 oz/A. (1)

Scorpion 35SL, 3.5 to 7 fl oz/A. (1 day)

**WHITEFLIES:**

Scorpion 35SL, 3.5 to 7 fl oz/A. (1 day)

**DISEASES**

**PREPLANT SOIL FUMIGATION:**

**PINK ROOT (Phoma terrestris):** See Bulletin E-2099. Apply as a broadcast or row treatment, placing the fumigant at least 12 to 14 inches below the final soil surface.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate taping.

1.3 Dichloropropane/chloropicrin
- Telone C35, 13-35 gal. (RUP)

**Metam Potassium**
- Sectagon-K54, 30-60 gal. (RUP)

**Metam Sodium**
- Sectagon 42, 37.5-75 gal. (RUP)

**AT-PLANTING TREATMENT:**

**SMUT (Urocytis cepulae):** Apply in planter box at seeding or purchase treated seed. **Note:** Use only as directed; overtreatment may cause injury.

**Mancozeb**
- Dithane F-45 Rainshield, 2.4 qt. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).

**Dithane M-45, 3 lb per acre. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).**

**Manzate Max, 2.4 qt. (7 days)**

**Manzate Pro- Stick, 3 lb per acre. Apply as an in-furrow drench at planting in 75 to 125 gallons of water per acre (field-seeded onions only).**
Materials marked with an asterisk are particularly recommended for problem infestations.

**FOLIA**

AT PLANTING OR SIDE DRESS:

**PINK ROOT (Phoma terrestris):**

- *Topsin* M 70 WSP, 2 lb (broadcast).

**WHITE ROT (Sclerotium cepivorum):**

- Thiophanate-Methyl
- *Cercobin* 4.1F, 43.6 fl oz. Spray directly into the open furrow at time of planting. Rate is broadcast.

**DAMPING OFF (Fusarium spp.:)**

- Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.
- *Ridomil* Gold SL, 0.5-1 pt.
- *Ultra* Flourish, 1 to 2 pt.

**FOLIAR TREATMENT:**

**BOTRYTIS LEAF BLIGHT (Botrytis squamosa):** Apply every 7 to 10 days after the 4-leaf stage or according to the onion leaf blight predictor.

- *Azoxystrobin + Chlorothalonil*
- *Quadris* Opti, 1.6 to 3.2 pt. (7 days)
- *Azoxystrobin + Difenconazole*
- *Quadris* Top, 14 fl oz. (1 day) One application before alternating with another chemical.
- *Chlorothalonil*
- *Bravo Ultrex*, 0.9 to 2.7 lb. (7 days) 1.4 to 2.7 lb for green bunching onions (14 day PHI) May be applied through sprinkler irrigation systems. Applications of more than 9 lb of Bravo Ultrex per season may result in yield reductions.
- *Bravo Weather Stik, Equus 720 SST, 1 1/2 to 3 pt (green bunching) (14 days) or 1 to 3 pt (dry bulb) (7 days). Do not apply more than 3 times per season on green bunching onions.
- *Bravo ZN, 1 1/2 to 4 1/4 pt. (7 days) 2 1/4 to 4 1/4 rate for green bunching onions (14 day PHI)
- *Echo 720, 1 to 3 pt. (7 days)
- *Echo 90 DF, 7/8 to 1 5/8 lb. (7 days) 1 1/8 to 1 5/8 lb for green bunching onions (14 day PHI)
- *Equus DF, 0.9 to 2.7 lb. (7 days)

- *Difenconazole + Cyprodinil*
- *Inspire* Super, 16 to 20 fl oz. (7 days)
- *Iprodione*
- *Iprodione 4L AG, 1.5 pt. (7 days)
- *Meteor, 1.5 pt. (7 days)
- *Rowal 4 Flowable, 1 1/2 pt, 14-day interval. (7 days) Or 1 pt as tank mix with another fungicide, 7-day intervals. **Note:** See label for permissible crop rotations. Maximum 5 applications.

**Mancozeb**

- *Dithane* F-45 Rainshield, 2.4 qt. (7 days)
- *Dithane M-45, 3 lb. (7 days)
- *Koverall, 3 lb. (7 days)
- *Manzate Max, 1.6 to 2.4 qt. (7 days)
- *Manzate Pro-Stick, 3 lb. (7 days) Do not apply to exposed bulbs. Maximum 30 lb/year.
- *Pencozeb* 75 DF, 2 to 3 lb. (7 days)

- *Azoxystrobin*
- *Quadris, 9.2 to 15.4 fl oz. (0 days)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

- *Azoxystrobin + Propiconazole*
- *Quilt (14 to 27.5 fl oz) or Quilt Xcel (17.5 to 26 fl oz) (14 days)

**Boscalid**

- *Endura, 6.8 oz. (7 days)
- *Cyperconazole* + *Fludioxonil*
- *Switch 62.5 WG, 11 - 14 oz every 7 to 10 days. (7 days)
- *Fluxapyroxad + Pyraclostrobin*
- *Merivon* Xemium Brand Fungicide, 8 to 11 fl oz. (7 days)

- *Mancozeb + Copper Hydroxide*
- *ManKocide, 2 1/2 lb. (7 days)
- *Mancozeb + Zoxamide*
- *Gavel 75 DF, 1.5 - 2.0 lb. (7 days)
- *Mefenoxam + Chlorothalonil*
- *Ridomil Gold Bravo, 2.5 pt. (7 days) 14 day PHI for green onions

**Neem Oil**

- *Trilogy, 2 pt. (0 days)

**Penthiopyrad**

- *Mancozeb, 24 fl oz. (3 days)
- *Propiconazole*
- *Propimax EC, 4 to 8 fl oz. (14 days)
- *Tilt, 4-8 fl oz. (14 days)
- *Pyraclostrobin*
- *Cabo, 12 oz (suppression). (7 days) Do not apply more than one application before alternating with another chemical.

**Pyraclostrobin/Boscalid**

- *Pristine, 14.5 to 18.5 oz. (7 days)
- *Pyrimethanil*
- *Scala, 18 fl oz. (7 days) 12 hr REI.
- *Zoxamide + chlorothalonil*
- *Zing!, 30 oz. (7 days)

**DOWNY MILDEW (Peronospora destructor):** Apply after 4-leaf stage.

- *Famoxadone + Cymoxanil*
- *Taros, 8 oz. (1 day) Apply as preventative and tank mix.
- *Fosetyl-Aluminum*
- *Aliette WDG, 2 to 3 lb, 7- to 14-day intervals. (7 days) Do not make more than 7 applications per season. Do not tank mix with copper fungicides.

**Mancozeb**

- *Dithane DF Rainshield, Dithane M-45, 3 lb. (7 days) Do not apply to exposed bulbs. Maximum 30 lb/year.
- *Dithane F-45 Rainshield, 2.4 qt. (7 days)
- *Koverall, 3 lb. (7 days)
- *Manzate Max, 1.6 to 2.4 qt. (7 days)
- *Manzate Pro-Stick, 3 lb. (7 days)
- *Pencozeb 75 DF, 2 to 3 lb. (7 days)

- *Mancozeb + Copper Hydroxide*
- *ManKocide, 2.5 lb. (7 days)
- *Ridomil Gold Copper, 2 lb. (10 days dry bulb onions, maximum 4 applications; 7 days green onion) Maximum 3 applications.

**Mefenoxam + Chlorothalonil**

- *Ridomil Gold Bravo, 2.5 pt. (7 days dry bulb onions; 14 days green onion) Maximum 3 applications.

**Mefenoxam + Copper Hydroxide**

- *ManKocide, 2.5 lb. (7 days)
- *Ridomil Gold Copper, 2 lb. (10 days dry bulb onions, maximum 4 applications; 7 days green onion) Maximum 3 applications.

*Materials marked with an asterisk are particularly recommended for problem infestations.*

**Always read and follow label instructions carefully**
Onions

* Mefenoxam + Mancozeb
  * Ridomil Gold MZ, 2.5 lb (7 days). (7 days) See label.
  
  **Note:** See label for plant back restrictions.

Ametrotin + Dimethomorph

* Zampco, 14 fl oz. (0 days)

Azoxystrobin

* Quadris, 9.2 to 15.4 fl oz. (0 days)
  
  Do not apply more than one foliar application of Amistar, Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

Azoxystrobin + Chlorothalonil

* Quadris Opti, 2.4 to 3.6 pt. (7 days)

Chlorothalonil
Downy mildew suppression.

* Bravo Ultrex, 0.9 - 2.7 lb every 7 to 10 days. (7 days)

* Bravo Weather Stik, Equus 720 SST, 1 to 3 pt. (7 days dry bulb onions; 14 days green bunching onions; 14 days purple blotch) (7 days)

* Bravo ZN, 1 1/2 to 4 1/4 pt. (7 days)

* Echo 90 DF, 1 1/4 to 2 1/2 lb. (7 days)

Copper Hydroxide + Copper Oxychloride

* Badge SC, 1.5 pt. (0 days)

Dimethomorph

* Forum, 6 fl oz. (0 days)

Fenamidone

* Reason 500 SC, 5.5 fl oz every 5 to 10 days. (7 days)

Fluxapyroxad + Pyraclostrobin

* Merivon Xemium Brand Fungicide, 8 to 11 fl oz. (7 days) Suppression only

Mancozeb + Zoxamide

* Gavel 75 DF, 1.5 - 2.0 lb. (7 days)

Mancozeb + Zoxamide

* Revus, 8 fl oz. (7 day)

Mono- and dibasic sodium, potassium and ammonium phosphites

* Phostroin, 2.5 to 3.75 pt every 7 - 14 days. (0 days)

* Prophyl, 4 pt. (0 days)

Neem Oil

* Trilogy, 2 pt. (0 days)

Potassium phosphate/chlorothalonil

* Catamaran, 4-7 pt. (7 days) 14 day PHI for green onions

Pyraclostrobin

* Cabrio, 12 oz. (7 days) Do not apply more than one application before alternating with another chemical.

Pyraclostrobin/Bosalid

* Pristine, 18.5 oz (suppression), (7 days)

Zoxamide + chlorothalonil

* Zing, 30 fl oz. (7 days)

**Note:** Most fungicides that protect against purple blotch may also provide limited downy mildew protection.

**PURPLE BLOTCH (Alternaria porri): Apply every 7 to 10 days after the 4-leaf stage.**

* Azoxystrobin
  
  * Quadris, 6.2 to 12.3 fl oz. (0 days)
  
  Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

* Azoxystrobin + Chlorothalonil
  
  * Quadris Opti, 1.6 to 3.2 pt. (7 days)

* Azoxystrobin + Difenoconazole

* Quadris Top, 12 to 14 fl oz. (7 days)

* Azoxystrobin + Propiconazole

* Quilt (14 to 27.5 fl oz) or Quilt Xcel (14 to 21 fl oz) (14 days)

* Chlorothalonil
  
  * Bravo Ultrex, 0.9 to 2.7 lb. (7 days) 1.4 to 2.7 lb for green bunching onions (14 day PHI) May be applied through sprinkler irrigation systems. Applications of more than 9 lb of Bravo Ultrex per season may result in yield reductions.

* Bravo Weather Stik, Equus 720 SST, 1 1/2 to 3 pt (green bunching) (14 days) or 1 to 3 pt (dry bulb) (7 days). (14 days) Do not apply more than 3 times per season on green bunching onions.

* Bravo ZN, 1 1/2 to 4 1/4 pt. (7 days) 2 1/4 to 4 1/4 rate for green bunching onions (14 day PHI)

* Echo 720, 1 to 2 pt. (7 days)

* Echo 90 DF, 7/8 to 1 5/8 lb. (7 days) 1 1/8 to 1 5/8 lb for green bunching onions (14 day PHI)

* Equus DF, 0.9 to 2.7 lb. (7 days)

* Cyprodinil + Fludioxonil
  
  * Switch 62.5 WG, 11-14 oz. (7 days)

* Difenconazole + Cyprodinil
  
  * Inspire Super, 16 to 20 fl oz. (7 days)

* Ipodione
  
  * Ipodione, Rovral 4 Flowable, 1.5 pt, 14-day intervals or 1 pt as tank mix with another fungicide, 7-day intervals. (7 days)

* Meteor, 1.5 pt. (7 days)

**Note:** See label for permissible crop rotations. Maximum 5 applications.

* Mancozeb
  
  * Dithane F-45 Rainshied, 2.4 qt. (7 days)

  * Dithane M-45, 3 lb. (7 days)

  * Koverall, 3 lb. (7 days)

  * Manzate Max, 1.6 to 2.4 qt. (7 days)

  * Manzate Pro-Stick, 3 lb. (7 days) Do not apply to exposed bulbs. Maximum 30 lb/year.

  * Penncozeb 75 DF, 2 to 3 lb. (7 days)

* Pyraclostrobin
  
  * Cabrio, 8-12 oz. (7 days) Do not apply more than one application before alternating with another chemical.

* Pyraclostrobin/Bosalid
  
  * Pristine, 10.5 to 18.5 oz. (7 days)

Bosalid

* Endura, 6.8 oz. (7 days)

Copper Ammonium Carbonate

* Copper Count N, 2 qt. (0 days)

Copper Hydroxide

* Champ DP Dry Prill, 1 1/3 lb. (0 days)

  * Champ Formula 2 F, 1 1/3 pt. (0 days)

  * Kocide 2000, 1 1/2 lb. (0 days)

  * Kocide 3000, 0.75-1.5 lb. (0 day)

  * Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

  * Nu-Cop 50 DF, 2 lb. (0 days)

Copper Hydroxide + Copper Oxychloride

* Badge SC, 1.5 pt. (0 days)

Copper Sulfate

* Cuprofix Ultra 40 Disperss, 1.25 to 2.5 lb. (0 days)

Famoxadone + Cymanonil

* Tanos, 8 oz. (1 day) Apply as preventative and tank mix.

Fenamidone

* Reason 500 SC, 5.5 fl oz every 5 to 10 days. (7 days)

Fluxapyroxad + Pyraclostrobin

* Merivon Xemium Brand Fungicide, 4 - 11 fl oz. (7 days)

Fosetyl-Aluminum

* Aliette WDG, 2 to 3 lb, 7- to 14-day intervals. (7 days) Do not tank mix with copper fungicides.

*Materials marked with an asterisk are particularly recommended for problem infestations.

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Always read and follow label Instructions carefully.
Materials marked with an asterisk are particularly recommended for problem infestations.

WHITE ROT (Pseudomonas)

BACTERIAL BLIGHT (Neck Rot)

*Famoxadone + Cymoxanil
*Copper Sulfate
*Copper Hydroxide + Copper Oxychloride
*Copper Hydroxide
Symptomless spread in the field prior to harvest.

**Note:** Neem Oil

Propiconazole

*Propimax EC, 4 to 8 fl oz. (14 days)
*Tilt, 4-8 fl oz. (14 days)
*Pyrimethanil
*Scala, 18 fl oz. (7 days) 12 hr REI.

Tebuconazole

*Onix 3.6F, Tebuozol 3.6, 4-6 fl oz. (7 days) Maximum 12 fl oz/acre/season. 12 hr REI.

Zoxamide + chlorothalonil

*Zing!, 30 fl oz. (7 days)

NECK ROT (Botrytis spp.):

Bacillus subtilis

*Serenade ASO, 2 - 6 qts. (0 days) Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

Chlorothalonil

*Bravo Ultrix, 1.25 - 2.7 lb every 7 days. (7 days)
*Fluxapyroxad + Pyraclostrobin
*Merivon Xemium Brand Fungicide, 8 to 11 fl oz. (7 days)

**Mancozeb**

*Koverall, 3 lb (7 days)
*Manzate Max, 1.6 to 2.4 qt. (7 days)
*Manzate Pro-Stick, 3 lb. (7 days)
*Pencozeb 75 DF, 2 to 3 lb. (7 days)

**Mancozeb + Zoxamide**

*Gavel 75 DF, 1.5 - 2.0 lb. (7 days)

Neem Oil

*Trilogy, 2 pt. (0 days)

**Note:** Treatments for onion leaf blight may retard or prevent symptomless spread in the field prior to harvest.

BACTERIAL BLIGHT (Erwinia carotovora subsp. carotovora, Pseudomonas spp.):

Copper Hydroxide. Apply at 7 to 10 day intervals when plants are 4-6 in. tall. Can cause foliar phytotoxicity.

*Champ DP Dry Prill, 2/3 to 1 lb. (0 days)
*Champ Formula 2 F, 2/3 to 1 pt. (0 days)
*Kocide 2000, 3/4 to 1 1/4 lb. (0 days)
*Kocide 3000, 0.75-1.5 lb. (0 day)

Copper Hydroxide + Copper Oxychloride

*Badge SC, 1.5 pt. (0 days)

Copper Sulfate

*Cuprofix Ultra 40 Disperss, 1.25 to 2.5 lb. (0 days)

Famoxadone + Cymoxanil

*Tanos, 8 to 10 oz. (1 day) Apply as preventative and tank mix.

WHITE ROT (Sclerotium cepivorum):

*Azoxystrobin + Chlorothalonil
*Quadris Opti, 1.6 to 3.2 pt. (7 days)

**PINK ROOT (Phoma terrestris):**

Penthiopyrad

*Fontelis, 24 fl oz.

STEMPHYLIUM LEAF BLIGHT and STALK ROT:

Fluxapyroxad + Pyraclostrobin

*Merivon Xemium Brand Fungicide, 4 - 11 fl oz. (7 days)

**Parsnips**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Northern root-knot nematodes can reduce parsnip yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for parsnips, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of root-knot nematodes in parsnip production.

**FALL SOIL TREATMENT (BROADCAST):**

1.3-O

*Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).

Fumigate in the fall when soil temperatures at a 6 inch depth are above 50°F. Inject the fumigant to a soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label.

In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate taping.

**INSECTS**

**SOIL TREATMENT:**

LEAFHOPPERS, APHIDS, FLEA BEETLE: See label for application methods.

Imidacloprid

*Admire Pro, 4.4 to 10.5 fl oz. (21 days)
*Nuprid 2 F, 10 to 24 fl oz. (21 days)

**Thiameethoxam**

*Platinum (5 to 12 fl oz.) or Platinum 75 SG (1.7 to 4.01 oz.) (30 days) See label for application methods.

APHIDS, LEAFHOPPERS:

*Sivanto, 7 - 10.5 fl oz/A.

WHITEFLIES:

*Sivanto, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

**FLEA BEETLE:** Apply as needed, usually soon after plants come up.

Actara, 1.5 to 3 oz. (7 days)

Bifenithrin

*Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
*Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
*Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
*Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
*Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
**Parsnips**

- **Materials marked with an asterisk** are particularly recommended for problem infestations.

**APHIDS**: Apply if necessary.

**ARMYWORM, CUTWORM**: Apply if needed. Repeat as needed.

- Bifenthrin (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)
- Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)

**Bifenture**: 10 DF, 12.8 to 16 oz/A. (21 days)

- Carbaryl
  - Cararyl 4L, 0.5 to 1 qt. (7 days)
  - Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

- Imidacloprid
  - Admire Pro, 1.2 fl oz. (7 days)
  - Nuprid 1.6 F, 3.5 fl oz. (7 days)

- Malathion 8, 2 pt. (7 days)
- Mustang Max, 1.76 to 4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Cararyl 4L, 0.5 to 1 qt. (7 days)
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

- Spinosad
  - Blackhawk (1.7-3.3 oz/A) or Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (3 days)

**LEAFHOPPERS**: Apply when first seen. Repeat as needed.

- Actara, 1.5 to 3 oz. (7 days)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

- Carbaryl
  - Carbaryl 4L, 0.5 to 2 qt. (7 days)
  - Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)

- Imidacloprid
  - Admire Pro, 1.2 fl oz. (7 days)
  - Nuprid 1.6 F, 3.5 fl oz. (7 days)

- Malathion 8, 2 pt. (7 days)
- Mustang Max, 1.76 to 4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Cararyl 4L, 0.5 to 2 qt. (7 days)
- Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)

**DISEASES**

**SEED TREATMENT:**

- **DAMPING OFF** (*Pythium spp.*, *Rhizoctonia solani*):
  - Fluodyxinil
  - Maxim 4 FS, 0.08 to 0.16 oz/100 lb seed
  - Mefenoxam
  - Apron XL, 0.085 - 0.64 fl oz/100 lb seed (*Pythium*).

- **WHITEFLIES**:
  - Sivanto, 7 - 10.5 fl oz/A.

**ARMYWORM**:

- Agree WG, 0.5 to 2 lb. (0 days)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

- Carbaryl
  - Mustang 5, or Malathion 5 EC (1.5 to 2 pt.) or Malathion 57 EC (1 to 2 pt.) or Malathion 8 (2 pt.) or Malathion 8 Aquamul (1 to 1.25 pt.) (21 days for Malathion 5 EC, 7 days for others)

- Pyreneone, 1 to 12 fl oz. (0 days)
- Sivanto, 7 - 10.5 fl oz/A.

**MITES**

- Bifenthrin
  - Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- Carbaryl
  - Javelin WQ, 0.12 to 1.5 lb. (0 days)
  - Pyreneone, 1 to 12 fl oz. (0 days)
  - Cararyl 4L, 1 to 2 qt. (7 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (7 days)

**APHIDS**: Apply if necessary.

- Actara, 1.5 to 3 oz. (7 days)
- Beleaf 50 SG, 2 to 2.8 oz. (3 days)
- Bifenthrin
  - Bifenture 10 DF, 12.8 to 16 oz/A. (1 day)
PREPLANT INCORPORATED:
DAMPING OFF (Pythium and Phytophthora spp., Rhizoctonia solani):
Fluopicolid
- Presidio, 3-4 fl oz. (7 days) Must be mixed with another fungicide active on pathogen.
Mefenoxam, Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. sprinkler irrigation.
- Ultra Flourish, 2 to 4 pt.

FOLIAR TREATMENT:
CERCOSPORA LEAF SPOT (Cercospora spp.), ALTERNARIA LEAF SPOT (Alternaria spp.): Apply at first sign of disease and repeat every 7 to 10 days.
- Azoxystrobin
  - Quadris, 6 to 15.5 fl oz (Alternaria); 9.0 to 15.5 fl oz (Cercospora). (0 days)
Don not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- Pyraclostrobin
  - Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- Trifloxystrobin
  - Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action. 12 hr REI.
Chlorothalonil
- Bravo Ultrex, Equus DF, 1.4 to 1.8 lb. (10 days) (Alternaria) Do not apply more than 4 times per season.
- Bravo Weather Stik, Echo 720, 1.5 to 2 pt. (10 days) (Alternaria) Do not apply more than 4 times per season.
- Echo 90 DF, 1 1/4 to 1 5/8 lb. (10 days)
Neem Oil
- Trilogy, 2 pt. (0 days)
Penthiopyrad
- Fentikol, 16 - 30 fl oz. (0 days)
POWDER MILDEW, RUST:
- Penthiopyrad
  - Fentikol, 16 - 30 fl oz. (0 days)
- Trifloxystrobin
  - Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) Maximum 12 oz/year. 12 hr REI.

SOIL TREATMENT:
LEAFHOPPERS, APHIDS:
Imidacloprid
- Admire Pro, 7 to 10.5 fl oz. (21 days) See label for application methods.
- Nupride 2 F, 16 to 24 fl oz. (21 days) Apply preplant, in furrow, or as a post-planting drench.
Sivanto, 7 - 10.5 fl oz/A.
CUTWORM:
Diazonon 50 W, 4 to 8 lb. (RUP)
ARMYWORM, CUTWORM:
Capture LFR, 3.4 to 6.8 fl oz. (RUP)
SEEDCORN MAGGOT:
Bifenture 10 DF, 8 to 16 oz/A.
Brigade WSB, 8 to 16 oz. (RUP)
Chlorpyrifos
- Chlorpyrifos 4E AG, . (RUP)
- Gover, . (RUP)
- Hatchet, . (RUP)
- Lorsban 4 E / Lorsban Advanced, Lorsban 75 WG, . (RUP)
- Nufos 4E, . (RUP)
- Vulcan, . (RUP)
- Whirlwind, . (RUP)
See labels for rates.
GRUBS:
Bifenture 10 DF, 8 to 16 oz/A.
WIREWORMS:
Bifenture 10 DF, 8 to 16 oz/A.
WHITEFLIES:
Sivanto, 10.5 - 14 fl oz/A.

FOLIAR TREATMENT:
ARMYWORM, CUTWORM: Apply if there are more than 1/25 sweeps. Pay special attention to grassy areas in the field.
- Bifenthrin
  - Bifenture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Brigade 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (3 days) (RUP)
  - Capture EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Fantam 2EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-FenvalStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
Belt SC, 2 to 3 fl oz. (1 day)
Bifenthrin + Imidacloprid
- Brigadier, 5.5 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 11 fl oz. (7 days) (RUP)
Bifenthrin + Zea-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
Bifenture 10 DF, 4 to 16 oz/A. (3 days)
Bifenture 10 DF, 5.3 to 16 oz/A. (3 days)
Javelin WG, 0.12 to 1.5 lb. (0 days)
Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
Pyrenone, 1 to 12 fl oz. (0 days)
LEAFHOPPERS: Apply as necessary
Acetamiprid
- Assail 30 SG (2.5 to 5.3 oz.) or Assail 70WP (1 to 2.3 oz.) (7 days)

Peas

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

INSECTS
SEED TREATMENT: Treatments applied to seed prior to planting. Insecticide and fungicide treatments can be combined according to directions. Handle seed carefully to prevent cracking.
APHIDS, BEAN LEAF BEETLE, MEXICAN BEAN BEETLE, LEAFHOPPERS, SEED CORN MAGGOT: Early season protection.
Crusier 5 FS, 1.28 fl oz/100 lb seed.
SEED CORN MAGGOT:
Lorsban 50 W, 2 oz/100 lb seed. (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
### Peas

<table>
<thead>
<tr>
<th>Materials marked with an asterisk are particularly recommended for problem infestations.</th>
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<tbody>
<tr>
<td><strong>Admire Pro</strong>, 1.2 fl oz (21 days)</td>
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<tr>
<td><strong>Baythroid XL</strong>, 0.8 to 1.6 fl oz (3 days) (RUP)</td>
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<tr>
<td><strong>Bifenthrin</strong></td>
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<tr>
<td>- <strong>Bifenture EC</strong>, 1.6 to 6.4 fl oz (3 days) (RUP)</td>
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<tr>
<td>- <strong>Brigade @ 2EC (1.6 to 6.4 fl oz.)</strong> or <strong>Brigade WSB (5.3 to 16 oz.)</strong> (3 days) (RUP)</td>
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<tr>
<td>- <strong>Capture 2 EC</strong>, 1.6 to 6.4 fl oz. (3 days) (RUP)</td>
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<tr>
<td>- <strong>Discipline 2EC</strong>, 1.6 to 6.4 fl oz. (3 days) (RUP)</td>
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<tr>
<td>- <strong>Fanfare 2EC</strong>, 1.6 to 6.4 fl oz. (3 days) (RUP)</td>
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<tr>
<td>- <strong>Sniper</strong>, 1.6 to 6.4 fl oz. (3 days) (RUP)</td>
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<tr>
<td>- <strong>Tundra EC</strong>, 1.6 to 6.4 fl oz. (3 days) (RUP)</td>
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<tr>
<td><strong>Bifenthrin + Imidacloprid</strong></td>
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<tr>
<td>- <strong>Brigadier</strong>, 3.8 to 5.5 fl oz. (7 days) (RUP)</td>
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<tr>
<td>- <strong>Swagger</strong>, 7.6 to 11 fl oz. (7 days) (RUP)</td>
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<tr>
<td><strong>Bifenthrin + Zeta-Cypermethrin</strong></td>
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<tr>
<td>- <strong>Hero</strong> (4 to 10.3 oz.) or <strong>Hero EW</strong> (4.5 to 11.2 oz.) (3 days) (RUP)</td>
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<tr>
<td>- <strong>Steed</strong>, 3.5 to 4.7 fl oz (3 days) (RUP)</td>
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<tr>
<td>- <strong>Tundra EC</strong>, 1.6 to 6.4 fl oz. (3 days) (RUP)</td>
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<tr>
<td>- <strong>Dimethoate</strong></td>
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<tr>
<td>- <strong>Dimethoate 4 EC (0.3 pt.)</strong> or <strong>Dimethoate 400 (0.32 pt.)</strong> or <strong>Dimethoate 4E (0.32 pt.)</strong> (0 days)</td>
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<tr>
<td>- <strong>Esfenvalerate</strong></td>
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<tr>
<td>- <strong>Adjourn</strong>, 2.9 to 5.8 fl oz. (3 days) (RUP)</td>
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<td>- <strong>Asana XL</strong>, 2.9 to 5.8 fl oz. (3 days) (RUP)</td>
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<td>- <strong>S-FenvalStar</strong>, 2.9 to 5.8 fl oz. (3 days) (RUP)</td>
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<tr>
<td>- <strong>Imidacloprid</strong></td>
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<tr>
<td>- <strong>Admire Pro</strong>, 1.2 fl oz. (7 days)</td>
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<tr>
<td>- <strong>Nuprid</strong>, 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.</td>
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<tr>
<td><strong>Lambda-cyhalothrin</strong></td>
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<tr>
<td>- <strong>Lambda-Cy</strong>, 2.56 to 3.84 fl oz. (7 days) (RUP)</td>
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<tr>
<td>- <strong>Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.)</strong> (7 days) (RUP)</td>
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<tr>
<td><strong>Leverage 360</strong>, 2.4 to 2.8 fl oz. (7 days) (RUP)</td>
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<tr>
<td><strong>Malathion</strong></td>
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<tr>
<td>- <strong>Malathion 5 EC (1.5 to 2 pt.)</strong> or <strong>Malathion 57 EC (1.5 to 1.6 pt.)</strong> or <strong>Malathion 8 (1 to 2.5 pt.)</strong> or <strong>Malathion 8 Aquamul (1 pt.)</strong> (3 days)</td>
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<tr>
<td>- <strong>Methomyl</strong></td>
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<tr>
<td>- <strong>Lannate LV (1.5 to 3 pt.)</strong> or <strong>Lannate SP (0.5 to 1 lb.)</strong> (1 day) (RUP)</td>
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<tr>
<td>- <strong>Nudrin LV (1.5 to 3 pt.)</strong> or <strong>Nudrin SP (0.5 to 1 lb.)</strong> (1 day) (RUP)</td>
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<tr>
<td>- <strong>Movento</strong>, 4 to 5 fl oz. (1 day) (RUP)</td>
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<tr>
<td>- <strong>Mustang Max</strong>, 3.2 to 4 oz. (1 day) (RUP)</td>
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<tr>
<td>- <strong>Proaxis</strong>, 2.56 to 3.84 fl oz. (7 days) (RUP)</td>
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<tr>
<td>- <strong>Pyreneone</strong>, 1 to 12 fl oz. (0 days) (RUP)</td>
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<tr>
<td>- <strong>Sivanto</strong>, 7 - 10.5 fl oz/A. (0 days)</td>
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<tr>
<td><strong>PEA WEEVIL: Apply when they appear at blossom time, usually at 10 to 50% bloom and 7 days later.</strong></td>
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**Bifenthrin** |

- **Bifenture EC**, 1.6 to 6.4 fl oz. (3 days) (RUP) |
- **Brigade @ 2EC (1.6 to 6.4 fl oz.)** or **Brigade WSB (5.3 to 16 oz.)** (3 days) (RUP) |
- **Capture 2 EC**, 1.6 to 6.4 fl oz. (3 days) (RUP) |
- **Discipline 2EC**, 1.6 to 6.4 fl oz. (3 days) (RUP) |
- **Fanfare 2EC**, 1.6 to 6.4 fl oz. (3 days) (RUP) |
- **Sniper**, 1.6 to 6.4 fl oz. (3 days) (RUP) |
- **Tundra EC**, 1.6 to 6.4 fl oz. (3 days) (RUP) |

**Bifenthrin + Imidacloprid** |

- **Brigadier**, 3.8 to 5.5 fl oz. (7 days) (RUP) |
- **Swagger**, 7.6 to 11 fl oz. (7 days) (RUP) |

**Bifenthrin + Zeta-Cypermethrin** |

- **Hero** (4 to 10.3 oz.) or **Hero EW** (4.5 to 11.2 oz.) (3 days) (RUP) |
- **Steed**, 3.5 to 4.7 fl oz (3 days) (RUP) |

**Diazinon AG 500**, 1 pt. (7 days) (RUP) |

**Dibrom 8 Emulsive**, 1 pt. (1 day) (RUP) |

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*Always read and follow label Instructions carefully.*
**CUTWORM:**
- **Lambda-cyhalothrin**
- **Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)**
- **Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)**
- **Baythroid XL, 0.8 to 1.6 fl oz. (3 days) (RUP)**
- **Carbaryl**
  - **Carbaryl 4L, 1 to 1.5 qt. (3 days)**
  - **Sevin 4 F (1 to 1.5 qt.) or Sevin 80 S (1.25 to 1.87 lb.) or Sevin XLR Plus (1 to 1.5 qt.) (3 days)**
- **Danitol 2.4 EC, 10.67 fl oz. (7 days) (RUP)**
- **Intrepid 2F, 4 to 8 fl oz. (early-season applications to young, small crops) or 8 to 10 fl oz. (mid- to late-season applications). (7 days)**

**METHYMY**
- **Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)**
- **Lannate SP (0.5 to 1 lb.) or Nudrin LV (1.5 to 3 pt.) (1 day) (RUP)**
- **Mustang Max, 1.28 to 4 oz. (1 day) (RUP)**
- **Proaxis, 1.92 to 3.2 fl oz. (7 days) (RUP)**
- **Carbaryl 4L, 1 to 1.5 qt. (3 days)**
- **Sevin 4 F (1 to 1.5 qt.) or Sevin 80 S (1.25 to 1.87 lb.) or Sevin XLR Plus (1 to 1.5 qt.) (3 days)**

**ARMYWORM:**
- **Bacillus thuringiensis**
  - **Agree WG, 0.5 to 2 lb. (0 days)**
  - **Biobit HP, 0.5 to 2 lb. (0 days)**
  - **DiPel DF (1 to 2 lb.) or DiPel ES (2 to 4 pt.) (0 days)**
  - **XenTari, 0.5 to 2 lb. (0 days)**
  - **Baythroid XL, 1.6 to 2.1 fl oz. (3 days) (RUP)**
- **Carbaryl**
  - **Carbaryl 4L, 1 to 1.5 qt. (3 days)**
  - **Sevin 4 F (1 to 1.5 qt.) or Sevin 80 S (1.25 to 1.87 lb.) or Sevin XLR Plus (1 to 1.5 qt.) (3 days)**
- **Coragen, 3.5 to 5 fl oz. (1 day)**
  - **intrepid 2F, 4 to 8 fl oz. (early-season applications to young, small crops) or 8 to 10 fl oz. (mid- to late-season applications). (7 days)**
- **Lambda-cyhalothrin**
  - **Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)**
  - **Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)**
- **Methomyl**
  - **Lannate LV (0.75 to 3 pt.) or Lannate SP (0.25 to 1 lb.) (1 day) (RUP)**
  - **Nudrin LV (0.75 to 3 pt.) or Nudrin SP (0.25 to 1 lb.) (1 day) (RUP)**
  - **Mustang Max, 2.72 to 4 oz. (1 day) (RUP)**
  - **Proaxis, 2.56 to 3.84 fl oz. (7 days) (RUP)**
  - **Radiant SC, 4 to 8 fl oz. (3 days)**
  - **Carbaryl 4L, 1 to 1.5 qt. (3 days)**
  - **Sevin 4 F (1 to 1.5 qt.) or Sevin 80 S (1.25 to 1.87 lb.) or Sevin XLR Plus (1 to 1.5 qt.) (3 days)**
- **Spinosad**
  - **Entrust (1.25 to 2 oz.) or Entrust SC (4 to 6 fl oz.) (3 days)**

**LOOPERS:**
- **Bacillus thuringiensis**
  - **Agree WG, 0.5 to 2 lb. (0 days)**
  - **Biobit HP, 0.5 to 1 lb. (0 days)**
  - **DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)**
  - **XenTari, 0.5 to 1 lb. (0 days)**
  - **Danitol 2.4 EC, 10.67 fl oz. (7 days) (RUP)**
  - **Intrepid 2F, 4 to 8 fl oz. (early-season applications to young, small crops) or 8 to 10 fl oz. (mid- to late-season applications). (7 days)**

**LAMBDACYHALOTHIN**
- **Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)**
- **Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)**

**DISEASES**

**SEED TREATMENT:**
- **DAMPING OFF (Pythium spp., Rhizoctonia solani).** Use slurry or dust method. **Note:** If possible, buy fungicide treated seed instead of treating seed on the farm.
- **Captan**
  - **Captan 4 Flowable, 2.6 fl oz/100 lb seed.**

*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label instructions carefully.
Peppers

Fludioxonil
- Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed
  *(Rhizoctonia). Commercial seed treatment plants only.
Fludioxonil + mefenoxam
- Apron Maxx RFC, 1.5 fl oz/100 lb seed.
Fludioxonil + metalaxyl
- Apron Maxx RFC, 1.5 fl oz/100 lb seed.
Mefenoxam
- Apron XL, 0.16 to 0.64 fl oz/100 lb (Pythium); 0.64 fl oz/100 lb (Phytophthora); 1.28 fl oz/100 lb (Downy mildew).
Metalaxyl
- Allegiance-FL, 0.75 fl oz/100 lb seed (Pythium) or 1.5 fl oz/100 lb seed (systemic down mildew).
- Apron 50 W, 1/2 to 1 oz/100 lb seed (Pythium and Phytophthora) or 2 1/4 oz/100 lb seed (Pythium and systemic downy mildew).
- Apron FS, 0.75 to 1.5 oz/100 lb seed (Pythium) or 3.4 oz/100 lb seed (Pythium and systemic downy mildew).

Thiram
- 42-S Thiram (3 oz/100 lb seed) or Thiram 50 WP Dyed (8 oz/100 lb seed)

PREPLANT INCORPORATED:
DAMPING OFF (Pythium spp.):
- Azoxystrobin
  - Quadris, 0.4 to 0.8 fl oz per 1000 ft in furrow.
Mefenoxam
- Ridomil Gold SL, 0.5-1 pt.

FOLIAR TREATMENT:
POWDERY MILDEW (Erysiphe polygoni): Apply every 7 to 10 days after disease appears.
- *Fluxapyroxad + Pyraclostrobin
  - Priaxor Xemium Brand Fungicide, 4 - 8 fl oz. (7 days)
- Penthiopyrad
  - Fontelis, 14 - 30 fl oz. (0 days)
Copper Hydroxide
- Champ DP Dry Prill, 1 to 2 lb every 7 days. (0 days)
- Champ Formula 2 F, 1 to 2 pt. (0 days)
- Kocide 2000, 1 1/4 to 2 1/4 lb.
- Kocide 3000, 0.5-1.25 lb. (0 days)
- Nu-Cop 3 L, 1 to 2 pt. (0 days)
- Nu-Cop 50 DF, 1 1/2 lb. (7 days)
Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt. (0 days)
Copper Sulfate
- Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)
Sulfur
- Kumulus DF, 3 to 10 lb. (0 days)
- Thiolux, 3 to 10 lb. (0 days)

ANTHRACNOSE (Colletotrichum lindemuthianum), ALTERNARIA BLIGHT (Alternaria spp.), RUST (Phakopsora spp.):
- *Fluxapyroxad + Pyraclostrobin
  - Priaxor Xemium Brand Fungicide, 4 - 8 fl oz. (7 days)
Azoxystrobin
- Quadris, 6.0 to 15.5 fl oz. Follow guidelines for resistance management.
Penthiopyrad
- Fontelis, 14 - 30 fl oz. (0 days)

Peppers

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES
Northern root-knot nematodes can reduce pepper yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant parasitic nematode is present at a population density above the economic threshold for peppers, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot nematodes in pepper production.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

FALL SOIL TREATMENT (BROADCAST):
- 1-3-D
  - Telone II, 25 gal/A (muck soil), 9-18 gal/A (mineral soil).
  - Fumigate in the fall when soil temperatures at 6-inch depth are above 50F. Inject the fumigant to soil depth of 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

PREPLANT NEMATICIDE TREATMENT:
- Flusulfuron
  - Nimitz 480 EC, 3.5 - 5.0 pints/A. apply broadcast and incorporate either mechanically or with water to a depth of 6-8 inches at least 7 days prior to transplanting or planting. Do not apply if heavy rainfall is expected within 48 hours of application. This material can be applied in bands or by drip but apparently is most effective if applied broadcast and incorporated. Do not apply to extremely cold soils (<40 F) as nematodes have to be active for the product to be effective. Product has not been evaluated in Michigan.

TRANSPLANT WATER TREATMENT: Apply as needed.
- Oxamyl
  - Vydate L, 2 pt in at least 200 gallons of water. Do not apply during periods of slow plant growth, such as when temperatures are below 45F. (RUP)
  - See label for application methods.

This treatment should be followed by broadcast or band applications using ground equipment at 1 gal/A in 20-50 gal water. Response is usually best if application is made to seedling plants from flag leaf to 2 or 3 true leaves.

INSECTS

SOIL TREATMENT:
LEAFHOPPERS, APHIDS, PSYLLID, WHITEFLIES:
- Sivanto, 21 - 28 fl oz/A.

AT PLANTING OR TRANSPLANTING:
APHIDS, FLEA BEETLE:
- Belay 50 WDG, 4.8 to 6.4 oz. See label for application methods.
- Durivo, 10 to 13 fl oz. (30 days) See label for application methods.

Imidacloprid, Additional generic brands available.
- Admire Pro, 7 to 14 fl oz. (21 days)
- Nuprid 2 F, 16 to 32 fl oz. (21 days)
- Thiamethoxam
  - Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

Materials marked with an asterisk are particularly recommended for problem infestations.

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label Instructions carefully
FOLIAR TREATMENT:

**FLEA BEETLE:**
- Carbaryl
- Mustang
- Bifenthrin
- Leverage

**CUTWORM, FLEA BEETLE LARVAE:**
- Cyhalothrin
- Endosulfan
- Fenval Star
- Pyrenone
- Carbaryl

**ARMYWORM:**
- Venlam
- Flexi

**FOLIAR TREATMENT:**

**FLEA BEETLE:**
- Actara, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting.
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Baythroid XL, 2.8 fl oz. (7 days) (RUP)
- Belay 50 WDG, 1.6 oz to 2.1 oz. (7 days)

**Bifenthrin**
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discitp 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Imidacloprid**
- Brigadier, 5.1 to 9.85 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 19.7 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (10.3 oz.) or Hero EW (11.2 oz.) (7 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

**Carbaryl**
- Carbaryl 4L, 0.5 to 1 qt. (3 days)
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)
- Dibrom 8 Emulsive, 1 to 2 pt. (1 day) (RUP)

**Dinotefuran**
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)
- Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- S- Fenval Star, 5.8 to 9.6 fl oz. (7 days) (RUP)
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
- Warrior II with Zenon Technology (1.28 to 1.92 fl oz.) or Warrior with Zenon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)
- Leverage 360, 4.1 fl oz. (7 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

**Permethrin, Bell peppers only**
- Ambush 25 W, 6.4 to 12.8 oz. (3 days) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (3 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (3 days) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Carbaryl 4L, 0.5 to 1 qt. (3 days)

**Sevin 4 F** (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)

**Voliam Flexi, 4 to 7 oz. (1 day)**

Consult label for rotation restrictions.

**CUTWORM:** 
- As needed to protect new transplants.

**Bacillus thuringiensis**
- Biobit HP, 0.5 to 1 lb. (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Xentari, 0.5 to 1.5 lb. (0 days)
- Baythroid XL, 2.1 to 2.8 fl oz. (7 days) (RUP)
- Bell SC, 1.5 fl oz. (1 day)

**Bifenthrin**
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discitp 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Empower, 3.5 to 8.7 lb. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Carbaryl
- Carbaryl 4L, 2 qt. (3 days)
- Sevin 4 F (2 qt.) or Sevin 80 S (2.5 lb.) or Sevin 80 WSP (2.5 lb.) or Sevin XLR Plus (2 qt.) (3 days)

**Cypermethrin**
- Confirm 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season), (7 days)
- Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 8 fl oz. (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Leverage 360, 3.8 to 4.1 fl oz. (7 days) (RUP)

**Methomyl**
- Lannate LV (0.75 to 1.5 pt.) or Lannate SP (0.25 to 0.5 lb.) (3 days) (RUP)
- NuDrin LV (0.75 to 1.5 pt.) or NuDrin SP (0.25 to 0.5 lb.) (3 days) (RUP)

**Mustang Max, 2.24 to 4 oz. (1 day) (RUP)**
- Permethrin, Bell peppers only.

**Permethrin**
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (3 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (3 days) (RUP)
- Proaxis, 1.92 to 3.12 fl oz. (5 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Carbaryl 4L, 2 qt. (3 days)
- Sevin 4 F (2 qt.) or Sevin 80 S (2.5 lb.) or Sevin 80 WSP (2.5 lb.) or Sevin XLR Plus (2 qt.) (3 days)
- Swagger, 10.2 to 19.7 fl oz. (7 days) (RUP)
- Veticla, 12 to 17 fl oz. (1 day)
- Warrior with Zenon Technology, 1.3 to 3.8 fl oz. (5 days) (RUP)

**APHIDS:** Apply as needed if a neonicitinoid was used at planting.
- Assail SG (2 to 4 oz.) or Assail 70WP (0.8 to 1.7 oz.) (7 days)

**Actara, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting.

**Imidacloprid**
- Admire Pro, 1.3 to 2.2 fl oz. (0 days)
- Nuprid 1.6 F, 3.8 to 6.2 fl oz. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Peppers

Do not use if neonicotinoids were applied at planting. Do not exceed 19.2 oz/acre per season.

Acephate
- Acephate 90 WDG (0.55 to 1.11 lb for bell; 0.55 lb for non-bell) or Acephate 90 WSP (0.5 to 1.1 lb for bell; 0.5 lb for non-bell) or Acephate 97 (0.5 to 1 lb for bell; 0.5 lb for non-bell) or Acephate 97 UP (0.5 to 1 lb for bell; 0.5 lb for non-bell) (7 days)
- Bracket 97, 8 to 16 oz for bell; 8 oz for non-bell. (7 days)
- Orthene 97, 8 to 17.6 oz for bell; 8 oz for non-bell. (7 days)

Athaena, 7 to 17 fl oz. (7 days) (RUP)
Baythroid XL, 1.6 to 2.8 fl oz. (7 days) (RUP)
Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
Beleaf 50 SG, 2 to 2.8 oz. (0 days)

Bifenthrin + Imidacloprid
- Brigadier, 3.8 to 9.85 fl oz. (7 days) (RUP)
- Swagger, 7.6 to 19.7 fl oz. (7 days) (RUP)

Dibrom 8 Emulsive, 1 to 2 pt. (1 day) (RUP)

Dimethoate
- Dimethoate 4 EC, or Dimethoate 400 (0.5 to 0.66 pt.) or Dimethoate 4E (0.51 to 0.66 pt.) (0 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)
- Endosulfan EC, 0.86 to 1.33 qt. (9 days) (RUP)
- Exirel, 13.5 to 20.5 oz. (1) (RUP)
- Fulfilt, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)
- Leverage 360, 3.8 to 4.1 fl oz. (7 days) (RUP)

Malathion
- Malathion 5 (1 pt.), or Malathion 5 EC (1 to 2.5 pt.), or Malathion 57 EC (1.25 to 1.5 pt.), or Malathion 8 (1.5 pt.), or Malathion 8 Aquamul (0.75 to 1.5 pt.) (3 days)

Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (3 days) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (3 days) (RUP)
- Movento, 4 to 5 fl oz. (1 day) Must be tank mixed with adjuvant having spreading and penetrating properties.
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Sivanto, 7 - 12 fl oz/A.
- Volumi Flexi, 4 to 7 oz. (1 day)
- Vydacte L, 2 to 4 pt. (7 days) (RUP)

EUROPEAN CORN BORER: Apply treatments to coincide with fruit formation and second-brood egg-laying period (usually around July 20 to August 15) and continue as needed. Direct spray to underside of leaves and cap area of fruit.

Acephate, Bell peppers only.
- Acephate 90 WDG (0.83 to 1.1 lb.) or Acephate 90 WSP (0.8 to 1.1 lb.) or Acephate 97 (0.75 to 1 lb.) or Acephate 97 UP (0.75 to 1 lb.) (7 days)
- Bracket 97, 12 to 16 oz. (7 days)
- Orthene 97, 12 to 16 oz. (7 days)

Athaena, 7 to 17 fl oz. (7 days) (RUP)
Avaunt, 3.5 oz. (3 days) Bell peppers only.
Baythroid XL, 1.6 to 2.8 fl oz. (7 days) (RUP)
Belt SC, 1.5 fl oz. (1 day)

Bifenthrin
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (7 days) (RUP)
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Discipline 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

Bifenthrin + Imidacloprid
- Brigadier, 5.1 to 9.85 fl oz. (7 days) (RUP)
- Swagger, 10.2 to 19.7 fl oz. (7 days) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (7 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)

Carbaryl
- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

Confirm, 2, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid-to-late-season). (7 days)

Coragen, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.

Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)

Esfenvalerate
- Adjoum, 5.8 to 9.6 fl oz. (7 days) (RUP)
- Assana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- S-FenvalaStar, 5.8 to 9.6 fl oz. (7 days) (RUP)
- Exirel, 7-13.5 oz/A. (1)
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid-to-late-season applications). (1 day)
- Javelin WG, 0.12 to 1.5 lb. (0 days)

Lambda-cyhalothrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)

Leverage 360, 3.8 to 4.1 fl oz. (7 days) (RUP)

Methomyl
- Lannate LV (3 pt.) or Lannate SP (1 lb.) (3 days) (RUP)
- Nudrin LV (3 pt.) or Nudrin SP (1 lb.) (3 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

Permethrin. Bell peppers only.
- Ambush 25 W, 12.8 oz. (3 days) (RUP)
- Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (3 days) (RUP)
- Pounce 25 WP, 12.8 oz. (3 days) (RUP)
- Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

Spinosad
- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
- Veteca, 12 to 17 fl oz. (1 day)

PEPPER WEEVIL:

Acetamiprid
- Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1.1 to 1.7 oz.) (7 days)
- Actara, 3 to 5.5 oz. (0 days)

Athaena, 7 to 17 fl oz. (7 days) (RUP)
Belay 50 WDG, 1.6 to 2.1 oz. (7 days) (RUP)

Bifenthrin
- Bifenture EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (7 days) (RUP)
*Materials marked with an asterisk are particularly recommended for problem infestations.

**WHITEFLIES:**

- Bifenthrin
- Bifenazate
- Abamectin
- Sivanto

**LEAFHOPPERS:**

- Exirel
- Sivanto
- Assail
- Rimon
- Pyrenone
- Vydate
- Scorpion
- Mustang
- Rimon
- Fanfare
- Capture 2 EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Butterfly** 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Fanfare** 2EC, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Sniper**, 2.1 to 6.4 fl oz. (7 days) (RUP)
- **Tundra** EC, 2.1 to 6.4 fl oz. (7 days) (RUP)

**ARMYWORM:**

- Bifenthrin + Imidacloprid
- Bifenthrin + Zeta-Cypermethrin
- Exirel
- Sivanto
- Metam Potassium
- Terminal
- Rimon
- Assail
- Woodland
- Soilex
- Pyrantran
- **Coyote**, 2 EC, 10 to 19 fl oz. (7 days) (RUP)
- **Lusca**, 2 EC, 10 to 19 fl oz. (7 days) (RUP)
- **Tofa**, 2 EC, 10 to 19 fl oz. (7 days) (RUP)
- **Bacillus**, 2 EC, 10 to 19 fl oz. (7 days) (RUP)

**THRIPS:**

- Bifenthrin + Zeta-Cypermethrin
- Exirel
- Sivanto
- Acaramite 50WS, 0.75 to 1 lb. (3 days)
- Bifenthrin
- Bifenture EC, 5.12 to 6.4 fl oz. (7 days) (RUP)
- Bifenture 10 DF, 12.8 oz/A. (7 days)
- **Coyote**, 2 EC, 10 to 19 fl oz. (7 days) (RUP)

**COLORADO POTATO BEETLE:**

- Bifenthrin
- Bifenazate
- Abamectin
- Sivanto
- Exirel
- Mustang
- Vydate
- **Assail** 30G, 2.5 to 4 oz. (7 days)
- **Assail** 70WP, 1.1 to 1.7 oz. (7 days)
- **Exirel**, 13.5-20.5 oz/A. (7 days)
- **Sivanto**, 10.5 - 14 fl oz/A.

**SOIL FUMIGATION:**

- **SoilGard**, 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.
- **Athena**, 13.5 to 17 fl oz. (7 days) (RUP)
- **Bifenthrin + Zeta-Cypermethrin**
- **Etoxazole**
- **Zeta-Cypermethrin + Avermectin**
- **Gladiator**, 19 fl oz. (7 days) (RUP)

**DISEASES**

**SEED TREATMENT:**

- **PRE-EMERGENCE DAMPING OFF (Rhizoctonia solani, Pythium spp., Phytophthora spp.):**
  - Fludioxonil
  - Metadoxan
  - **Apron XL**, 0.085 - 0.64 fl oz/100 lb seed (Pythium).
  - **Thiram**
  - 42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 8 oz/100 lb seed.

- **SOIL FUMIGATION:**
  - **Verticillium wilt, Phytophthora:** Apply to production fields before planting. Note: Most fumigants applied to the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.

- **SOIL STERILIZATION:**
  - Most fumigants applied to the soil for control of soil-borne pests. Special care is needed to seal fumigants in the target zone for required times. This can be achieved by soil packing or immediate tarping.

- **1,3 Dichloropropene/chloropicrin**
- **Telone C35, 13-35 gal. (RUP)**
- **Metam Potassium**
- **Sectagon-K54, 30-60 gal. (RUP)**
- **Metam Sodium**
- **Sectagon 42, 37.5-75 gal. (RUP)**

**GREENHOUSE PREPLANT INCORPORATION:**

- **DAMPING OFF (Pythium spp.) and ROOT ROT (Rhizoctonia spp.):**
  - **Gliocladium virens GL-21**
  - **SoilGard 12 G**, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

**PREPLANT OR AT PLANTING INCORPORATED:**

- **DAMPING OFF (Pythium spp.), PHYTOPHTHORA CROWN STEM and FRUIT ROT (Phytophthora capsici):**
  - Mefenoxam, Ridomil and Ultra Flourish must be applied to the soil before the plants are infected with Phytophthora to obtain satisfactory disease control.
Peppers

- *Ridomil* Gold SL, 1 pt. (7 days)
- *Ultra Flourish*, 2 pt. (7 days)
Incorporate mechanically before planting or move into root zone after planting with 1/2 to 1 inch sprinkler water. For banded applications, use 12- to 16-inch band. One supplemental directed application at 1 pt (Ridomil Gold EC) or 2 pt (Ultra Flourish) should be made 30 days later following applications of Ridomil Gold/Copper (MEFENOXAM/COPPER), 2 1/2 lb (1/4 lb a.i.) (7 days). Make 3 to 4 applications of Ridomil Gold/Copper at 10 to 14 day intervals.

**Note:** Observe limit of active ingredient/crop on label.

**Drip Application:**

**PHYTOPHTHORA BLIGHT** (*Phytophthora capsici*):

- *Fluopicolide*
  - *Presidio*, 3-4 fl oz. (2 days)
- Ametoctradin + Dimethomorph
- *Zampro*, 14 fl oz. (4 days)
- Mefenoxam
  - *Ridomil* Gold SL (1 pt) or *Ultra Flourish* (2 pt) (7 days)

**Foliar Treatment:**

**GRAY MOLD** (*Botrytis* spp.), **CLADOSPORIUM LEAF MOLD** (*Cladosporium capsici*), **SCLEROTINIA WHITE MOLD** (*Sclerotinia sclerotiorum*):

* Bacillus subtilis
  - *Serenade*, 2 to 6 qt. (0 days) Biological control product needed to be applied before disease development. Control may be limited under heavy disease pressure.
- *Fluxapyroxad + Pyraclostrobin*
  - *Priaxor* Xemium Brand Fungicide, 4 - 8 fl oz. (0 days) Gray Mold and White Mold only.
- *Neem Oil*
  - *Trilogy*, 2 pt. (0 days)
- *Potassium Bicarbonate*
- *Arimicar 100*, 2.5 to 5 lb (*Botrytis*), (0 days)

**ANTHRACNOSE** (*Colletotrichum* spp.), **ALTERNARIA (RIPE) ROT** (*Alternaria tenuis*): Apply when disease threatens and every 7 to 10 days.

* Azoxystrobin
  - *Quadris*, 6 to 15.5 fl oz. (0 days)
  - *Bosalid*
  - *Endura*, 2.5 to 3.5 oz (alternaria rot only), (0 days)
  - *Fluxapyroxad + Pyraclostrobin*
  - *Priaxor* Xemium Brand Fungicide, 4 - 8 fl oz. (7 days)
  - *Penthiopyrad*
  - *Fontelis*, 16 - 24 fl oz. (0 days)
  - *Pyraclostrobin*
  - *Cabrio*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
  - *Trifloxystrobin*
    - *Flint*, 3 to 4 oz. (3 days) Do not apply more than three sequential foliar applications of strobilurin fungicides before alternating with a fungicide that has a different mode of action.

* Bacillus amyloliquefaciens
  - *Serifel*, 4 - 16 fl oz. (0 day)
  - *Copper Hydroxide*
    - *Kocide 3000*, 0.75 to 1.25 lb. (0 day)
  - *Copper Hydroxide + Copper Oxycloride*
  - *Badge SC*, 1 to 2.25 pt. (0 days)

**Copper Sulfate**

* Cuprofix Ultra 40 Disperss, 0.75 to 2 lb. (0 days)
  - *Mancozeb*
  - *Manzate Max*, 1.2 - 2.4 qt. (7 days)
  - *Neem Oil*
  - *Trilogy*, 2 pt. (0 days)
  - *Potassium Bicarbonate*
  - *Arimicar 100*, 2.5 to 5 lb.

**BACTERIAL SPOT** (*Xanthomonas campestris* pv. *vesicatoria*): Apply as needed every 5 to 7 days.

* Copper Ammonium Carbonate
  - *Copper Count N*, 1 1/2 to 3 qt. (0 days)
* Copper Hydroxide
  - *Champ DP Dry Prill*, 1 1/3 to 2 lb. (0 days)
  - *Champ Formula 2 F*, 1 1/3 to 2 pt. (0 days)
  - *Kocide 2000*, 1 1/2 to 2 1/4 lb. (0 days)
  - *Kocide 3000*, 0.75 to 1.25 lb. (0 day)
  - *Nu-Cop 3 L*, 1 1/3 to 2 pt. (0 days)
  - *Nu-Cop 50 DF*, 1 1/2 lb. (0 days)

* Copper Hydroxide + Copper Oxycloride
  - *Badge SC*, 1 to 2.25 pt. (0 days)
  - *Potassium Bicarbonate*
  - *Arimicar 50*, 1.5 to 2 lb. (0 days)
  - *Cuprofix Ultra 40 Disperss*, 0.75 to 2 lb. (0 days)
  - *Famoxadone + Cymoxanil*
  - *Tanox*, 8 - 10 oz every 5 - 7 days. (3 days)

* Quinoxyfen
  - *Quintec*, 6 fl oz. (0 days) Suppression only

**PHYTOPHTHORA BLIGHT** (*Phytophthora capsici*): *Dimethomorph*

- *Forum*, 6 fl oz. (0 days)
- *Famoxadone + Cymoxanil*
- *Tanox*, 8 to 10 oz (3 days)
- *Fluopicolide*
  - *Presidio*, 3-4 fl oz. (2 days)
- *Mefenoxam + Copper Hydroxide*
  - *Ridomil* Gold Copper, 2 lb. (7 days)
  - *Ametoctradin + Dimethomorph*
  - *Zampro*, 14 fl oz. (4 days)
  - *Copper Hydroxide + Copper Oxycloride*
  - *Badge SC*, 1 to 2.25 pt. (0 days)
  - *Cycloheximide*
  - *Ranman 400SC*, 2.75 fl oz. (0 days)

* Fenamidine
  - *Reason 500 SC*, 2.75 fl oz. (0 days)
  - *Fenamidine*
  - *Koverall*, 3 lb. (7 days)
  - *Manzate Pro-Stick*, 1.6 to 3.2 lb. (7 days)

* Mantripropamid
  - *Rebus*, 8 fl oz. (1 day)

* Mono-, dibasic sodium salts of phosphorous acid
  - *Fosprone*, 1 to 3 qt per 100 gal (ground) or 10 gal (aerial) of water. (0 days)

* Mono-, dibasic sodium, potassium, and ammonium phosphites
  - *Phostrol*, 2 to 4 pt. (0 days)
  - *Prophyt*, 6 pt. (0 days)

**ANTHRACNOSE:**

* Azoxystrobin + Difenoconazol
  - *Quadris*, 1 to 2.25 pt. (0 days) One application before alternating with another chemical.
SOIL TREATMENT AT PLANTING:

PREPLANT SOIL TREATMENT:

- **Ethoprop**
  - Mocap 15 G, broadcast 40 to 60 lb and incorporate to a depth of 2 to 4 inches. (RUP)
  - Mocap 6EC, broadcast 1 to 1.5 gal/A within 2 weeks before planting until crop emergence. (RUP)

SOIL TREATMENT AT PLANTING:

- **Ethoprop**
  - Mocap 15 G, 20 lb/acre (36 inch row spacing) or 1/4 lb/1000 row feet in a band 12 inches wide on the row at planting. Mix with the top 2-4 inches of soil
  - Note: Mocap use may result in delayed emergence particularly if excessive quantities of material contact seed. (RUP)

Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
**Potatoes**

**COLORADO POTATO BEETLE, POTATO PSYLID, WHITEFLIES:**

Sivanto, 10.5 - 14 fl oz/A.

**FURROW TREATMENT:**

APHIDS, FLEA BEETLE, LEAFHOPPERS:

*Delay, 9.0 to 12.0 fl oz. (14 days)*

**Imidacloprid**
- Admire Pro, 5.7 to 8.7 fl oz.
- Nuprid 2 F, 0.9 to 1.3 fl oz/1,000 row ft.

**Thiamethoxam**
- Platinum (5 to 8 fl oz.) or Platinum 75 SG (1.66 to 2.67 oz.) (30 days) See label for application methods.

Thimet 20 G, 8.5 to 11.3 oz. (for light, sandy soils) or 13 to 17.3 oz. (for heavy, clay soils) / 1,000 row ft. (90 days) May also help control Colorado potato beetle. See label for application methods. (RUP)

**COLORADO POTATO BEETLE:**

*Delay, 9 to 12 fl oz. (14 days)* See label for application methods.

**Dinotefuran**
- Scorpion 3SSL, 11 to 13 fl oz.
- Venom, 6.5 to 7.5 oz.
- Venom 20 SG, 1.40-1.65 lb/A.

See label for application methods.

**Imidacloprid** Additional generic brands available.
- Admire Pro, 5.7 to 8.7 fl oz.
- Nuprid 2 F, 0.9 to 1.3 fl oz/1,000 row ft.

See label for application methods.

**Thiamethoxam**
- Platinum (5 to 8 fl oz.) or Platinum 75 SG (1.66 to 2.67 oz.) (30 days) See label for application methods.

Thimet 20 G, 13.0-17.3 oz per 1000 ft for any row spacing (32-inch minimum) or no more than 17.7 lb/A. (90 days) (RUP)

**FLEA BEETLE, LEAFHOPPERS:**

**Dinotefuran**
- Scorpion 3SSL, 11 to 13 fl oz. (21 days) See label for application methods.
- Venom, 6.5 to 7.5 oz.
- Venom 20 SG, 1.40-1.65 lb/A.

**Imidacloprid**
- Admire Pro, 5.7 - 8.7 fl oz.
- Nuprid 2 F, 0.9 to 1.3 fl oz per 1,000 row ft.

Thimet 20 G, 8.5 to 11.3 oz. (for light, sandy soils) or 13 to 17.3 oz. (for heavy, clay soils) / 1,000 row ft. (90 days) (RUP)

**WIREWORM:**

Thimet 20 G, 8.5 to 11.3 oz. (for light, sandy soils) or 13 to 17.3 oz. (for heavy, clay soils) / 1,000 row ft. (90 days) no more than 11.5 lb/A (RUP)

**APHIDS, COLORADO POTATO BEETLE, FLEA BEETLE, LEAFHOPPERS:**

Swagger, 32 to 51.2 fl oz. (21 days) (RUP)

Vydate L, 1 to 2 gal in at least 20 gallons of water. (RUP)

**APHIDS, LEAFHOPPERS:**

Sivanto, 7 - 10.5 fl oz/A.

**COLORADO POTATO BEETLE, POTATO PSYLID, WHITEFLIES:**

Sivanto, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

**FLEA BEETLE:** Apply if there are more than 50/25 sweeps. May occur soon after plants emerge and again in late July and August.

**Acytometrin**
- Assail 30 SG (1.5 to 2.5 oz.) or Assail 70WP (0.6 to 1.1 oz.) (7 days)
- Actara, 1.5 to 3 oz. (14 days) Do not apply if a neonicotinoid was used at planting. Do not exceed 6 oz/acre per season.
- Athena, 7 to 17 fl oz. (21 days) (RUP)

Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

*Delay, 2 to 3 fl oz. (14 days)*

**Bifenthrin**
- Bifenture EC, 2.1 to 6.4 fl oz. (21 days) (RUP)
- Brigade @ 2EC, 2.1 to 6.4 fl oz. (21 days) (RUP)
- Fanfare 2EC, 2.1 to 6.4 fl oz. (21 days) (RUP)
- Sniper, 2.1 to 6.4 fl oz. (21 days) (RUP)
- Tundra EC, 2.1 to 6.4 fl oz. (21 days) (RUP)

**Bifenthrin + Imidacloprid**
- Brigadier, 4.8 to 6.14 fl oz. (21 days) (RUP)
- Swagger, 9.6 to 12.28 fl oz. (21 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)
- Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)

**Carbaryl**
- Carbaryl 4L, 0.5 to 1 qt. (7 days)
- Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

**Dinotefuran**
- Scorpion 3SSSL, 2 to 2.75 fl oz. (7 days)
- Venom, 1 to 1.5 oz. (7 days)
- Endigo ZC, 3.5 to 4.5 fl oz. (14 days) (RUP)
- Endosulfan 3 EC, 0.66 to 1.33 qt.. (12 days) (RUP)

**Esfenvalerate**
- Adjoum, 5.8 to 9.6 fl oz. (7 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- S-FenvalStar, 5.8 to 9.6 fl oz. (7 days) (RUP)
- Gladiator, 8 to 19 fl oz. (14 days) (RUP)

**Imidacloprid** Additional generic brands available.
- Admire Pro, 1.3 fl oz.
- Nuprid 1.6 F, 3.8 fl oz. (7 days)

Do not use if neonicotinoids were applied at planting. Do not exceed 19.2 oz/acre per season.

**Imidan 70-W, 1.33 lb. (7 days)**

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

**Leverage 360, 2.8 fl oz. (14 days) (RUP)**

**Methomyl**
- Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (6 days) (RUP)
- Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (6 days) (RUP)

**Mustang Max, 1.76 to 4 oz. (1 day) (RUP)**

**Parathion-methyl**
- Methyl 4 EC, 1.5 pt. (6 days) (RUP)
- Pennco-M, 2 to 4 pt. (5 days) (RUP)

**Permethrin**
- Ambush 25 W, 3.2 to 12.8 oz. (14 days) (RUP)
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (14 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)

**Pyrene, 1 to 12 fl oz. (0 days)**

**Carbaryl 4L, 0.5 to 1 qt. (7 days)**

**Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)**

**Voliam Flexi, 4 oz. (14 days)**

**Vydate L, 2 to 4 pt. (7 days) (RUP)**

**COLORADO POTATO BEETLE:** Apply if there is more than 1 large larva or adult per plant. Piperonyl butoxide (Butoxide, Pentox POB-8, Incite) at 0.5 to 1 pt. per acre may be effective as a synergist to block resistance to organophosphate (Guthion, Imidan, etc.) and pyrethroid (Asana, etc.) insecticides.

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*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label Instructions carefully.
<table>
<thead>
<tr>
<th>Material</th>
<th>Application Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbaryl</td>
<td>9 to 12 fl oz. (14 days)</td>
</tr>
<tr>
<td>Rimon</td>
<td>Do not exceed 6 oz/acre per season.</td>
</tr>
<tr>
<td>Pyrenone</td>
<td>70WP 2 to 3 fl oz. (14 days)</td>
</tr>
<tr>
<td>Mustang</td>
<td>1 to 2 qt. (7 days)</td>
</tr>
</tbody>
</table>

**Note:** Always read and follow label instructions carefully.
Potatoes

- Malathion
  - Malathion 5 (1 pt.) or Malathion 5 EC (2 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 (1 pt.) or Malathion 8 Aquamul (1 to 1.5 pt.) (0 days)
- Methomyl
  - Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (6 days) (RUP)
  - Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (6 days) (RUP)
  - Mustang Max, 1.76 oz to 4 oz. (1 day) (RUP)
- Parathion-methyl
  - Methyl 4 EC, 1.5 pt. (6 days) (RUP)
  - Penncap-M, 2 to 4 pt. (5 days) (RUP)
- Permethrin
  - Ambush 25 W, 3.2 to 12.8 oz. (14 days) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (14 days) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)
  - Pyreneone, 1 to 12 fl oz. (0 days)
  - Carbaryl 4L, 0.5 to 2 qt. (7 days)
  - Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)
  - Sivanto, 7 - 10.5 fl oz/A.
  - Torac, 14-21 oz/A. (14)
  - Transform WG, 1.5 to 2.25 oz/A. (7) Do not apply more than a total of 8.5 oz of Transform WG per acre per year.
  - Voliam Flexi, 4 oz. (14 days) Do not apply if a neonicotinoid was used at planting.
  - Vydate L, 2 to 4 pt. (7 days) (RUP)

APHIDS: Treat if numbers exceed 1 per leaf (1/10 leaves for seed potatoes). Control is especially important to reduce virus disease in seed potato production.

* Fulfill, 2.75 to 5.5 oz. (14 days) May require 5 to 7 days for aphid mortality.

- Acetamiprid
  - Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1 to 1.7 oz.) (7 days)
  - Actara, 3 oz. (14 days) Do not apply if a neonicotinoid was used at planting. Do not exceed 6 oz/acre per season.
  - Athena, 7 to 17 fl oz. (21 days) (RUP)
  - Belay, 2 to 3 fl oz. (14 days)
  - Beleaf 50 SG, 2 to 2.8 oz. (7 days)
- Bifenthrin + Imidacloprid
  - Brigadier, 3.8 to 6.14 fl oz. (21 days) (RUP)
  - Swagger, 7.6 to 12.28 fl oz. (21 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)
  - Closer SC, 1.5 to 2.0 oz/A. (7 days)
- Dimethoate
  - Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt.. (0 days)
  - Endigo ZC, 4.5 fl oz. (14 days) (RUP)
  - Endosulfan 3 EC, 0.66 to 1.33 qt.. (12 days) (RUP)
- Efenvlarate
  - Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
  - S-FenvaloStar, 5.8 to 9.6 fl oz. (7 days) (RUP)
  - Gladiator, 19 fl oz. (14 days) (RUP)
- Imidacloprid, Additional generic brands available.
  - Admire Pro, 1.3 fl oz.
  - Nuprid 1.6 F, 3.8 fl oz. (7 days)

Do not use if neonicotinoids were applied at planting. Do not exceed 19.2 oz/acre per season.

* Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

Leverage 360, 2.8 fl oz. (14 days) (RUP)

- Malathion
  - Malathion 5 (1 pt.) or Malathion 5 EC (2 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 (1 pt.) or Malathion 8 Aquamul (1 to 1.5 pt.) (0 days)
- Methomyl
  - Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (6 days) (RUP)
  - Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (6 days) (RUP)
- Mustang Max, 1.76 oz to 4 oz. (1 day) (RUP)
- Parathion-methyl
  - Methyl 4 EC, 1.5 pt. (6 days) (RUP)
  - Penncap-M, 2 to 4 pt. (5 days) (RUP)
- Permethrin
  - Ambush 25 W, 3.2 to 12.8 oz. (14 days) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (14 days) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)
  - Pyreneone, 1 to 12 fl oz. (0 days)
  - Sivanto, 7 - 10.5 fl oz/A.
  - Torac, 17-21 oz/A. (14) Do not make more than 2 applications per crop cycle
  - Transform WG, 0.75 to 1.5 oz/A. (7) Do not apply more than a total of Transform WG 8.5 oz/A per year
  - Voliam Flexi, 4 oz. (14 days)
  - Vydate L, 2 to 4 pt. (7 days) (RUP)

TARNISHED PLANT BUG:
- Athena, 10 to 17 fl oz. (21 days) (RUP)
- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
- Beleaf 50 SG, 2 to 2.8 oz. (7 days)
- Carbaryl
  - Carbaryl 4L, 1 to 2 qt. (7 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (7 days)
- Endigo ZC, 4 to 4.5 fl oz. (14 days) (RUP)
- Endosulfan 3 EC, 0.66 to 1.33 qt. (12 days) (RUP)

Efenvlarate
- Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
  - S-FenvaloStar, 5.8 to 9.6 fl oz. (7 days) (RUP)
  - Gladiator, 19 fl oz. (14 days) (RUP)
- Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (7 days) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)

Leverage 360, 2.8 fl oz. (14 days) (RUP)

- Malathion
  - Malathion 5 (1 pt.) or Malathion 5 EC (2 pt.) or Malathion 57 EC (1 to 1.5 pt.) or Malathion 8 (3 pt.) or Malathion 8 Aquamul (1 to 1.5 pt.) (0 days)
- Methomyl
  - Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (6 days) (RUP)
  - Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (6 days) (RUP)
- Mustang Max, 1.76 oz to 4 oz. (1 day) (RUP)
- Parathion-methyl
  - Methyl 4 EC, 1.5 pt. (6 days) (RUP)
  - Penncap-M, 2 to 4 pt. (5 days) (RUP)
- Permethrin
  - Ambush 25 W, 3.2 to 12.8 oz. (14 days) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (14 days) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (14 days) (RUP)
  - Pyreneone, 1 to 12 fl oz. (0 days)
  - Sivanto, 7 - 10.5 fl oz/A.
  - Torac, 17-21 oz/A. (14) Do not make more than 2 applications per crop cycle
  - Transform WG, 0.75 to 1.5 oz/A. (7) Do not apply more than a total of Transform WG 8.5 oz/A per year
  - Voliam Flexi, 4 oz. (14 days)
  - Vydate L, 2 to 4 pt. (7 days) (RUP)

Always read and follow label instructions carefully.

*Materials marked with an asterisk are particularly recommended for problem infestations.
**EUROPEAN CORN BORER:** Plan treatment to coincide with first generation egg laying if there is more than 1 egg mass per 25 leaves.

* Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
* Radiant SC, 4.5 to 8 fl oz. (7 days) Minimum of 7 days between applications; do not apply more than 32 fl oz. per season.
* Spinosad
  - Entrust (1 to 2 oz.) or Entrust SC (3 to 10 fl oz.) (7 days)

**Acetamiprid**
- Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1.1 to 1.7 oz.) (7 days)

For use as an ovicide.

**CABBAGE LOOPERS:**
- Egg laying if there is more than 1 egg mass per 25 leaves.

**EUROPEAN CORN BORER:** Plan treatment to coincide with first egg laying if there is more than 1 egg mass per 25 leaves.

**Bifenthrin + Imidacloprid**
- **Baythroid**
- **Avaunt**
- **Plus**
- **Pyrenone**
- **Penncap**
- Mustang
- **Imidan**
- **Esfenvalerate**
- **Cypermethrin**
- **Pyriproxyfen**

* Materials marked with an asterisk are particularly recommended for problem infestations.

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**ARMY WORMS:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacillus thuringiensis</strong></td>
<td>For use as a control for armyworms.</td>
</tr>
<tr>
<td><strong>Bifenthrin</strong></td>
<td>A synthetic pyrethroid insecticide.</td>
</tr>
<tr>
<td><strong>Imidan</strong></td>
<td>An organophosphate insecticide.</td>
</tr>
<tr>
<td><strong>Esfenvalerate</strong></td>
<td>An insecticide derived from tobacco.</td>
</tr>
<tr>
<td><strong>Pyriproxyfen</strong></td>
<td>A systemic insecticide.</td>
</tr>
</tbody>
</table>

Always read and follow label instructions carefully.
**Potatoes**

<table>
<thead>
<tr>
<th>Spinosad</th>
<th>Bifenazate 4SC, 16 to 24 fl oz (14 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackhawk (2.25-3.5 oz/A) or Entrust (1.5 to 3 oz.) or Entrust SC (4 to 10 fl oz.) (7 days)</td>
<td>Bifenazate</td>
</tr>
<tr>
<td>Voliam Flexi, 4 oz. (14 days)</td>
<td>Bifenazate 4SC, 2.1 to 6.4 fl oz. (21 days) (RUP)</td>
</tr>
<tr>
<td>CUTWORM:</td>
<td></td>
</tr>
<tr>
<td>Bacillus thuringiensis</td>
<td>Brigade @ 2EC, 5.12 to 6.4 fl oz (21 days) (RUP)</td>
</tr>
<tr>
<td>Biobit HP, 0.5 to 1 lb. (0 days)</td>
<td>Bifentrin + Avermectin</td>
</tr>
<tr>
<td>DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)</td>
<td>Athena, 10 to 17 fl oz. (21 days) (RUP)</td>
</tr>
<tr>
<td>XenTan, 0.5 to 1.5 lb. (0 days)</td>
<td>Bifentrin + Zeta-Cypermethrin</td>
</tr>
<tr>
<td>Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)</td>
<td>Hero (10.3 oz.) or Hero EW (11.2 oz.) (21 days) (RUP)</td>
</tr>
<tr>
<td>Bifentrin + Zeta-Cypermethrin</td>
<td>Parathion-methyl</td>
</tr>
<tr>
<td>Hero (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)</td>
<td>Methyl 4 EC, 1.5 pt. (6 days) (RUP)</td>
</tr>
<tr>
<td>Carbaryl</td>
<td>Spiromesifen</td>
</tr>
<tr>
<td>Carbaryl 4L, 1 to 2 qt. (7 days)</td>
<td>Oberon 2 SC, 8 to 16 fl oz. (7 days)</td>
</tr>
<tr>
<td>Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1.5 to 2 qt.) (7 days)</td>
<td>Zeta-Cypermethrin + Avermectin</td>
</tr>
<tr>
<td>Endigo ZC, 3.5 to 4.5 fl oz. (14 days) (RUP)</td>
<td>Gladiator, 19 fl oz (14 days) (RUP)</td>
</tr>
<tr>
<td>Gladiator, 8 to 19 fl oz. (14 days) (RUP)</td>
<td>DISEASES</td>
</tr>
<tr>
<td>Lambda-cyhalothrin</td>
<td>SEED TREATMENT:</td>
</tr>
<tr>
<td>Lambda-Cy, 1.92 to 3.2 fl oz. (7 days) (RUP)</td>
<td>FUSARIUM TUBER ROT (Fusarium spp.): Fall treatment. Treat seed going into storage or at the time of shipping. This must be done at least 6 weeks before planting.</td>
</tr>
<tr>
<td>Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)</td>
<td>Thiabendazole</td>
</tr>
<tr>
<td>Leverage 360, 2.8 fl oz (14 days) (RUP)</td>
<td>Mervect 340, 0.42 fl oz/ton of potatoes. Apply in enough water for complete coverage. Apply as a spray to potato tubers (seed and table stock) at time of storage and again at removal. See manufacturer’s recommendations for equipment and methods to use. Treatment may be applied to washed or unwashed potatoes.</td>
</tr>
<tr>
<td>Methomyl</td>
<td>SOFT ROT and BLACKLEG (Pectobacterium carotovorum):</td>
</tr>
<tr>
<td>Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (6 days) (RUP)</td>
<td>Streptomycin sulfate</td>
</tr>
<tr>
<td>Nudrin LV (1.5 pt.) or Nudrin SP (0.5 lb.) (6 days) (RUP)</td>
<td>Agri-mycin 17, 100 ppm. Mix with Maxim 4FS or Maxim MZ.</td>
</tr>
<tr>
<td>Mustang Max, 1.28 to 4 oz. (1 day) (RUP)</td>
<td>Bac-master, 100 ppm. Mix with Maxim 4FS or Maxim MZ.</td>
</tr>
<tr>
<td>Penncap-M, 2 to 4 pt. (5 days) (RUP)</td>
<td>SEED TREATMENT AND HANDLING:</td>
</tr>
<tr>
<td>Carbaryl 4L, 1 to 2 qt. (7 days)</td>
<td>FUSARIUM TUBER ROT (Fusarium spp.): Pre-planting treatment. Dust or spray cut or whole seed before planting.</td>
</tr>
<tr>
<td>Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1.5 to 2 qt.) (7 days)</td>
<td>Capitan</td>
</tr>
<tr>
<td>WHITE GRUBS, WIREDWORM:</td>
<td></td>
</tr>
<tr>
<td>Bifentrin</td>
<td>Capitan 10 Potato Seed Protectant, 0.75 lb per 100 lb cut seed pieces.</td>
</tr>
<tr>
<td>Bifentrin EC, 2.1 to 6.4 fl oz. (21 days) (RUP)</td>
<td>Fluodioxinil</td>
</tr>
<tr>
<td>Brigade @ 2EC, 2.1 to 6.4 fl oz. (21 days) (RUP)</td>
<td>Maxim MZ 0.5 D, 0.5 lb per 100 lb seed potatoes.</td>
</tr>
<tr>
<td>Discipline 2EC, 2.1 to 6.4 fl oz. (21 days) (RUP)</td>
<td>Mancozeb</td>
</tr>
<tr>
<td>Fanfare 2EC, 2.1 to 6.4 fl oz. (21 days) (RUP)</td>
<td>Dithane F-45 Rainshield, 2 pt per 50 gal water. Treat as above.</td>
</tr>
<tr>
<td>Sniper, 2.1 to 6.4 fl oz. (21 days) (RUP)</td>
<td>Dithane M-45, 1.25 lb per 50 gal water. Treat as above.</td>
</tr>
<tr>
<td>Tundra EC, 2.1 to 6.4 fl oz. (21 days) (RUP)</td>
<td>Koverall, 1.25 lb. per 50 gal water. Treat as above.</td>
</tr>
<tr>
<td>WHITEFLIES:</td>
<td>Manzate 200 80 W, 2.5 lb per 100 gal water. Drain and plant as soon as possible.</td>
</tr>
<tr>
<td>Closer SC, 4.25 to 5.75 oz/A. (7 days)</td>
<td>Moncoat MZ, 0.75-1.0 lb/100 lb of seed potatoes.</td>
</tr>
<tr>
<td>Transform WG, 2.0 to 2.25 oz/A. (7) Do not apply more than a total of 8.5 of Transform WG per acre per year.</td>
<td>Note: Use only as directed. DO NOT feed treated seed to livestock.</td>
</tr>
<tr>
<td>Sivanto, 10.5 - 14 fl oz/A.</td>
<td>RHIZOCTONIA DISEASE (Rhizoctonia solani): Dust cut or whole seed just before planting.</td>
</tr>
<tr>
<td>Closer SC, 4.25 to 5.75 oz/A. (7 days)</td>
<td>Fluodioxinil</td>
</tr>
<tr>
<td>Transform WG, 2.0 to 2.25 oz/A. (7) Do not apply more than a total of 8.5 of Transform WG per acre per year.</td>
<td>Maxim 0.5 D, 0.5 lb per 100 lb seed potatoes.</td>
</tr>
<tr>
<td>CUCUMBER BEETLE:</td>
<td>Maxim 4 FS, 0.08 fl oz. Note: If Maxim 4 FS is used for potatoes for seed production, a labeled rate of mancozeb seed treatment dust must be applied to seed tubers after the Maxim 4 FS treatment. Alternatively, an in-furrow application of Quadris at 6.1 - 9.2 fl oz/A may be used (34* row spacing).</td>
</tr>
<tr>
<td>Acetamiprid</td>
<td>Maxim MZ 0.5 D, 0.5 lb per 100 lb seed potatoes.</td>
</tr>
<tr>
<td>Assail 30 SG, 1.5 to 4 oz.. (7 days)</td>
<td>Fluodioxinil</td>
</tr>
<tr>
<td>Assail 70WP, 0.6 to 1.7 oz/A. (7 days)</td>
<td>Maxim 0.5 D, 0.5 lb per 100 lb seed potatoes.</td>
</tr>
<tr>
<td>THRIPS:</td>
<td>Maxim 4 FS, 0.08 fl oz. Note: If Maxim 4 FS is used for potatoes for seed production, a labeled rate of mancozeb seed treatment dust must be applied to seed tubers after the Maxim 4 FS treatment. Alternatively, an in-furrow application of Quadris at 6.1 - 9.2 fl oz/A may be used (34* row spacing).</td>
</tr>
<tr>
<td>Blackhawk, 2.25-3.5 oz/A. (3 days) Add adjuvant</td>
<td>Maxim MZ 0.5 D, 0.5 lb per 100 lb seed potatoes.</td>
</tr>
<tr>
<td>Torac, 17-21 oz/A. (14) Do not make more than 2 applications per crop cycle</td>
<td>Moncout, 0.71 - 1.1 lb/A in-furrow at planting with a minimum of 3 gal/A. 1.1 lb maximum per season.</td>
</tr>
<tr>
<td>POTATO PSYLID:</td>
<td>Always read and follow label Instructions carefully</td>
</tr>
<tr>
<td>Sivanto, 10.5 - 14 fl oz/A.</td>
<td><em>Materials marked with an asterisk are particularly recommended for problem infestations.</em></td>
</tr>
</tbody>
</table>
Potatoes

Moncoat MZ, 0.75-1.0 lb/100 lb seed potatoes.

SILVER SCURF (Helminthosporium solani):

- **Fludioxinil**
  - *Maxim* 0.5 D, 0.5 lb per 100 lb seed potatoes.
  - *Maxim* 4 FS, 0.08 fl oz/100 lb seed potatoes. **Note:** If Maxim 4 FS is used for potatoes for seed production, a labeled rate of mancozeb seed treatment dust must be applied to seed tubers after the Maxim 4 FS treatment.
  - *Maxim MZ* 0.5 D, 0.5 lb per 100 lb seed potatoes.
  - *Moncoat MZ* 0.75 - 1.0 lb pre-plant per 100 lb seed. Maximum 1.0 lb per season.

**DISINFECTION OF CUTTING KNIVES:** Spray or mist surface of knives:

- Quaternary ammonium compounds
- **Green Shield, 0.5 fl oz per gallon of water.**
- **Hypochlorite 5.25% bleach, 1 part commercial formulation in 50 parts of water (2%).**

**PRE-PLANT TREATMENT:**

**WHITE MOLD (Sclerotinia sclerotiorum):**

- Contans, 1 - 4 lb.

**IN FURROW AT PLANTING TREATMENTS:** For control of seed-borne and soil-borne diseases.

**BLACK DOT (Colletotrichum coccodes):**

- **Azoxystrobin**
  - *Quadris*, in-furrow at planting at 6.1 - 9.2 fl oz/A (34" row spacing). Maximum 7.5 pt/A per season. **Note:** It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

**RHIZOCTONIA DISEASE (Rhizoctonia solani):**

- **Azoxystrobin**
  - *Quadris*, in-furrow at planting at 6.1 - 9.2 fl oz/A (34" row spacing). Maximum of 7.5 pt/A season. **Note:** It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

**Flutolanil**

- *Moncut, 0.71 - 1.1 lb/A with a minimum of 3 gal/A. Maximum of 1.1 lb/season.

**SILVER SCURF (Helminthosporium solani):**

- **Azoxystrobin**
  - *Quadris*, 6.2 to 9.2 fl oz. Maximum 7.5 pt/A season. **Note:** It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

**BLACK DOT, PINK ROT, PYTHIUM LEAK, PYTHIUM SEEDLING BLIGHT, RHIZOCTONIA STEM CANKER:**

- *Quadris Ridomil Gold, 12.6 fl oz (45 hours) See label for plantback restrictions.*

**PINK ROT (Phytophthora erythroseptica), PYTHIUM LEAK (Pythium ultimum):**

- **Cyazofamid**
  - *Ranman 400SC, 0.42 fl oz.*
  - Mono-, dibasic sodium, potassium and ammonium phosphites
  - **Prophyt, 4 - 10 pt.** Apply at least 3 gallons of mix per acre. Add Ridomil.

**BLACK SCURF/STEM CANKER ((Rhizoctonia solani):**

- **Bacillus amyloliquefaciens**
  - Double Nickel 55 WDG, 0.25 - 3.0 lb. (0 days) Organic approval.
  - Double Nickel LC, 1 - 2 pt. (0 days) Organic approval.

**FOLIAR TREATMENT:**

**BLACK DOT (Colletotrichum coccodes):**

- **Azoxystrobin + Chlorothalonil**
  - *Quadris Opti, 1.6 pt/A every 7 - 14 days. Maximum of 9.6 pt/season. (14 days)*
  - Mandipropamid + Difenoconazole
  - *Revus Top, 5.5-7 fl oz every 7-10 days. (14 days) Maximum 28 fl oz/A/season.*
  - Potassium Bicarbonate
  - *Armicarb 100, 2.5 to 5 lb every 5-14 days. (0 days)*
  - Pyrimethanil + Fluoypiram
  - *Luna Tranquility, 11.2 fl oz every 7-14 days. (7 days) Maximum of 43.6 fl oz per season.*

**EARLY BLIGHT (Alternaria solani):** Apply every 5 to 7 days after emergence.

- **Azoxystrobin**
  - *Quadris, 6.2 to 15.4 fl oz. Maximum 7.5 pt/A/season. Note:** It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

- **Azoxystrobin + Chlorothalonil**
  - *Quadris Opti, 1.6 pt/A every 5 - 7 days. (14 days) Maximum of 9.6 pt/season.*

- **Bacillus amyloliquefaciens**
  - *Double Nickel 55 WDG, 0.25 - 3.0 lb. (0 days) Apply every 7 - 10 days. Organic approval.*
  - *Double Nickel LC, 0.5 - 6 qts. (0 days) Apply every 7 - 10 days. Organic approval.*

- **Bacillus pumilus**
  - *Sonata, 4 - 8 pt/A every 5 - 7 days.*

- **Bacillus subtilis**
  - *Serenade, 6 lb/A every 5 - 7 days.*

- **Boscalid**
  - *Endura, 2.5 - 4.5 oz every 7 - 14 days. (10 days) Maximum of 20 oz/season.*

- **Chlorothalonil**
  - *Applause 720, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Do not apply more than 15 pt/A/season.*
  - *Bravo Ultrex, 0.9 to 1.4 lb. (7 days) Do not apply more than 14.5 lb in a growing season.*
  - *Bravo Weather Stik, 1 to 1.5 pt. (7 days) Do not apply more than 16 pt in a growing season.*
  - *Echo Zn, 1.5 to 2.2 pt. (7 days) Do not apply more than 21.5 pt in a growing season.*
  - *Equus 720 SST, 1 to 1.5 pt. (7 days) Do not apply more than 15 pt in a growing season.*
  - *Initiate 720, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Maximum 15 pt/A/season.*

**Note:** All chlorothalonil products may be applied through irrigation water.

**Copper Hydroxide + Copper Oxchloride**

- *Badge SC, 0.9 - 3.7 pt every 7 - 10 days.*

- **C/O-C-S WDG [potato, 1.5 to 4 lb every 7-10 days. (0 days)**

- **Kentan DF, 3 lb every 7-10 days.**

- **Kocide 2.4 LF, 2 lb. (0 days)**

- **Copper-based compounds**
  - *Badge SC, 0.9 - 3.7 pt 7 every 7 - 10 days.*

*Materials marked with an asterisk are particularly recommended for problem infestations.*

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Always read and follow label instructions carefully
Potatoes

- C-0-C-S WDG [potato], 1.5 to 4 lb every 7-10 days. (0 days)
- Kentan DF, 3 lb every 7-10 days.
- Kocide 2.4 LF, 2 lb. (0 days)

Famoxadone + Cyxomaxil
- Tanos, 6 oz/A every 7 to 10 days. (14 days) Maximum 3.0 lb/season.

Fenamidone
- Reason 500 SC, 5.5 - 8.2 fl oz every 5 to 10 days. 24.6 fl oz maximum per season. (7 days) Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

Fluoxastrobin
- Evito 480SC, 3.8 fl oz every 7-10 days. It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

Iprodione
- Iprodione 4L, 1 - 2 pt every 14-21 days. (14 days) Maximum 8 pt/A/season.
- Meteor, 1 - 2 pt. (14 days)
- Nevada 4F, 1 - 2 pt every 14-21 days. (14 days) Maximum 8 pt/A/season.
- Rovral 4 Flouvable, 1 to 2 pt. (7 days) See label for rotational crop and other restrictions.
- Rovral 50 W, 2 lb. (14 days) See label for rotational crop restrictions.

Note: Garlic, dry bulb onions, broccoli, lettuce, peanuts, carrots, beans and potatoes can be rotated after harvest. Root crops, tomatoes and cotton may be rotated one month after last application.

Mancozeb
- Dithane DF Rainshiel, Dithane M-45, 2 lb. (3 days) May be used through irrigation equipment.
- Koverall, 1 to 2 lb. (3 days)
- Manex II, 3.2 pt. (3 days)
- Manzate Max, 0.4 to 1.6 qt. (3 days)
- Manzate Pro-Stick, 1 to 2 lb. (3 days) May be used through irrigation equipment.
- Penvcozeb 75 DF, 2 lb. (3 days)

Mancozeb + Zoxamide
- Gavel 75 DF, 1.5 - 2.0 lb every 5 - 7 days. Maximum 12.0 lb/season. (3 days)

Mandipropamid + Difenconazole
- Revus Top, 5.5-7 fl oz every 7-10 days. (14 days) Maximum 28 fl oz/A/season.

Organin-Based Compounds
- Agritin 80 WP, Supertin 80 WP, 2.5 to 3.75 oz. (21 days) Use only in tank mixture with other fungicides. Do not apply more than 11.5 oz/acre in a growing season.
- Superin 4L, 4 to 6 fl oz. (7 days)
- Polymar 80 DF, 2 lb. (3 days)

Potassium Bicarbonate
- Armicarb 100, 2.5 to 5 lb every 5-14 days. (0 days)

Pyraclostrobin
- Headline EC, Headline SC, 6-9 fl oz. (3 days) Do not apply more than 72 fl oz per season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

Pyrimethanil
- Scala, 7 fl oz every 7 - 14 days. (7 days) Maximum of 35 fl oz per season. Note: It is recommended that Scala is used in a tank mix with a labeled dose rate of another effective early blight fungicide.

Pyrifloxynil + Fluopyram
- Luna Tranquility, 11.2 fl oz every 7-14 days. (7 days) Maximum of 35 fl oz per season.

Trifloxystrobin
- Gem 25 WDG (6.0-8.0 oz) or Gem 500 (2.9 to 3.8 fl oz) (7 days) Do not apply more than 48 oz. per season. Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

LATE BLIGHT (Phytophthora infestans): Apply after plants are 6 inches tall and every 5-7 days until vines are completely dead.

Ametoctradin + Dimethomorph
- Zampro, 11 - 14 fl. oz. (4 days) Maximum of three applications at full rate to 42 fl. oz/season.

Azoxystrobin
- Quadris, 6.2-15.4 fl. oz.

Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

Azoxystrobin + Chlorothalonil
- Quadris Opti, 1.6 pt/A every 5 - 7 days. (14 days) Maximum 9.6 pt/season.

Bacillus amyloliquefaciens
- Double Nickel 55 WDG, 0.25 - 3.0 lb. (0 days) Apply every 7 - 10 days. Organic approval.
- Double Nickel LC, 0.5 - 6 qts. (0 days) Apply every 7 - 10 days. Organic approval.

Bacillus pumilus
- Sonata, 4 - 8 pt/A every 5 - 7 days.
- Bacillus subtilis
- Serenade, 6 lb/A every 5 - 7 days.

Chlorothalonil
- Applause 72O, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Do not apply more than 15 pt/A/season.
- Bravo Utrex, 0.9 to 1.4 lb. (7 days)
- Bravo Weather Stik, 1 to 1.5 pt. (7 days) Do not apply more than 16 pt in a growing season.
- Bravo Weather Stik Zn, 1.0 to 1.5 pt. (7 days) Do not apply more than 16 pt in a growing season.
- Echo Zn, 1.5 to 2 pt/A. (7 days) Do not apply more than 21.5 pt in a growing season.
- Equus 720 SST, 1 to 1.5 pt. (7 days) Do not apply more than 15 pt in a growing season.
- Initiate 72O, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Maximum 15 pt/A/season.

Note: All chlorothalonil products may be applied through irrigation water.

Cyozfamid
- Raman 400SC, 1.4 to 2.75 fl oz every 7 to 10 days. (7 days) Maximum 27.5 fl oz/A/season.

Cymoxanil
- Curzate 60 DF, 0.21 lb. (14 days) Use only in tank mixture with other fungicides from when foliage meets within rows to early senescence. May be used to prevent spread to uninfected foliage.

*Materials marked with an asterisk are particularly recommended for problem infestations.
from within infected fields. Must be mixed with a fungicide partner such as an EBDC or chlorothalonil.

**Dimethomorph**
- Forum, 4 to 6 fl oz. (4 days) Use from when foliage meets within rows to late senescence. May be used to prevent spread to uninfected foliage from within infected fields. Must be mixed with a fungicide partner such as an EBDC or chlorothalonil.

**Farnoxadone + Cyloxanil**
- Tanos, 6 - 8 oz/A every 7 to 10 days. (14 days) Maximum 3.0 lb/season.

**Fenamidone**
- Reason 500 SC, 5.5 - 8.2 fl oz every 5 to 10 days. (7 days) Maximum 24.6 fl oz/season.

**Note:** It is recommended that a protectant partner such as an EBDC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

**Fluazinam**
- Omega 500 F, 5.5 fl oz/A. (14 days) Do not apply more than 3.5 pt in a growing season.

**Fluoxastrobin**
- Evito 480SC, 3.8 fl oz every 7-10 days. It is recommended that a protectant partner such as an EBDC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

**Mancozeb**
- Dithane DF Rainshield (2 lb) or Manzate Pro-Stick (1 to 2 lb) (3 days) May be used through irrigation equipment.
- Koverall, 1 to 2 lb. (3 days)
- Manex II, 3.2 pt. (3 days)
- Manzate Max, 0.4 to 1.6 qt. (3 days)
- Penncozeb 75 DF, 2 lb. (3 days)

**Mancozeb + Zoxamide**
- Gavel 75 DF, 1.5 - 2.0 lb every 5 - 7 days. (3 days) Maximum 12.0 lb/season.

**Mandipropamid + Difenoconazole**
- Revus Top, 5.5-7 fl oz every 7-10 days. (14 days) Maximum 28 fl oz/A/season.

**Mefenoxyam + Chlorothalonil**
- Ridomil Gold Bravo, 2 lb. (7 days)
- Ridomil Gold Copper, 2 lb. (7 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.
- Ridomil Gold MZ, 2.5 lb. (7 days)

**Mefenoxyam + Copper Hydroxide**
- Ridomil Gold Bravo, 2 lb. (7 days)
- Ridomil Gold Copper, 2 lb. (7 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.
- Ridomil Gold MZ, 2.5 lb. (7 days)

**Mefenoxyam + Mancozeb**
- Ridomil Gold Bravo, 2 lb. (7 days)
- Ridomil Gold Copper, 2 lb. (7 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.
- Ridomil Gold MZ, 2.5 lb. (7 days)

**Mono-, dibasic sodium, potassium and ammonium phosphites**
- Phostrof, 3.75 - 10 pt/A every 5 to 10 days. **Note:** It is recommended that a protectant partner such as an EDHC (mancozeb or metiram) or chlorothalonil product is added in tank mixture.

**Propythiopropyl Carbamate**
- Prophyt, 4 pt every 5-10 days.

**Organonit-Based Compounds**
- Agritin 80 WP, Superitin 80 WP, 2.5 to 3.75 oz. (21 days) Use only in tank mixture with other fungicides. Do not apply more than 11.5 oz per growing season.
- Superitin 4L, 4 to 6 fl oz. (7 days)
- Polyram 80 DF, 2 lb. (3 days)
- Propanocarb
- Previcur Flex, 0.9 to 1.2 pt/acre depending on disease pressure; with chlorothalonil-based product at 2/3 rate or with EBDC-based product at 2/3 rate. (14 days)

**Pyraclostrobin**
- Headline EC, Headline SC, 6-9 fl oz. (3 days) Do not apply more than 72 fl oz per season. **Note:** It is recommended that a protectant partner such as an EBDC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

**Trifloxystrobin**
- Gem 25 WDG, 6.0-8.0 oz. (7 days) Do not apply more than 48 oz. per season. **Note:** It is recommended that a protectant partner such as an EBDC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.
- Gem 500, 3.8 fl oz. (7 days) Tank mix only with protectant.

**LATE BLIGHT TUBER ROT (Phytophthora infestans), LEAK (Phytophthora spp.), PINK ROT (Phytophthora erythroseptica): Apply at flowering and again 14 days later.**

**Mefenoxyam + Chlorothalonil**
- Ridomil Gold Bravo, or Ridomil Gold Copper (2 lb) or Ridomil Gold MZ (2.5 lb) (21 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.

**Mefenoxyam + Copper Hydroxide**
- Ridomil Gold Bravo, or Ridomil Gold Copper (2 lb) or Ridomil Gold MZ (2.5 lb) (21 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.
- Mefenoxyam + Mancozeb
- Ridomil Gold Bravo, or Ridomil Gold Copper (2 lb) or Ridomil Gold MZ (2.5 lb) (21 days) Apply when foliage meets within the row and may be applied once more after 14 days. Use protectant fungicides between applications.

**BOTRYTIS BLIGHT (Botrytis cinerea): Apply after mid-season when disease symptoms are likely to appear.**

**Chlorothalonil**
- Applause 720, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Do not apply more than 15 pt/A/season.
- Bravo Ultrex, 0.9 to 1.4 lb. (7 days) Do not apply more than 21.5 lb in a growing season.
- Bravo Weather Stik, Equus 720 SST, 1 to 1.5 pt. (7 days) Do not apply more than 15 pt in a growing season.
- Echo Zn, 1.5 to 2.2 pt. (7 days) Do not apply more than 21.5 pt in a growing season.
- Initiate 720, 1.0 to 1.5 pt. (7 days) Apply every 5-10 days. Maximum 15 pt/A/season.

**Note:** All chlorothalonil products may be applied through irrigation water.
- Mancozeb
- Dithane DF Rainshield, 2 lb. (3 days) May be used through irrigation equipment.

*Materials marked with an asterisk are particularly recommended for problem infestations.*
Potatoes

- Koverall, 1 to 2 lb. (3 days)
- Manzate Pro-Stick, 1 to 2 lb. (3 days)
- Penncozeb 75 DF, 2 lb. (3 days)

**Polyram 80 DF**, 2 lb. (3 days)

**Pyrimethanil**
- Scala, 7 fl oz every 7 - 14 days. (7 days) Maximum of 35 fl oz per season. **Note:** It is recommended that Scala is used in a tank mix with a labeled dose rate of another effective early blight fungicide.
- Bacillus amyloliquefaciens

**Pyrimethanil + Fludioxonil**
- Luna Tranquility, 11.2 fl oz every 7-14 days. (7 days) Maximum of 43.6 fl oz per season.

**WHITE MOLD** (*Sclerotinia sclerotiorum*): Apply at first sign of disease (90 days) or immediately prior to row closing, and again 28 days later if needed. *Bacillus amyloliquefaciens*

- Double Nickel 55 WDG, 0.25 - 3.0 lb. (0 days) Apply every 7 - 10 days. Organic approval.
- Double Nickel LC, 0.5 - 6 qts. (0 days) Apply every 7 - 10 days. Organic approval.

**Boscalid**
- Endura, 5.5 - 10 oz/A every 14 days. (30 days) Maximum of 20 oz/season.

**Fluazinam**
- Omega 500 F, 5.5 fl oz. (14 days) Do not apply more than 3.5 pt in a growing season.

**Iprodione**
- Iprodione 4L, 1 - 2 pt every 14-21 days. (14 days) Maximum of 8 pt/A/season.
- Meteor, 1.5 - 2.0 pt. (14 days).
- Nevado 4F, 1 - 2 pt every 14-21 days. (14 days) Maximum of 8 pt/A/season.
- Rovral 4 Flowable, 2 pt in at least 10 gallons of water per acre. (14 days) See label for rotational crop restrictions.

**Pyrimethanil + Fludioxonil**
- Luna Tranquility, 11.2 fl oz every 7-14 days. (7 days) Maximum of 43.6 fl oz per season.

**Thiophanate-Methyl**
- Tospin M 70 WSB, 1-2 lb. (21 days) Do not apply more than 4 lb per season.

**BROWN LEAF SPOT** (*Alternaria alternata*):

* Bacillus amyloliquefaciens

- Double Nickel 55 WDG, 0.25 - 3.0 lb. (0 days) Apply every 7 - 10 days. Organic approval.
- Double Nickel LC, 0.5 - 6 qts. (0 days) Apply every 7 - 10 days. Organic approval.

**Famoxadone + Cymoxanil**
- Tanco DF, 6 oz every 7-10 days. (14) Maximum of 3 lb/A/season. It is recommended that a protectant partner such as an EBDC (mancozeb or metalom) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

**Mancozeb + Difenoconazole**
- Revus Top, 5.5-7 fl oz every 7-10 days. (14 days) Maximum of 28 fl oz/A/season.

**GRAY MOLD** (*Botrytis cinerea*):

* Bacillus amyloliquefaciens

- Double Nickel 55 WDG, 0.25 - 3.0 lb. (0 days) Apply every 7 - 10 days. Organic approval.

- Double Nickel LC, 0.5 - 6 qts. (0 days) Apply every 7 - 10 days. Organic approval.

**PRE-HARVEST SPRAYS:**

**LATE BLIGHT:** When vines are seriously infected at harvest time. Apply as necessary.
- Blue Viking Star Grow Powder 100 SC, 10 lb.
- Blue Viking Star Shine Crystals 100 SC, 10 lb.

**Note:** The Blue Viking Concentrates should only be applied at vine kill as they are phytotoxic.

**Copper Hydroxide**
- Champ Formula 2 F, 2 to 5 pt.

**Copper-based compounds**
- Kocide 2.4 LF, 2 lb.

**STORAGE DISINFECTION:**

To disinfect storages, boxes, truck beds, bags and equipment (tools, farm machinery), spray or drench surfaces with one of the following compounds:

- **Quaternary ammonium compounds**
  - Aquahyme (E-Z Flo), Use according to manufacturer’s recommendations.
  - Green Shield, 0.5 fl oz per gallon of water.
  - Hy 2389 (Rohm & Haas), Use according to manufacturer’s recommendations.
  - Odorless Disinfectant (Haviland), Use according to manufacturer’s recommendations.

The addition of a wetting agent with quaternary ammonium sprays or drenches is suggested to obtain more uniform coverage of surfaces. Use only those wetting agents recommended by the manufacturer because some are not compatible. Rinse food containers and implements that come in contact with food after treatment.

**Sodium Hypochlorite**
- Chlorine solution, 1,000 to 2,000 ppm concentration. Commercial formulations vary in concentration; therefore, follow manufacturer’s recommendation when mixing solutions. Example: Perchlorin is a granule containing 70% calcium hypo-chlorite. It takes 5 teaspoons in 3 gallons of water to make a solution of 1,000 ppm. Rinse food containers and implements that come in contact with food after treatment.
- Soluble copper sulfate (blue vitriol; bluestone; etc.), 10 to 15 lb in 100 gallons of water.

**Note:** It is important to remove all dirt and trash from surfaces to be treated.

**PRE-STORAGE TREATMENTS FOR STORAGE DISEASES:**

**BACTERIAL SOFT ROT** (*Erwinia carotovora*): Wash potatoes in chlorinated water to (1) disinfect tuber surfaces; (2) cauterize wounds; and (3) promote rapid formation of protective tissue over injured surfaces.

**Sodium Hypochlorite**
- Chlorine solution, . Add a concentrated stock solution of chlorine to wash water to give a concentration of 200 ppm ( = 2 pt household bleach (5.25% sodium hypo-chlorite) per 60 gallons of water or 1 gal of bleach per 240 gallons of water).

Mix stock solutions of chlorine in earthen-ware crocks or plastic containers. DO NOT USE metal containers. Dry washed potatoes before bagging or bulk storing by passing hot air over the end of the sorting table. Usually, the sponge draining technique is inadequate without the addition of heat.

**FUSARIUM DRY ROT** (*Fusarium spp.*):

- Azoxystrubon + Difenoconazole + Fludioxonil

- Merflect 340, 42 oz flowable formulation in 100 gallons of water. Apply as a spray to potato tubers (seed and table stock) at

*Materials marked with an asterisk are particularly recommended for problem infestations.*

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Always read and follow label Instructions carefully
**Pumpkins**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**
Pumpkins are hosts for root-knot and lesion nematodes. These nematodes can reduce pumpkin yields but yield losses in Michigan have not been documented. If you suspect nematodes are reducing pumpkin yields collect root and soil samples for analysis as described in Appendix C. If the numbers of nematodes recovered from those samples exceed damage thresholds; control options will be suggested. Vydate 2L is labeled for use in pumpkins.

**PREPLANT NEMATICIDE TREATMENT:**

- **Fluensulfone**
  - *Nimitz* 480EC, 3.5 - 5.0 pints/A. apply broadcast and incorporate either mechanically or with water to a depth of 6-8 inches at least 7 days prior to transplanting or planting. Do not apply if heavy rainfall is expected within 48 hours of application. This material can be applied in bands or by drip but apparently is most effective if applied broadcast and incorporated. Do not apply to extremely cold soils (<40 F) as nematodes have to be active for the product to be effective. Product has not been evaluated in Michigan.

**INSECTS**

**SEED TREATMENT:**

- **CUCUMBER BEETLE:**
  - Cruiser 5 FS. See label for rates and application methods.

**SOIL TREATMENT:**

- **APHIDS, FLEA BEETLE, LEAFHOPPER, THRIPS:**
  - **Durivo**, 10 to 15 fl oz. (30 days)
  - Thiamectoxam
    - *Platinum* (5 to 11 fl oz.) or *Platinum 75 SG* (1.66 to 3.67 oz.) (30 days) See label for application methods.
  - THRIPS, LEAFHOPPERS, SQUASH BUG:
    - *Venom*, 5 to 6 oz. (21 days) See label for application methods
  - CUTWORM, FLEA BEETLE LARVAE:
    - Capture LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)

**SEED CORN MAGGOT:**

- **Athena**, 8.5 to 17 fl oz. (RUP)
- **Bifenthrin**
  - *Brigade WSB*, 8 to 16 oz. (RUP)
  - *Capture LFR*, 3.4 to 6.8 fl oz. (RUP)
  - See label for application methods.
- **Bifenture**
  - 1.66 to 3.67 oz. See label for application methods.
- **Verimark**
  - *Adire Pro*, 7 to 10.5 fl oz. (21 days)
  - *Nuprid* 2 F, 16 to 24 fl oz. (21 days)
  - *Scorpion 35SL*, 9 to 10.5 fl oz. (21 days)
- **Verimark**, 10-13.5 oz/A. (1)
- **APHIDS, CUCUMBER BEETLES, LEAFHOPPERS, THRIPS:**
  - **Belay** 50 WDG, 4.8 to 6.4 oz.
  - **Imidacloprid**
    - *Adire Pro*, 7 to 10.5 fl oz. (21 days)
    - *Nuprid 2 F*, 16 to 24 fl oz. (21 days)
    - *Scorpion 35SL*, 9 to 10.5 fl oz. (21 days)
- **ARMYWORM:**
  - **Verimark**, 6.75-13.5 oz/A. (1)
- **APHIDS and THRIPS:**
  - **Verimark**, 10-13.5 oz/A. (1)
- **LEAFHOPPERS:**
  - **Sivanto**, 21 - 28 fl oz/A.
- **APHIDS:**
  - **Sivanto**, 21 - 28 fl oz/A.
- **WHITEFLIES:**
  - **Sivanto**, 21 - 28 fl oz/A.

**FOLIAR TREATMENT:**
Pumpkin plants may be sensitive to insecticide formulations under certain conditions. Be sure a problem exists before treatment. Read and observe restrictions or the label. To avoid killing bees, do not treat pumpkins during bloom. See the Insecticide Effectiveness table for bee toxicity.

- **CUTWORM:** Apply when damage is first seen and repeat as needed.
  - *Baythroid XL*, 0.8 to 1.6 fl oz. (0 days) (RUP)
  - *Bifenthrin*
    - *Bifenture EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
    - *Brigade @ EEC* (2.6 to 6.4 fl oz.) or *Brigade WSB* (8 to 16 oz.) (3 days) (RUP)
    - *Capture EC*, 2.6 to 6.4 fl oz. (3 days) (RUP)
    - *Discipline EEC*, 2.6 to 6.4 fl oz. (3 days) (RUP)

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*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label instructions carefully.
**Pumpkins**

- **Esfenvalerate**
- **Adjourn**, 5.8 to 9.6 fl oz. (3 days) (RUP)
- **Asana XL**, 5.8 to 9.6 fl oz. (3 days) (RUP)
- **S-FenvalStar**, 5.8 to 9.6 fl oz. (3 days) (RUP)
  *Esfenvalerate*

- **Permethrin**
- **Ambush** 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
- **Perm-UP 25DF** (6.4 to 12.8 oz.) or **Perm-UP 3.2 EC** (4 to 8 oz.) (RUP)
- **Pounce** 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)

*Permethrin*

- **Belay**
- **Baythroid**
- **Athena**, 7 to 17 fl oz. (7 days) (RUP)
- **Belt SC**, 1.5 fl oz. (1 day)
- **Bifenthrin + Zeta-Cypermethrin**
  - **Hero** (4 to 10.3 oz.) or **Hero EW** (4.5 to 11.2 oz.) (3 days) (RUP)
  - **Steed**, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - **Endigo ZC**, 4 to 4.5 fl oz. (1 day) (RUP)
  - **Gladiator**, 6 to 19 fl oz. (7 days) (RUP)
- **Javelin WG**, 0.12 to 1.5 lb. (0 days)

*Stripped and spotted cucumber beetle: Apply as soon as beetles are seen and repeat as needed to prevent bacterial wilt disease.

- **Acetamiprid**
  - **Assail 30 SG**, 2.5 to 5.3 oz. or **Assail 70 WP** (1.1 to 2.3 oz.) (0 days) (RUP)
  - **Bifenture EC**, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - **Brigeade @ 2 EC** (2.6 to 6.4 fl oz.) or **Brigeade WSB** (8 to 16 oz.) (3 days) (RUP)
  - **Capture 2 EC**, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - **Discipline 2EC**, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - **Fanfare 2EC**, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - **Sniper**, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - **Tundra EC**, 2.6 to 6.4 fl oz. (3 days) (RUP)

- **Bifenthrin + Zeta-Cypermethrin**
  - **Hero** (4 to 10.3 oz.) or **Hero EW** (4.5 to 11.2 oz.) (3 days) (RUP)
  - **Steed**, 3.5 to 4.7 fl oz. (3 days) (RUP)

- **Carbarly**
  - **Carbaryl 4L**, 1 qt. (3 days) (RUP)
  - **Sevin F** (1 qt.) or **Sevin 80 S** (1.25 lb.) or **Sevin XLR Plus** (1 qt.) (3 days) (RUP)

- **Dinofeturan**
  - **Scorpion 35SL**, 2 to 7 fl oz. (1 day) (RUP)
  - **Steed**, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - **Bifenture 10 DF**, 8 to 16 oz/A. (3 days)

- **Carbaryl**
  - **Carbaryl 4L**, 1 qt. (3 days) (RUP)
  - **Sevin F** (1 qt.) or **Sevin 80 S** (1.25 lb.) or **Sevin XLR Plus** (1 qt.) (3 days) (RUP)

- **Dinofeturan**
  - **Scorpion 35SL**, 2 to 7 fl oz. (1 day) (RUP)
  - **Steed**, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - **Bifenture 10 DF**, 8 to 16 oz/A. (3 days)
  - **Carbaryl 4L**, 1 qt. (3 days) (RUP)

**Materials marked with an asterisk are particularly recommended for problem infestations.**

Always read and follow label instructions carefully.
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
- Carbaryl
  - Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

Dinofuran
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)

Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Permethrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

Mustang Max, 2.8 to 4 oz. (1 day) (RUP)
- Permethrin
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
  - Pyrene, 1 to 12 fl oz. (0 days)
  - Carbaryl 4L, 1 qt. (3 days)
  - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
- Sivanto, 21 - 28 fl oz/A.
- Vetica, 14 to 17 fl oz. (7 days)

SQUASH BUG: Apply as needed.
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Permethrin
  - Ambush 25 W, 12.8 oz. (0 days) (RUP)
  - Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)
  - Pounce 25 WP, 12.8 oz. (0 days) (RUP)
- Acetamiprid
  - Assail 30 SG (5.3 oz.) or Assail 70WP (2.3 oz.) (0 days)
  - Athena, 7 to 17 fl oz. (7 days) (RUP)
- Belt SC, 1.5 fl oz. (1 day)
- Bifenthrin
  - Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Discipli-Bio, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Endosulfan 3 EC, 0.66 to 1.33 qt. (11 days) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)
- Bifenthrin + Cypermethrin
  - Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Endosulfan 3 EC, 0.66 to 1.33 qt. (11 days) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Pumpkins

Beleaf 50 SG, 2 to 2.8 oz. (0 days)

**Bifenthrin**
- Bifenthrin EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Malathion, 2.4 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Nyvar @ 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

**Bifenthrin + Avermectin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (7 days) (RUP)
- Bifenthrin 10 DF, 8 to 16 oz/A. (3 days) (RUP)
- Coragen, 3.5 to 5 fl oz. (1 day) (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Gladiator, 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 10 fl oz. (3 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

**Malathion**
- Malathion 5, or Malathion 57 EC (1.5 pt.) or Malathion 8 Aquamul (1 pt.) (1 day)

**Permethrin**
- Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)
- Pounce 25 WP, 12.8 oz. (0 days) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Sivanto, 21 - 28 fl oz/A.
- Voliam Flexi, 4 to 7 oz. (1 day)
- Vydate L, 2 to 4 pt. (1 day) (RUP)

**THRIPS:**
- Athena, 13.5 to 17 fl oz. (7 days) (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Exirel, 13.5-20.5 oz/A. (1)
- Lambda-Cy, 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.92 fl oz.) or Warrior with Zeon Technology (3.84 fl oz.) (1 day) (RUP)
- Malathion 8 Aquamul, 1 pt. (1 day)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Radiant SC, 6 to 10 fl oz. (3 days)
- Rimon 0.83EC, 12 fl oz. (1 day)
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Vydate L, 2 to 4 pt. (1 day) (RUP)

**SEED CORN MAGGOT:**
- Empower, 3.5 to 8.7 lb. (3 days) (RUP)

**ARMYWORM:**
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Avaunt, 3.5 to 6 oz. (3 days)
- Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
- Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
- Beleaf 50 SG, 10.66 to 16 fl oz. (7 days)
- Belt SC, 1.5 fl oz. (1 day)
- Bifenthrin
  - Bifenthrin EC, 2.6 to 6.4 oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

**MITES**
Apply when needed. Usually a problem only in hot dry weather.
- Abamectin
  - Assail 30 SG, 2.5 to 5.3 oz. (0 days)
  - Assail 70WP, 1.1 to 2.3 oz/A. (0 days)
- Exirel, 7-13.5 oz/A. (1)

**WHITEFLIES:**
- Sivanto, 21 - 28 fl oz/A.

*Materials marked with an asterisk are particularly recommended for problem infestations.*
Materials marked with an asterisk are particularly recommended for problem infestations.

**Slug Control**
Deadline M-Ps 4% (20 to 40 lb) or Metaldehyde 3.5 G (30 to 40 lb) Apply between rows. Avoid contact with edible product.

**Diseases**

**Seed Treatment: Damping Off (Pythium spp., Phytophthora spp., Rhizoctonia solani):** Use only as directed; over-treatment may cause injury.
- Captan 4 Flowable, 2 fl oz/100 lb seed.
- Fludioxonil Max 4 FS, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia).
- Thiram 42-S Thiram, Thiram 480 DP, Thiram 50 WP Dyed, 4 1/2 oz/100 lb seed.

**Pre-Plant Fumigation:**
*Note:* Most fumigants applied to the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.

Soil sterilization by fumigation is best achieved by proper application of soil fumigants. Special care is needed to seal fumigants in target zones for required time periods. This can be achieved by soil packing or immediate tarping to seal fumigants in target zones for required time periods. This can be achieved by soil packing or immediate tarping.

**4-Chloro-1,2-Dichloropropane/chloropicrin**
- Telone C35, 13-35 gal. (RUP)
- Metam Potassium Sectagon-K54, 30-60 gal. (RUP)
- Metam Sodium Sectagon 42, 37-5-75 gal. (RUP)

**1,3-Dichloropropene/chloropicrin**
- Thiram 42-S Thiram, Thiram 480 DP, Thiram 50 WP Dyed, 4 1/2 oz/100 lb seed.

**Pre-Plant Incorporation:**
**Foliar Treatment:**

**Foliar Treatment:**

**Alternaria Leaf Spot (Alternaria cucumerina), Anthracnose (Colletotrichum lagenarium):** Apply every 7 to 14 days after disease appears.
- *Azoxystrobin* Quardis, 11.0 to 15.5 fl oz. (1 day)
  - Do not apply more than one foliar application of Amistar and Quardis or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- *Azoxystrobin + Chlorothalonil* Quardis Opti, 3.2 pt. (1 day)
- *Azoxystrobin + Difenconazole* Quardis Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
- *Chlorothalonil* Bravo Ultrex (1.4 to 1.8 lb (Anthracnose) or 1.8 to 2.7 lb (Alternaria)) or Equus DF (1.4 to 1.8 lb) (0 days)
- *Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt, (Anthracnose) or 2 to 3 pt (Alternaria). (0 days)
- Echo 90 DF, 1 1/4 to 1 5/8 lb (Anthracnose), 1 5/8 to 2 1/2 lb (Alternaria), (0 days)
- *Fluxapyroxad + Pyraclostrobin* Merivon, Xemium Brand Fungicide, 4 - 5.5 fl oz. (0 days)
- *Pyraclostrobin* Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- *Pyraclostrobin/Boscalid* Pristine, 12.5 to 18.5 oz for Alternaria, 18.5 oz for Anthracnose. (0 days) See label for use of adjuvants.
- *Thiophanate-Methyl* Cercobin 4.1F, 10.9 fl oz. (1 day)
- *Topsin* 4.5 FL, 10 fl oz. (1 day) Anthracnose only.
- *Topsin M 70 WP, Topsin M WSB, 0.5 lb. (1 day) Anthracnose only.

**Bacillus amyloliquefaciens**
- *Senfel, 4 - 16 fl oz. (0 day)

**Boscalid**
- *Dithane* Endura, 6.5 oz. (0 days) Alternaria only.
- *Copper Ammonium Carbonate* Copper Count N, 1 1/2 to 2 qt. (0 days)
- *Copper Hydroxide* Champ DP Dry Prill, 1 1/3 lb. (0 days)
- *Copper Formula 2 F, 1 1/3 pt. (0 days)
- *Champion WP, 1.5 to 3 lb. (0 days)
- *Kocide 2000, 1 1/2 lb. (0 days)
- *Kocide 3000, 0.5-1.25 lb. (0 day)
- *Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

**Copper Hydroxide + Copper Oxchloride**
- *Budge SC, 1 to 2.5 pt. (0 days)
- *Copper Oxchloride + Copper Sulfate* C-O-C-S WDS, 1 to 2 lb. (0 days)

**Copper Sulfate**
- *Cupr fix Ultra 40 Disperss, 1 to 2 lb. (0 days)
- *Difenconazole + Cyproconazole* Inspire Super, 16 to 20 fl oz. (7 days)
- *Famoxadone + Cyloxanil* Tanos, 8 oz. (3 days)
- *Fenamidone* Reason 500 SC, 5.5 fl oz. (14 days) Alternaria only.
- *Mancozeb* Dithane M-45, 2 to 3 lb. (5 days)
- *Koverall, 2 - 3 lb. (5 days)

**Drying Application:**
*Pythophthora Blight (Phytophthora capsici), Downy Mildew (Pseudomonospora cubensis):*
- *Amectin* + Dimethomorph Presidio, 3-4 fl oz (2 days)
- *Zampro, 14 fl oz. (0 days)
- *Fluopicolide* Presidio, 3-4 fl oz (2 days)
- *Zampro, 14 fl oz. (0 days)

**Pythium Root Rot:**
- *Mefenoxam* Ridomil Gold SL, 0.25-0.4 pt. (5 days)

**Application:**
- *Boscalid* 1 1/3 pt. (0 days) Anthracnose only.
- *Copper Ammonium Carbonate* Copper Count N, 1 1/2 to 2 qt. (0 days)
- *Copper Hydroxide* 1 1/3 lb. (0 days)
- *Champion WP, 1.5 to 3 lb. (0 days)
- *Kocide 2000, 1 1/2 lb. (0 days)
- *Kocide 3000, 0.5-1.25 lb. (0 day)
- *Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)
- *Cu Pr Fix Ultra 40 Disperss, 1 to 2 lb. (0 days)

**Copper Oxchloride + Copper Sulfate**
- *C-O-C-S WDS, 1 to 2 lb. (0 days)
- *Copper Sulfate* Cupr fix Ultra 40 Disperss, 1 to 2 lb. (0 days)
- *Difenconazole + Cyproconazole* Inspire Super, 16 to 20 fl oz. (7 days)
- *Famoxadone + Cyloxanil* Tanos, 8 oz. (3 days)
- *Fenamidone* Reason 500 SC, 5.5 fl oz. (14 days) Alternaria only.
- *Mancozeb* Dithane M-45, 2 to 3 lb. (5 days)
- *Koverall, 2 - 3 lb. (5 days)
Pumpkins

- Manzate Max, 1.6 to 2.4 qt. (5 days)
- Manzate Pro-Stick, 2 to 3 lb. (5 days)
- Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days)
- Mancozeb + Zoxamide
- Gavel 75 DF, 1.5 - 2.0 lb. (5 days) Alternaria only.
- Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt. (0 days)
- Neem Oil
- Trilogy, 2 pt. (0 days)
- Penthiopyrad
- Fontelis, 12 - 16 fl oz. (1 day) Alternaria only.
- Potassium Bicarbonate
- Armicarb 100, 2.5 to 5 lb. (0 days)
- Potassium phosphate/chlorothalonil
- Catamaran, 6 pt (Alternaria), 4 pt (Anthracnose). (1 day)
- Zoxamide + chlorothalonil
- Zing!, 36 fl oz. (0 days)

ANGULAR LEAF SPOT (Pseudomonas lachrymans): Spray every 7 days, starting before the first fruit forms and continue to protect fruit at all stages of development.

Copper Ammonium Carbonate
- Copper Count N, 1 1/2 to 2 qt. (0 days)
- Copper Hydroxide
- Champ DP Dry Prill, 1 1/3 lb. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champion WP, 1.5 to 3 lb. (0 days)
- Kocide 2000, 1 1/2 lb. (0 days)
- Kocide 3000, 0.5-1.25 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)
- Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt. (0 days)
- Copper Sulfate
- Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)
- Neem Oil
- Trilogy, 2 pt. (0 days)

SCAB (Cladosporium cucumerinum): Apply every 7 to 10 days after plants are 2 to 3 inches tall.

- Chlorothalonil
- Bravo Utrex, Equus DF, 1.8 to 2.7 lb. (0 days)
- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
- Echo 90 DF, 1 5/8 to 2 1/2 lb. (0 days)
- Mancozeb
- Koverall, 2 - 3 lb. (5 days)
- Manzate Max, 1.6 to 2.4 qt. (5 days)
- Manzate Pro-Stick, 2 to 3 lb. (5 days)
- Mancozeb + Copper Hydroxide
- ManKocide, 2-3 lb. (5 days)
- Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt. (0 days)
- Neem Oil
- Trilogy, 2 pt. (0 days)
- Potassium phosphate/chlorothalonil
- Catamaran, 6 pt. (1 day)

POWDERY MILDEW (Sphaerotheca fulginea, Erysiphe cichoracearum): Treat at disease appearance and at 7-day intervals.

- Azoxystrobin + Difenzoconazole
- Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
- Cyfluorenidam
- Torno, 3.4 oz. (0 day)

* Materials marked with an asterisk are particularly recommended for problem infestations.

**Always read and follow label instructions carefully**
Neem Oil
- Trilogy, 2 pt. (0 days)

Potassium Bicarbonate
- Amicarb 100, 2.5 to 5 lb. (0 days)

Sulfur
- Microthiol Disperss, 5 to 10 lb. (0 days)

Tebuconazole
- Oris 3.6F, Tebuzeol 3.6, 4-6 fl oz. (7 days)

Triflumizole
- Procure 480 SC, 4 to 8 fl oz. (0 days)

GUMMY STEM BLIGHT, BLACK ROT (Didymella bryoniae also called Mycosphaerella melonis): Begin at the 2-leaf stage and apply every 7 to 14 days.

- Azoxystrobin: Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action
  - Quadris, 11.0 to 15.5 fl oz. (1 day)
- Azoxystrobin + Chlorothalonil
  - Quadris Opti, 3.2 pt. (1 day)
- Chlorothalonil
  - Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)
  - Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
- Echo 90 DF, 1 5/8 to 2 1/2 lb. (0 days)
- Thiophanate-Methyl
  - Topsin 4.5 FL, 10 fl oz. (1 day)
  - Topsin M 70 WP, Topsin M WSB, 0.5 lb. (0 days)

Azoxystrobin + Difenconazole
- Quadris Top, 12 to 14 fl oz. (0 days)
- Quadris Opti, 3.2 pt. (1 day)

Azoxystrobin + Difenconazole
- Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

Boscalid
- Endura, 6.5 oz. (0 days)

Copper Ammonium Carbonate
- Copper Count N, 1 1/2 to 2 qt. (0 days)

Copper Hydroxide
- Champ DP Dry Prill, 1 1/3 lb. (0 days)
  - Champ Formula 2 F, 1 1/3 pt. (0 days)
  - Champion WP, 1.5 to 3 lb. (0 days)
  - Kocide 2000, 1 1/2 lb. (0 days)
- Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt. (0 days)
- Copper Sulfate
  - Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)

Difenconazole + Cyprodinil
- Inspire Super, 16 to 20 fl oz. (7 days)

Kresoxim-methyl
- Sovran, 4.8 oz. (0 days)

Mancozeb
  - Manzate Max, 1.6 to 2.4 qt. (5 days)
  - Manzate Pro-Stick, 2 to 3 lb. (5 days)

Mefenoxam + Chlorothalonil
- Ridomil Gold Bravo, 2.5 to 3.25 pt. (0 days)

Penthiopyrad
- Fontelis, 12 - 16 fl oz. (1 day)

Potassium phosphate/chlorothalonil
- Catamaran, 6 pt. (1 day)

Pyraclostrobin
- Cabrio, 12 to 16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

Pyraclostrobin/Boscalid
- Pristine, 12.5 to 18.5 oz. (0 days) See label for use of adjuvants.

Tebuconazole
- Oris 3.6F, Tebuzeol 3.6, 8 fl oz. (7 days) Approved for gummy stem blight. Suppression only.

Tebuconazole
- Oris 3.6F, Tebuzeol 3.6, 8 fl oz. (7 days) Suppression only.

Triadimenol
- Mefenoxam + Chlorothalonil
  - Topsin 4.5 FL, 10 fl oz. (1 day)
  - Topsin M 70 WP, Topsin M WSB, 0.5 lb. (1 day)

DOWNY MILDEW (Pseudoperonospora cubensis): Begin applications when conditions are favorable for disease, but before infection.

- Ametoctadin + Dimethomorph
  - Zampro, 14 fl oz. (0 days)

- Chlorothalonil
  - Bravo Ultrex, Equus DF, 1.4 to 1.8 lb. (0 days)
  - Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)
  - Echo 90 DF, 1 1/4 to 1 5/8 lb. (0 days)
  - Cyzofamid
    - Ranman 400SC, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)

- Cymoxanil
  - Curzate 60 DF, 3.2 to 5 oz. (3 days)
  - Famoxadone + Cymoxanil
  - Taros, 8 oz. (3 days)

- Mancozeb + Zoxamide
  - Gavel 75 DF, 1.5 - 2.0 lb. (5 days)

- Propamocarb
  - Previcur Flex, 1.2 pt every 7 - 14 days. (2 days)

Azoxystrobin
- Quadris, 11.0 to 15.5 fl oz. (1 day)

Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

- Azoxystrobin + Chlorothalonil
  - Quadris Opti, 3.2 pt. (1 day)
- Azoxystrobin + Difenconazole
  - Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

Bacillus amyloliquefaciens
- Senfil, 4 - 16 fl oz. (0 day)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1 to 2.5 pt. (0 days)

Dimethomorph
- Forum, 6 fl oz. (0 days)

Fenamidine
- Reason 500 SC, 5.5 fl oz every 5 to 10 days. (14 days)

Fluopicolide
- Pradisio, 3-4 fl oz. (2 days)

Fluxapyroxad + Pyraclostrobin
- Merivon Xemium Brand Fungicide, 5.5 fl oz. (0 days) Suppression only

Fosetyl-Aluminum
- Allele WDG, 2 to 5 lb, 7- to 14-day intervals. (0 days) Do not tank mix with copper fungicides.

Mancozeb
  - Overview, 2 - 3 lb. (5 days)
  - Manzate Max, 1.6 to 2.4 qt. (5 days)
  - Manzate Pro-Stick, 2 to 3 lb. (5 days)
- Mancozeb + Copper Hydroxide
  - ManKocide, 2-3 lb. (5 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Radishes

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES

Root-knot nematodes can reduce radish yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the root-knot nematode is present at a population density above the economical threshold for radishes, crop rotation or application of a nematicide is recommended. The following nematicide is suitable for control of root-knot nematodes in radish production. Application is only needed before the first crop. The radish life cycle is shorter than that of the northern root-knot nematode and radishes serve as a good trap crop for this nematode.

FALL SOIL TREATMENT (BROADCAST):

1,3-D
- Telone II, 25 gal/A (muck soil).
  Fumigate in the fall when soil temperatures at a 6 inch depth are above 50°F. Inject the fumigant to soil depth of 6 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.

Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

INSECTS

SOIL TREATMENT:

CABBAGE MAGGOT:

Chlorpyrifos
- Chlorpyrifos 15G (3.3 oz/1000 row ft.) or Chlorpyrifos 4E AG (5.5 pt as pre-plant; 1 fl oz/1000 row ft at planting) (7 days for 15G, 30 days for 4E AG) (RUP)
- Govern, 5.5 pt as pre-plant; 1 fl oz/1000 row ft at planting. (30 days) (RUP)
- Hatchet, 5.5 pt as pre-plant; 1 fl oz/1000 row ft at planting. (30 days) (RUP)
- Lorsban 15 G (3.3 oz/1,000 row ft at planting) or Lorsban 4E (5.5 pt as pre-plant, 1 fl oz/1,000 row ft at planting) or Lorsban 75 WG (3.66 lb as pre-plant, 0.67 oz/1000 row ft at planting) (30 days) (RUP)
- Nufos 4E, 0.5 fl oz/1000 row ft. (30 days) (RUP)
- Saurus, 3.3 oz/1,000 row ft at planting. (7 days) (RUP)
- Vulcan, 1 fl oz/1,000 row ft at planting. (30 days) (RUP)
- Whirlwind, 1 fl oz/1,000 row ft at planting. (30 days) (RUP)

LEAFHOPPERS, APHIDS, FLEA BEETLE: See label for application method.

Imidacloprid
- Admire Pro, 4.4 to 10.5 fl oz. (21 days)
- Nupid 2 F, 10 to 24 oz. (21 days)

Thiamethoxam
- Platinum (5 to 6.5 fl oz.) or Platinum 75 SG (1.7 to 2.17 oz.) See label for application methods.
Materials marked with an asterisk are particularly recommended for problem infestations.

**CUTWORM:**
- **Diazinon**
  - Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) (RUP)

**APHIDS, LEAFHOPPER:**
- **Sivanto,** 7 - 10.5 fl oz/A.
- **WHITEFLIES:**
  - Sivanto, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**
**ARMYWORM, CUTWORM:** Apply as needed.
- **Bifenthrin**
  - Bifenture 10 DF, 12.8 to 16 oz/A. (21 days)
  - Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Carbaryl
    - Carbaryl 4L, 1 to 2 qt. (7 days)
    - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (7 days)
    - Javelin WG, 0.12 to 1.5 lb. (0 days)
    - Nuprid, 1 to 12 fl oz. (0 days)
  - Carbaryl 4L, 1 to 2 qt. (7 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (7 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - Nuprid, 1 to 12 fl oz. (0 days)

**FLEA BEETLE:** Apply when damage is first seen. Repeat if needed.
- **Actara,** 1.5 to 3 oz. (7 days)
  - Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
  - Bifenthrin
    - Bifenture 10 DF, 12.8 to 16 oz/A. (21 days)
    - Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
    - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
    - Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
    - Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
    - Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
    - Carbaryl
      - Carbaryl 4L, 0.5 to 1 qt. (7 days)
      - Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)

**Diazinon AG 500,** 0.5 to 1 pt. (14 days) (RUP)

**ESFENVALERATE**
- Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (7 days) (RUP)

**IMIDACLOPRID**
- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 3.5 oz/Acre per season.

**LEVERAGE 360,** 2.4 to 2.8 fl oz. (7 days) (RUP)

**MALATHION**
- Malathion 5 (1.6 pt.) or Malathion 5 EC (1.5 to 2 pt.) or Malathion 5 EC 1 (1.6 pt.) or Malathion 8 AG 500 (1 pt.) (7 days)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Sivanto, 7 - 10.5 fl oz/A.
- Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

**CUTWORM:**
- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
- DiPel DF, 0.5 to 1 lb. (0 days)
- Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
- Mustang Max, 1.28 to 4 oz. (1 day) (RUP)
- Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)

**LEAFHOPPER:**
- Actara, 1.5 to 3 oz. (7 days)
- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
- Carbaryl
  - Carbaryl 4L, 0.5 to 2 qt. (7 days)
  - Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)

**IMIDACLOPRID**
- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 3.5 oz/Acre per season.

**LEVERAGE 360,** 2.4 to 2.8 fl oz. (7 days) (RUP)

**MALATHION**
- Malathion 5 (1.6 pt.) or Malathion 5 EC (1.5 to 2 pt.) or Malathion 5 EC 1 (1.6 pt.) or Malathion 8 AG 500 (1 pt.) (7 days)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Sivanto, 7 - 10.5 fl oz/A.
- Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

**LEAFHOPPER:**
- Actara, 1.5 to 3 oz. (7 days)
- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
- Carbaryl
  - Carbaryl 4L, 0.5 to 2 qt. (7 days)
  - Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)

**IMIDACLOPRID**
- Admire Pro, 1.2 fl oz. (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days)
- Leverage 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
- Malathion 8, 2 pt. (7 days)
Rhubarb

Mustang Max, 1.76 to 4 oz. (1 day) (RUP)
Pyreneone, 1 to 12 fl oz. (0 days)
Carbaryl 4L, 0.5 to 2 qt. (7 days)
Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)
Sivanto, 7 - 10.5 fl oz/A.
Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

SEED TREATMENT:

SLUGS

Carbaryl
Sevin
Carbaryl
Leverage

MITES

Carbaryl

SOIL TREATMENT:

ALTERNARIA LEAF SPOT (Alternaria raphani):

Azoxystrobin
Quadris
Pyraclostrobin

FOLIAR TREATMENT:

ALTERNARIA LEAF SPOT (Alternaria raphani):

Azoxystrobin
Quadris
Pyraclostrobin

Whites RUST (Albugo candida): Apply foliar spray 40 to 50 days following Ridomil at-planting application and make 2 to 4 applications on a 14-day schedule depending on disease development.

Mefenofox + Copper Hydroxide
Ridomil Gold Copper 40-50 days after at-planting application of Ridomil Gold SL. Maximum 4 applications. Observe limit of a.i./A per season.

Pyraclostrobin
Cabrio, 8 to 16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

SEPTORIA LEAF SPOT (Septoria lycopersici):

Trifloxystrobin
• Flint, 2 to 4 oz. (7 days) Maximum 8 oz/year.

Rhubarb

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

INSECTS

SOIL TREATMENT:

ARMYWORM, CORN EARWORM, DIAMONDBACK MOTH, :
Verimark, 5-10 oz/A. (0 days)

LOOPERS, APHIDS, LEAFMINERS:
Verimark, 6.75-13.5 oz/A. (0 days)

DAMPING OFF (Pythium and Phytophthora spp.):
Mefenofox. Apply as a broadcast preplant application or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

• Ridomil Gold SL (1-2 pt) or Ultra Flourish (2 to 4 pt)
FOLIAR TREATMENT:

APHIDS, LOOPERS:

Permethrin
Mustang
Gladiator
Baythroid
Proclaim

CUTWORM, LOOPERS:

CABBAGE LOOPERS:

Aphids, Loopers:

Permethrin
Mustang
Gladiator
Baythroid
Proclaim

Rhubarb Curculio: No materials are currently registered.

ARMYWORM:

Exirel, 7-13.5 oz/A. (1)

CORN EARWORM:

Exirel, 7-13.5 oz/A. (1)

MITES

Abamectin
Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
Bifenthrin
Sniper, 5.12 to 6.4 fl oz. (7 days) (RUP)
Zeta-Cypermethrin + Avermectin
Gladiator, 19 fl oz. (7 days) (RUP)

DISEASES

SEED TREATMENT:

DAMPING OFF (Pythium spp., Rhizoctonia solani):

Fludioxine
Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia).
Mefenoxam
Apron XL, 0.085 - 0.64 fl oz/100 lb seed (Pythium).
Metalaxyl
Alliance-FL, 0.75 fl oz/100 lb seed (Pythium).

PREPLANT INCORPORATED:

DAMPING OFF (Pythium spp.):

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. Note: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.

Ridomil Gold GR, 20 to 40 lb.
Ridomil Gold WSP, 1 to 2 lb.
Ultra Flourish, 2 to 4 pt.

FOLIAR TREATMENT:

LEAF ROT, BOTRYTIS GRAY MOLD (Botrytis cinerea):

Fluxapyroxad + Pyraclostrobin
Merivo
Xemium Brand Fungicide, 8 to 11 fl oz. (1 day)
Penthiopyrad
Fontelis, 14 - 24 fl oz. (3 days)

ALTERNARIA LEAF SPOT:

Fluxapyroxad + Pyraclostrobin
Merivo
Xemium Brand Fungicide, 4 - 11 fl oz. (1 day)
Azoxystrobin
Quadris, 6.0 to 15.5 fl oz. (0 days)
Fenamidine
Reason 500 SC, 5.5 to 8.2 fl oz. (2 days) No more than 1 application before alternating
Penthiopyrad
Fontelis, 14 - 24 fl oz. (3 days)
Pyraclostrobin
Cabro, 12 to 16 oz. (0 days)

CERCOSPORAL LEAF SPOT (Cercospora spp.):

Azoxystrobin
Quadris, 6 to 15.5 fl oz. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Rutabagas

Recommended for problem infestations.

Leaffoppers, Aphids, Flea Beetle: See label for application methods.

**SOIL TREATMENT:**

**CABBAGE MAGGOT:** Apply in a 4- to 6-inch band around seed at time of planting so plants grow in treated soil.

- **Chlorpyrifos**
  - Chlorpyrifos 15G (4.6 to 9.3 oz/1000 row ft at planting) or Chlorpyrifos 4E AG (4.5 pt as pre-plant; 1.6 to 3.3 fl oz/1000 row ft at planting) (7 days for 15G, 30 days for 4E AG) (RUP)
  - Govem, 4.5 pt as pre-plant; 1.6 to 3.2 fl oz/1000 row ft at planting. (30 days) (RUP)
  - Hatchet, 4.5 pt as pre-plant; 1.6 to 3.2 fl oz/1000 row ft at planting. (30 days) (RUP)
  - Lorsban 15 G (4.6 to 9.2 oz/1000 row ft.) or Lorsban 4 E / Lorsban Advanced (4.5 pt as pre-plant, 1.6 to 3.3 fl oz/1000 row ft at planting) or Lorsban 75 WG (3 lb as pre-plant, 1.1 to 2.15 oz/1000 row ft at planting) (RUP)
  - Nufos 4E, 1.6 fl oz/1000 row ft at planting. (30 days) (RUP)
  - Saurus, 4.6 to 9.2 oz/1000 row ft at planting. (7 days)
  - Vulcan, 1.6 to 3.3 fl oz/1000 row ft at planting. (RUP)
  - Warhawk, 1.6 to 3.3 fl oz/1000 row ft at planting. (RUP)
  - Whirlwind, 1.6 to 3.2 fl oz/1000 row ft at planting. (30 days) (RUP)

**Diazinon**

- Diazinon W (4 to 6 lb.) or Diazinon AG600 (51 to 102 fl oz.) (RUP)

**FOLIAR TREATMENT:**

**Flea Beetle:** Apply if necessary.

- **Actara,** 1.5 to 3 oz. (7 days)
- **Bifenthrin**
  - Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

**Flea**

- **Bifenthrin** + Zeta-Cypermethrin
  - Hero (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)
  - Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)
  - Bifenture 10 DF, 12.8 to 16 oz/A. (21 days)
  - Carbaryl
    - Carbaryl 4L, 0.5 to 1 qt. (7 days)
    - Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (7 days)
  - Imidacloprid
    - Admire Pro, 1.2 fl oz. (7 days)
    - Nuprid 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.
  - Mustang Max, 1.76 to 4 oz. (1 day) (RUP)
  - Pyr enone, 1 to 12 fl oz. (0 days)
  - Carbaryl 4L, 0.5 to 1 qt. (7 days)
  - Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin XL R Plus (0.5 to 1 qt.) (7 days)
  - Spinosad
    - Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (3 days)
  - Mustang, 1.6 to 3 oz. (7 days)
  - Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
  - Pyr enone, 1 to 12 fl oz. (0 days)
  - Radiant SC, 5 to 10 fl oz. (7 days)

**APHIDS:** Apply as needed to prevent population build up.

- **Actara,** 1.5 to 3 oz. (7 days)
- **Beleaf 50 SG,** 2 to 2.8 oz. (3 days)
- **Bifenthrin**
  - Bifenture 10 DF, 12.8 to 16 oz/A. (21 days)
  - Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Intrepid 2F, 6 to 16 fl oz. (14 days) 4 to 10 fl oz with PHI of 1 day when harvesting leaves.
  - Malathion 57 EC, 1 to 1.6 pt. (7 days)
  - Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
  - Pyr enone, 1 to 12 fl oz. (0 days)
  - Radiant SC, 5 to 10 fl oz. (7 days)

**WHITEFLIES:**

- **Actara,** 10.5 to 14 fl oz/A.

*Materials marked with an asterisk are particularly recommended for problem infestations.*

**INSECTS:**

**SOIL TREATMENT:**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**LEAFHOPPERS, APHIDS, FLEA BEETLE:** See label for application methods.

- **Imidacloprid**
  - Admire Pro, 4.4 to 10.5 fl oz. (21 days)
  - Nuprid 2 F, 10 to 24 fl oz. (21 days) Apply pre-plant or in furrow.

- **Thiamethoxam**
  - Platinum (5 to 12 fl oz.) or Platinum 75 SG (1.7 to 4.01 oz.) (30 days) See label for application methods.

- **APHIDS, LEAFHOPPERS:**
  - Sivanto, 7 - 10.5 fl oz/A.

- **WHITEFLIES:**
  - Sivanto, 10.5 - 14 fl oz/A.

**FOLIAR TREATMENT:**

**Flea Beetle:** Apply if necessary.

- **Actara,** 1.5 to 3 oz. (7 days)
- **Bifenthrin**
  - Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
  - Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)

- **Bifenthrin** + Zeta-Cypermethrin
  - Hero (2.6 to 6.1 oz.) or Hero EW (2.8 to 6.7 oz.) (21 days) (RUP)
  - Steed, 2.5 to 3.5 fl oz. (21 days) (RUP)

**Malathion**

- Malathion 5 (1.6 pt.) or Malathion 5 EC (1.5 pt.) or Malathion 57 EC (1 to 1.6 pt.) or Malathion 8 (1 to 2 pt.) or Malathion 8 Aquamul (1 pt.) (3 days for Malathion 5 & 8; 7 days for all others)
- Pyr enone, 1 to 12 fl oz. (0 days)
- Sivanto, 7 - 10.5 fl oz/A.
LEAFHOPPER:
- Actara, 1.5 to 3 oz. (7 days)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)

Carbaryl
- Carbaryl 4L, 0.5 to 2 qt. (7 days)
- Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)

Imidacloprid
- Admire Pro, 1.2 oz (7 days)
- Nuprid 1.6 F, 3.5 fl oz. (7 days)
- Mustang Max, 1.76 to 4 oz. (1 day) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Carbaryl 4L, 0.5 to 2 qt. (7 days)
- Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (7 days)
- Sivanto, 7 - 10.5 fl oz/A.

ARMYWORM:
- Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - DiPel DF, 1 to 2 lb. (0 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (21 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (21 days) (RUP)
- Coragen, 3.5 to 5 fl oz. (1 day)
- Intrepid 2F, 6 to 16 fl oz. (14 days) 4 to 10 fl oz with PHI of 1 day when harvesting leaves.
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Radiant SC, 6 to 8 fl oz. (3 days) See label for treating and harvesting of leaves.
- Spinosad
  - Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (3 days)

WHITEFLIES:
- Sivanto, 10.5 - 14 fl oz/A.

MITES
- Bifenthrin EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Bifenthrin 10 DF, 12.8 to 16 oz/A. (21 days)
- Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)
- Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (10.3 oz.) or Hero EW (11.2 oz.) (21 days) (RUP)

DISEASES

SEED TREATMENT:
- DAMPING OFF (Pythium and Phytophthora spp.):
  - Fludioxonil
    - Maxim 4 FS, 0.08 to 0.16 fl oz/100 lb seed (Rhizoctonia).
  - Mefenoxam
    - Apron XL, 0.085 - 0.64 fl oz/100 lb seed (Pythium).
  - Metalaxyl
    - Allegiance-FL, 0.75 fl oz/100 lb seed (Pythium).

SOIL TREATMENT:
- DAMPING OFF (Pythium spp.):
  - Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.
  - Ridomil Gold WSP, 1 to 2 lb.
  - Ultra Flourish, 2 to 4 pt.

FOLIAR TREATMENT:
- LEAF ROT, BOTRYTIS GRAY MOLD (Botrytis cinerea):
  - Penhiopyrad
    - Fontelis, 16 - 30 fl oz. (0 days)
- ALTERNARIA LEAF SPOT:
  - Azoxystrobin
    - Quadris, 6.0 to 15.5 fl oz. (0 days)
  - Fenamidone
    - Reason 500 SC, 8.2 fl oz. (14 days) Suppression
  - Penhiopyrad
    - Fontelis, 16 - 30 fl oz. (0 days)
  - Pyraclostrobin
    - Cabrio, 8 to 12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

**Spinach**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

INSECTS

SOIL TREATMENT:
- **APHIDS:**
  - Imidacloprid
    - Admire Pro, 4.4 to 10.5 fl oz. (21 days) See label for application methods.
    - Nuprid 2 F, 10 to 24 fl oz. (21 days)
    - Sivanto, 10.5 - 12 fl oz/A.
    - Verimark, 6.75-13.5 oz/A. (0 days)

- **CABBAGE LOOPERS:**
  - Coragen, 3.5 to 5 fl oz. (1 day) See label for application methods.
  - Verimark, 6.75-13.5 oz/A. (0 days)

- **APHIDS, FLEA BEETLES, LEAFHOPPERS:**
  - Belay 50 WDG, 4.8 to 6.4 oz.
  - Thiamethoxam
    - Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.

- **LEAFHOPPERS:**
  - Imidacloprid
    - Admire Pro, 4.4 to 10.5 fl oz. (21 days)
    - Nuprid 2 F, 10 to 24 fl oz. (21 days)
    - Sivanto, 7 - 10.5 fl oz/A.
    - Venom, 5 to 6 oz. (21 days)

- **ARMYWORM:**
  - Capture LFR, 3.4 to 6.8 fl oz. (RUP)
  - Coragen, 3.5 to 5 fl oz. (1 day)
  - Verimark, 5-10 oz/A. (0 days)

- **FLEA BEETLE, LEAFHOPPERS:**
  - Scorpion 35SL, 9 to 10.5 fl oz. (21 days)

- **APHIDS, ARMYWORM, LOOPERS, FLEA BEETLE, LEAFHOPPERS:**
  - Durivo, 10 to 13 fl oz. (30 days) See label for application methods.

- **LEAFMINERS:**
  - Coragen, 5 to 7.5 fl oz. (1 day)
  - Verimark, 6.75-13.5 oz/A. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.*
Spinach

WHITEFLIES:
   - *Sivanto, 10.5 - 14 fl oz/A.

FOLIAR TREATMENT:
   - Actara, 1.5 to 3 oz. (7 days)
   - *Athena, 7 to 17 fl oz. (40 days) (RUP)
   - *Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
   - *Belay 50 WDG, 1.6 to 2.1 oz. (7 days)

Bifenทริน
   - *Bifenture 10 DF, 5.3 to 16 oz/A. (7 days)
   - *Bifenture EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
   - *Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (40 days) (RUP)
   - *Capture 2 EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
   - *Discipline 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
   - *Fanfare 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
   - *Sniper, 2.1 to 6.4 fl oz. (40 days) (RUP)
   - *Tundra EC, 2.1 to 6.4 fl oz. (40 days) (RUP)

Bifenทริน + Imidacloprid
   - *Brigadier, 5.1 to 6.1 fl oz. (40 days) (RUP)
   - *Swagger, 10.2 to 12.2 fl oz. (40 days) (RUP)

Carbaryl
   - *Carbaryl 4L, 0.5 to 1 qt. (14 days)
   - *Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (14 days)

Dinofعأفز
   - *Scorpion 3SSL (2 to 5.25 fl oz) or Venom (2 to 3 oz.) (7 days)
   - *Gladiator, 10 to 19 fl oz. (7 days) (RUP)

Imidacloprid
   - *Admire Pro, 1.3 fl oz. (7 days)
   - *Nuprid 1.6 F, 3.8 fl oz. (7 days) Do not exceed 19.2 oz/Acre per season.

Leverage 360, 3 fl oz. (7 days) (RUP)

Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

Permether
   - *Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
   - *Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 fl oz.) (1 day) (RUP)
   - *Pounce 25 WP, 3.2 to 12.8 oz. (1 day) (RUP)

Pyreneone, 1 to 12 fl oz. (0 days)

Carbaryl
   - *Carbaryl 4L, 0.5 to 2 qt. (14 days)
   - *Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin 80 WSP (0.67 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (14 days)

Sivanto, 7 - 10.5 fl oz/A.

Swagger, 7.6 to 12.2 fl oz. (40 days) (RUP)
   - *Torac, 14-21 oz/A. (1) Do not make more than 2 applications per crop cycle and no more than 4 applications per year. Allow at least 14 days between applications.
   - *Venom, 1 to 3 oz. (7 days)

Vetica, 14 to 17 fl oz. (7 days)

Voliام Flexi, 4 to 7 oz. (7 days)

LOOPERS, ARMYWORM: Apply when insects are small.
   - *Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
   - *Methomyl
   - *Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (7 days) Do not apply to seedlings less than 3 inches in diameter. (RUP)
   - *Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (7 days) (RUP)

Athena, 7 to 17 oz. (40 days) (RUP)

Avanti, 3.5 oz. (3 days)

Bacillus thuringiensis
   - *Agree WG, 0.5 to 2 lb. (0 days)
   - *Javelin WG, 0.12 to 1.5 lb. (0 days)

Belt SC, 1.5 fl oz. (1 day)

Bifenทริน
   - *Bifenture EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
   - *Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WSB (5.3 to 16 oz.) (40 days) (RUP)

Carbaryl
   - *Carbaryl 4L, 0.5 to 1 qt. (14 days)
   - *Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (14 days)

Dinofعأفز
   - *Scorpion 3SSL (2 to 5.25 fl oz) or Venom (2 to 3 oz.) (7 days)

Imidacloprid
   - *Admire Pro, 1.3 fl oz. (7 days)

Leverage 360, 3 fl oz. (7 days) (RUP)

Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

Pyreneone, 1 to 12 fl oz. (0 days)

Carbaryl
   - *Carbaryl 4L, 0.5 to 1 qt. (14 days)
   - *Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (14 days)

Torac, 17-21 oz/A. (1) Do not make more than 2 applications per crop cycle and no more than 4 applications per year. Allow at least 14 days between applications.

Voliام Flexi, 4 to 7 oz. (7 days)

CROWN MAGGOTS (SEVERAL SPECIES ARE INVOLVED):
   Chemical control is not presently available for this use.

LEAFHOPPERS: Apply as necessary.
   - Actara, 1.5 to 3 oz. (7 days)
   - *Athena, 7 to 17 fl oz. (40 days) (RUP)
   - *Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
   - *Belay 50 WDG, 1.6 to 2.1 oz. (7 days)

Carbaryl
   - *Carbaryl 4L, 0.5 to 2 qt. (14 days)
   - *Sevin 4 F (0.5 to 2 qt.) or Sevin 80 S (0.63 to 2.5 lb.) or Sevin 80 WSP (0.67 to 2.5 lb.) or Sevin XLR Plus (0.5 to 2 qt.) (14 days)

Dinofعأفز
   - *Scorpion 3SSL, 2 to 5.25 fl oz. (7 days)

Venom, 1 to 3 oz. (7 days)

Gladiator, 10 to 19 fl oz. (7 days) (RUP)

Imidacloprid
   - *Admire Pro, 1.3 fl oz. (7 days)

Always read and follow label instructions carefully.

*Materials marked with an asterisk are particularly recommended for problem infestations.
APHIDS: Apply as needed to avoid contamination at harvest.

* Acetamiprid
  - Assail 30 SG (2 to 4 oz.) or Assail 70WP (0.8 to 1.7 oz.) (7 days)
  - Actara, 1.5 to 3 oz. (7 days)
  - Athena, 7 to 17 fl oz. (40 days) (RUP)
  - Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
  - Beleaf 50 SG, 2 to 2.8 oz. (0 days)

Bifenthrin + Imidacloprid

  - Brigadier, 3.8 to 6.14 fl oz. (40 days) (RUP)
  - Swagger, 7.6 to 12.2 fl oz. (40 days) (RUP)
  - Diazinon AG 500, 0.5 to 1 pt. (14 days) (RUP)
  - Endosulfan 3 EC, 1 qt. (21 days) Maximum of one application. (RUP)
  - Éxirel, 13.5-20.5 oz/A. (1)
  - Fulfil, 2.75 oz. (0 days) May require 5 to 7 days for aphid mortality.
  - Gladiator, 19 fl oz. (7 days) (RUP)

Imidacloprid

  - Admire Pro, 1.3 fl oz. (7 days)
  - Nuprid 1.6 F, 3.8 fl oz. (7 days) Do not use if Imidacloprid was used at planting. Do not exceed 19.2 oz/Acre per season.
  - Leverage 380, 3 oz fl. (7 days) (RUP)

Malathion

  - Malathion 5 (1.6 pt.) or Malathion 5EC (2 pt.) or Malathion 57 EC (1.6 pt.) or Malathion 8 (1.5 pt.) or Malathion 8 Aquamul (1 pt.) (7 days)
  - Movento, 4 to 5 fl oz. (3 days) Must be tank mixed with adjuvant having spreading and penetrating properties.
  - Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
  - Pyrenone, 1 to 12 fl oz. (0 days)
  - Sivanto, 10.5 - 12 fl oz/A.
  - Torac, 17-21 oz/A. (1) Do not make than 2 applications per crop cycle and no more than 4 applications per year. Allow at least 14 days between applications.
  - Voliam Flexi, 4 to 7 oz. (7 days)

LEAF MINERS: Apply when eggs are first seen on undersides of leaves to prevent miners from entering leaves. Treatment after larvae are in the leaf is generally unsuccessful. Early-planted spinach usually is less susceptible to damage when planted late.

Abamectin

  - Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
  - Athena, 13.5 to 17 fl oz. (40 days) (RUP)

Bifenthrin

  - Bifenture EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
  - Brigade @ 2EC (2.1 to 6.4 fl oz.) or Brigade WS 5 (5.3 to 16 oz.) (40 days) (RUP)
  - Capture 2 EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
  - Discipline 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
  - Fanfare 2EC, 2.1 to 6.4 fl oz. (40 days) (RUP)
  - Sniper, 2.1 to 6.4 fl oz. (40 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (40 days) (RUP)

Bifenthrin + Imidacloprid

  - Brigadier, 5.1 to 6.14 fl oz. (40 days) (RUP)
  - Swagger, 10.2 to 12.2 fl oz. (40 days) (RUP)
  - Bifenture 10 DF, 5.3 to 16 oz/A. (40 days)
  - Coragen, 5.0 to 7.5 fl oz. (1 day) Minimum of 3 days between applications; do not apply more than 15.4 fl oz. per season.
  - Diazinon AG 500, 0.5 to 1 pt. (14 days) (RUP)

Dinofuran

  - Scorpion 35SL, 2 to 5.25 fl oz. (7 days)
  - Venom, 1 to 3 oz. (7 days)
  - Éxirel, 13.5-20.5 oz (1)

Gladiator, 19 fl oz. (7 days) (RUP)

Permethrin

  - Ambush 25 W, 6.4 to 12.8 oz. (1 day) (RUP)
  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 fl oz.) (1 day) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)

Pyrethrum

  - 1 to 12 fl oz. (0 days)

Radiant SC, 6 to 10 fl oz. (1 day)

Spinosad

  - Entrust (2 to 3 oz.) or Entrust SC (6 to 10 fl oz.) (1 day)
  - Trigard, 2.66 oz. (7 days)

DIAMONDBACK MOTH:

  - Athena, 13.5 to 17 fl oz. (40 days) (RUP)

Bacillus thuringiensis

  - DiPel DF (0.25 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
  - Javelin WG, 0.12 to 1.5 lb. (0 days)
  - XenTari, 0.5 to 1.5 lb. (0 days)

Bacillus thuringiensis

  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biobit HP, 0.5 to 1 lb. (0 days)
  - DiPel DF, 0.25 to 1 lb. (0 days)
  - Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)
  - Bell SC, 1.5 fl oz. (1 day)
  - Coragen, 3.5 to 5 fl oz. (1 day)
  - Éxirel, 7-13.5 oz/A. (1)
  - Gladiator, 10 to 19 fl oz. (7 days) (RUP)
  - Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
  - Pyrenone, 1 to 12 fl oz. (0 days)
  - Radiant SC, 5 to 10 fl oz. (1 day)

Spinosad

  - Entrust (0.5 to 1 oz.) or Entrust SC (1.5 to 3 fl oz.) (1 day)
  - Swagger, 10.2 to 12.8 fl oz. (40 days) (RUP)
  - Vetica, 12 to 17 fl oz. (7 days)

Voliam Flexi, 4 to 7 oz. (7 days)

ARMYWORM:

Bacillus thuringiensis

  - Biobit HP, 0.5 to 2 lb. (0 days)
  - DiPel DF (1 to 2 lb.) or DiPel ES (2 to 4 pt.) (0 days)
  - XenTari, 0.5 to 2 lb. (0 days)
  - Baythroid XL, 2.4 to 3.2 fl oz. (0 days) (RUP)

Carbaryl

  - Carbaryl 4L, 1 to 2 qt. (14 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)
  - Mustang Max, 3.2 to 4 oz. (1 day) (RUP)

Permethrin

  - Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 fl oz.) (1 day) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (1 day) (RUP)
  - Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
  - Carbaryl 4L, 1 to 2 qt. (14 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (14 days)

Spinosad

  - Entrust (1.25 to 2.5 oz.) or Entrust SC (4 to 8 fl oz.) (1 day)

SUPPRESSION ONLY

Torac, 21 oz/A. (1) Do not make more than 2 applications per crop cycle and no more than 4 applications per year. Allow at least 14 days between applications.

LOOPERS:

Bacillus thuringiensis

  - Biobit HP, 0.5 to 1 lb. (0 days)
Spinach

- **DiPel DF** (0.5 to 1 lb.) or **DiPel ES** (1 to 2 pt.) (0 days)
- **XenTan**, 0.5 to 1.5 lb. (0 days)
- **Baythroid XL**, 1.6 to 2.4 fl oz. (0 days) (RUP)
- **Bifenture 10 DF**, 5.3 to 16 oz/A. (7 days)
- **Exirel**, 10-17 oz/A. (1)
- **Permethrin**
  - **Perm-UP 25DF** (3.2 to 12.8 oz.) or **Perm-UP 3.2 EC** (2 to 8 fl oz.) (1 day) (RUP)
  - **Pounce 25 WP**, 3.2 to 12.8 oz. (1 day) (RUP)
- **Proclaim**, 3.2 to 4.8 oz. (7 days) (RUP)
- **Spinosad**
  - **Entrust** (1 to 2 oz.) or **Entrust SC** (3 to 6 fl oz.) (1 day)
  
**THRIPS:**
- **Exirel**, 13.5-20.5 oz/A. (1)
- **Torac**, 21 oz/A. (1) Do not make more than 2 applications per crop cycle and no more than 4 applications per year. Allow at least 14 days between applications.

**CUTWORM:** **SUPPRESSION ONLY**
- **Torac**, 21 oz/A. (1) Do not make more than 2 applications per crop cycle and no more than 4 applications per year. Allow at least 14 days between applications.

**WHITEFLIES:**
- **Sivanto**, 10.5 - 14 fl oz/A.

**MITES**
- **Abamectin**
  - **Agri-Mek 0.15 EC** (8 to 16 fl oz.) or **Agri-Mek SC** (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
- **Bifenthrin**
  - **Bifenture EC**, 5.12 to 6.4 fl oz. (40 days) (RUP)
  - **Bifenture 10 DF**, 12.8 to 16 oz/A. (40 days)
  - **Brigade @ 2 EC** (5.12 to 6.4 fl oz.) or **Brigade WSB** (12.8 to 16 oz) (40 days) (RUP)
  - **Capture 2 EC**, 5.12 to 6.4 fl oz. (40 days) (RUP)
  - **Discipline 2 EC**, 5.12 to 6.4 fl oz. (40 days) (RUP)
  - **Fanfare 2EC**, 5.12 to 6.4 fl oz. (40 days) (RUP)
  - **Sniper**, 5.12 to 6.4 fl oz. (40 days) (RUP)
  - **Tundra EC**, 5.12 to 6.4 fl oz. (40 days) (RUP)
- **Bifenthrin + Avermectin**
  - **Athena**, 13.5 to 17 fl oz. (40 days) (RUP)
  - **Zeta-Cypermethrin + Avermectin**
  - **Gladiator**, 19 fl oz. (7 days) (RUP)

**SLUGS**
- **Deadline** M-Ps 4% (20 to 40 lb) or **Metaldehyde** 3.5 G (30 to 40 lb) Apply between rows. Avoid contact to edible product.

**DISEASES**

**SEED TREATMENT:**

**DAMPING OFF** (**Pythium** spp., **Rhizoctonia solani**):
- **Captan**
  - **Captan** Flowable, 6.6 fl oz/100 lb seed.
- **Fludioxonil**
  - **Maxim 4 FS**, 0.08 to 0.16 fl oz/100 lb seed (**Rhizoctonia**).
- **Mefenoxam**
  - **Apron XL LS**, 0.085 to 0.64 fl oz/100 lb seed (**Pythium**). Do not apply to spinach that is destined to be grown in the greenhouse or enclosed environmentally-controlled rooms. Containers or bags containing Apron XL-treated spinach seed must be labeled with the restriction, "Do not use seed for spinach destined to be grown in the greenhouse or inside environmentally-controlled rooms."

**SOIL TREATMENT:**

**DOWNY MILDEW** (**Peronospora effusa**), **WHITE RUST** (**Albugo occidentalis**):
- **Mefenoxam**
  - **Ridomil Gold GR**, 5 lb. First application of Ridomil Gold GR should be as preplant incorporated at time of planting according to above directions. Sidedress 5 lb 21 days after planting or after the first cutting. Another application may be sidedressed after the next cutting. If Ridomil Gold GR is not used at planting, do not use it at any other time throughout the season.
  - **Ridomil Gold SL**, 0.25 pt. (21 days) Shank in 21 days after planting or after the first cutting. Another application may be shanked in after the next cutting. A total of 2 shanked applications may be made on a 21-day interval. Observe limit of amount of a.i./A per season. See label for further information about PHI.

**PREPLANT INCORPORATED:**

**WHITE RUST** (**Albugo occidentalis**), **DAMPING OFF** (**Pythium** spp.), **DOWNY MILDEW** (**Peronospora effusa**):
- **Mefenoxam** Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation. Observe limit of amount of a.i./A per season.
  - **Ridomil Gold GR**, 20 to 40 lb.
  - **Ridomil Gold SL**, 1-2 pt (**Pythium**) or 0.25 pt (downy mildew or white rust; 7 day PHI).
  - **Ridomil Gold WSP**, 1 to 2 lb.
  - **Ultra Flourish**, 2 to 4 pt.

**DRIP APPLICATION:**

**DOWNY MILDEW** (**Peronospora effusa**):
- **Fluopicolide**
  - **Presidio**, 3-4 fl oz. (2 days)

**FOLIAR TREATMENT:**

**DOWNY MILDEW** (**Peronospora effusa**):
- **Famoxadone + Cymoxanil**
  - **Tanos**, 8 to 10 oz. (1 day) Apply as preventive and tank mix.
  - **Fosetyl-Aluminum**
  - **Aliette WDG**, 2 to 5 lb, 7- to 21-day intervals. (3 days) Do not tank mix with copper fungicides.
  - **Mefenoxam + Copper Hydroxide**
  - **Ridomil Gold Copper**, 2 lb, 14-day intervals. (21 days) Maximum 2 applications. **Note:** Apply 21 days after Ridomil Gold at planting or after each repeated cutting.
- **Acibenzolar-S-methyl**
  - **Actigard**, 0.5 to 0.75 oz. (7 days) Do not apply to young seedlings.
  - **Copper Hydroxide + Copper Oxchloride**
  - **Badge SC** (1 to 2.25 pt) or **Badge X2** (0.75 to 1.25 lb) (0 days)
  - **Fluopicolide**
  - **Presidio**, 3-4 fl oz. (2 days)

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*Materials marked with an asterisk are particularly recommended for problem infestations.
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<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td><em>Merivon Xemium Brand Fungicide, 6 - 11 fl oz. (1 day)</em></td>
<td>Suppression only</td>
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<tr>
<td><em>Mandipropamid</em></td>
<td></td>
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<tr>
<td>* Revus, 8 fl oz. (1 day)*</td>
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<tr>
<td>Mono-, dibasic sodium salts of phosphorous acid</td>
<td></td>
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<tr>
<td>* Fosphite, 1 to 3 qt. (0 days)*</td>
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<tr>
<td>Mono-, dibasic sodium, potassium and ammonium phosphites</td>
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<tr>
<td>* Phostrol, 2.5 to 5 pt every 7 - 21 days. (0 days)*</td>
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<tr>
<td>* Prophyl, 2 to 4 pt. (0 days)*</td>
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<tr>
<td>Pyraclostrobin</td>
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<tr>
<td>* Cabrio, 12 to 16 oz. (0 days)*</td>
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</tbody>
</table>

**Note:** Fungicides that protect against Anthracnose and Cercospora leaf spot provide limited downy mildew protection.

**ANTHRACNOSE (Colletotrichum spinaeoc), CERCOSPORA LEAF SPOT (Cercospora beticola):** Apply at 7 to 10 day intervals.

* *Azoxystrobin* |
  - *Quadris, 6 to 15.5 fl oz. (0 days)*
  
* Do not apply more than one foliar application of Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

* *Fluxapyroxad + Pyraclostrobin* |
  - *Merivon Xemium Brand Fungicide, 4 - 11 fl oz. (1 day)*
  - *Copper Ammonium Carbonate* |
    - *Copper Count N, 1 1/2 qt. (0 days)*
    - *Copper Hydroxide* |
      - *Champ Formula 2 F, 1 1/3 to 2 2/3 pt. (0 days)*
      - *Kocide 3000, 0.75 to 1.75 lb. (0 day)*
    - *Copper Hydroxide + Copper Oxychloride* |
      - *Badge SC (1 to 2.25 pt) or Badge X2 (0.5 to 1.25 lb) (0 days)*
    - *Copper Sulfate* |
      - *Cuprofix Ultra 40 Disperss, 1.25 to 2 lb. (0 days)*

* Penthiopyrad |
  - *Fontelis, 14 - 24 fl oz. (3 days) Cercospora only. Pyraclostrobin |
  - * Cabrio, 12 to 16 oz. (0 days)*

**WHITE RUST (Albugo occidentalis):**

* *Fluxapyroxad + Pyraclostrobin* |
  - *Merivon Xemium Brand Fungicide, 4 - 11 fl oz. (1 day)*
  - *Acibenzolar-S-methyl* |
    - *Actigard, 0.5 to 0.75 oz. (7 days) Do not apply to young seedlings* |
  - *Azoxystrobin* |
    - *Quadris, 6 to 15.5 fl oz. (0 days)*

* Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

**Copper Hydroxide** |

* Champ Formula 2 F, 1 1/3 to 2 2/3 pt, 7- to 10-day intervals. (0 days) |
  - *Kocide 3000, 0.75 to 1.25 lb. (0 day)*

**Copper Hydroxide + Copper Oxychloride** |

* Badge SC (1 to 2.25 pt) or Badge X2 (0.5 to 1.25 lb) (0 days) |

**Copper Sulfate** |

* Cuprofix Ultra 40 Disperss, 1.25 to 2 lb. (0 days) |

**Fosetyl-Aluminum** |

* *Aliette WDG, 2 to 5 lb, 7- to 10-day intervals. (0 days)* Do not tank mix with copper fungicides. |
  - *Mefenoxam + Copper Hydroxide* |
  - *Ridomil Gold Copper, 2 lb, 14-day intervals. (21 days) Maximum 2 applications. **Note:** Apply 21 days after Ridomil Gold at planting or after each repeated cutting. |

**Squash**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**NEMATODES**

Squash are hosts for root-knot and lesion nematodes. These nematodes can reduce squash yields but yield losses in Michigan have not been documented. If you suspect nematodes are reducing squash yields collect root and soil samples for analysis as described in Appendix C. If the numbers of nematodes recovered from those samples exceed damage thresholds; control options will be suggested. Vydate 2L is labeled for use in squash.

**PREPLANT NEMATICIDE TREATMENT:**

**Fluensulfone** |

* *Nimzit 480EC, 3.5 - 5.0 pints/A. apply broadcast and incorporate either mechanically or with water to a depth of 6-8 inches at least 7 days prior to transplanting or planting. Do not apply if heavy rainfall is expected within 48 hours of application. This material can be applied in bands or by drip but apparently is most effective if applied broadcast and incorporated. Do not apply to extremely cold soils (<40°F) as nematodes have to be active for the product to be effective. Product has not been evaluated in Michigan.*

**SEED TREATMENT:**

**CUCCUMBER BEETLE:**

* *Cruiser 5 FS, 8 to 16 oz/A. See label for rates and application methods.*

**SOIL TREATMENT:**

**APHIDS, FLEA BEETLE, LEAFHOPPER, THRIPS:**

* *Durivo, 10 to 13 fl oz. (30 days)*

**Thiamethoxam** |

* *Platinum (5 to 11 fl oz./A) or Platinum 75 SG (1.66 to 3.67 oz./A) (30 days) See label for application methods.*

**THRIPS, LLEAFHOPPER, SQUASH BUG:**

* *Venom, 5 to 6 oz. (21 days) See label for application methods.*

**CUTWORM, FLEA BEETLE LARVAE:**

* *Capture LFR, 3.4 to 6.8 fl oz. (RUP)*

**APHIDS, CUCCUMBER BEETLES, LEAFHOPPERS, THRIPS:**

* *Delay 50 WDG, 4.8 to 6.4 oz.*

**Imidacloprid** |

* *Adire Pro, 7 to 10.5 fl oz. (21 days)*
* *Nuprid 2 F, 16 to 24 fl oz. (21 days)*

**SCorpion 35SL, 9 to 10.5 fl oz. (21 days)**

**GRUBS:**

* *Bifenture 10 DF, 8 to 16 oz/A.*

**WIREWORMS:**

* *Bifenture 10 DF, 8 to 16 oz/A.*

**MAGGOTS:**

* *Bifenture 10 DF, 8 to 16 oz/A.*

**ARMYWORM:**

* *Verimark, 6.75-13.5 oz/A. (1)*

*Materials marked with an asterisk are particularly recommended for problem infestations.*

*Always read and follow label instructions carefully.*
Squash

APHIDS and THRIPS:

Verimark, 10-13.5 oz/A. (1)

LEAFHOPPERS:

Sivanto, 21-28 fl oz/A.
Sivanto, 21-28 fl oz/A.

APHIDS:

Sivanto, 21-28 fl oz/A.

WHITEFLIES:

Sivanto, 21-28 fl oz/A.

FOLIAR TREATMENT: Summer and winter squash plants may be sensitive to certain insecticide formulations. Make certain a problem exists before treatment. Read and observe restrictions on the label. To avoid killing bees, do not treat plants during bloom.

**CUTWORM, ARMYWORM:** Apply if >1% of plants are injured.

- **Bifenthrin**
  - Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

- **Bifenthrin + Zeta-Cypermethrin**
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)

- **Methomyl**
  - Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)
  - Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

- **Pyrethroid**
  - Pyretic, 1 to 12 fl oz. (0 days)

- **Striped and Spotted Cucumber Beetle:** Apply to hard squash if numbers exceed 0.1 to 1/plant to prevent bacterial wilt disease.

- **Acetamiprid**
  - Assail 30 SG (2.5 to 5.3 oz.) or Assail 70WP (1.1 to 2.3 oz.) (0 days)

- **Athena, 7 to 17 fl oz. (7 days) (RUP)**

- **Baythroid XL, 2.4 to 2.8 fl oz. (0 days) (RUP)**

- **Belay 50 WDG, 1.6 to 2.1 oz. (7 days)** (RUP)

- **Bifenthrin**
  - Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

- **Bifenthrin + Zeta-Cypermethrin**
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

- **Carbaryl**
  - Carbaryl 4L, 1 qt. (3 days)
  - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

- **Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)**

- **Dibron Emulsive, 1 to 2 pt. (1 day) Use on summer squash only. (RUP)**

- **Dinofeturan**
  - Scorpion 3SSL, 2 to 7 fl oz. (1 day)
  - Venom, 3 to 4 oz. (1 day)

- **Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)**

- **Esfenvalerate**
  - Adjoum, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S- Fenvalister, 5.8 to 9.6 fl oz. (3 days) (RUP)

- **Gladiator, 14 to 19 fl oz. (7 days) (RUP)**

- **Kryocide, 8 to 16 lb. (7 days for summer squash; 14 days for winter squash)**

- **Lambda-cyhalothrin**
  - Lamba-Cy, 2.5 to 3.84 fl oz. (1 day) (RUP)

- **Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)**

- **Malathion**
  - Malathion 5 (2.75 pt for summer squash; 1.5 pt for winter squash) or Malathion 5 EC (3 pt.) or Malathion 8 (1.75 pt.) or Malathion 8 Aquamul (1.75 pt for summer squash; 1 pt for winter squash) (1 day)

- **Methomyl**
  - Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) Use on summer squash only. (RUP)
  - Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) (RUP)

- **Mustang Max, 2.8 to 4 oz. (1 day) (RUP)**

- **Permethrin**
  - Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
  - Pem-UP 25DF (6.4 to 12.8 oz.) or Pem-UP 32 EC (4 to 8 oz.) (0 days) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
  - Pyrethrin, 1 to 2 fl oz. (0 days)
  - Rimor 0.83EC, 9 to 12 fl oz. (1 day)

- **Carbaryl 4L, 1 qt. (3 days)**
  - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

- **Flea Beetle:** Apply if needed.

- **Actara, 1.5 to 3 oz. (0 days)**

- **Belay 50 WDG, 1.6 to 2.1 oz. (7 days)**

- **Carbaryl**
  - Carbaryl 4L, 1 qt. (3 days)
  - Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

- **Dinofeturan**
  - Scorpion 3SSL, 2 to 7 fl oz. (1 day)
  - Venom, 3 to 4 oz. (1 day)

- **Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)**

- **Endosulfan 3 EC, 0.66 to 1.33 qt. (4 days for summer squash; 11 days for winter squash) (RUP)**

- **Exirel, 13.5-20.5 oz/A. (1)**

- **Kryocide, 8 to 16 lb. (7 days for summer squash; 14 days for winter squash)**

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

*May also be used as a contact spray*

**Methomyl**
- Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days)) Use on summer squash only. (RUP)
- Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days) (RUP)

**Pyrenone**, 1 to 12 fl oz. (0 days)
**Carbaryl**, 4 L, 1 qt. (3 days)
**Sevin 4 F** (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
**Voliam Flexi**, 4 to 7 oz. (1 day)

**LEAFHOPPERS**: Apply if necessary.

**Acetamiprid**
- Assail 30 SG (2.5 to 4 oz.) or Assail 70 WP (1.1 to 1.7 oz.) (0 days)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days) (RUP)

**Bifenthrin**
- Bifenture 10 DF, 8 to 16 oz/A. (3 days)
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sevin, 1 to 4 oz. (1 day)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Carbaryl**
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

**Dinotefuran**
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)
- Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)

**Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Gladiator, 14 to 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

**Malathion**, 1.75 pt. (1 day)
**Mustang Max**, 2.8 to 4 oz. (1 day) (RUP)

**Permethrin**
- Perm-UP 25DF (6.4 to 12.8 oz.) or Perm-UP 32 EC (4 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Carbaryl 4L, 1 qt. (3 days)

**Sevin 4 F** (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)
**Sivanto**, 21 - 28 fl oz/A.
**Vertica**, 14 to 17 fl oz. (7 days)

**SQUASH BUG**: Apply if egg masses exceed 1/plant. Large nymphs and adults are difficult to control.

* **Esfenvalerate**
- Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (3 days) (RUP)

**Acetamiprid**
- Assail 30 SG (5.3 oz.) or Assail 70 WP (2.3 oz.) (0 days)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)

**Bifenthrin**
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sevin, 1 to 4 oz. (1 day)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)

**Bifenthrin + Zeta-Cypermethrin**
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
- Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)

**Bifenthrin 10 DF**, 8 to 16 oz/A. (3 days)

**Carbaryl**
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

**Dinotefuran**
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 3 to 4 oz. (1 day)

**Endigo ZC**, 4 to 4.5 fl oz. (1 day) (RUP)
**Gladiators**, 14 to 19 fl oz. (7 days) (RUP)

**Lambda-cyhalothrin**
- Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)

**Mustang Max**, 2.8 to 4 oz. (1 day) (RUP)

**Permethrin**
- Ambush 25 W, 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (12.8 oz.) or Perm-UP 32 EC (8 oz.) (0 days) (RUP)
- Pounce 25 WP, 12.8 oz. (0 days) (RUP)
- Pyrenone, 1 to 12 fl oz. (0 days)
- Rimon 0.83EC, 12 fl oz. (1 day)
- Carbaryl 4L, 1 qt. (3 days)
- Sevin 4 F (1 qt.) or Sevin 80 S (1.25 lb.) or Sevin XLR Plus (1 qt.) (3 days)

**SQUASH VINE BORER**: Apply to base of plants when moths are active, or when the first tunnels appear, usually starting when plants start to vine. Repeat in 5 to 7 days.

* **Acetamiprid**
- Assail 30 SG (5.3 oz.) or Assail 70 WP (2.3 oz.) (0 days)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Belt SC, 1.5 fl oz. (1 day)

**Bifenthrin**
- Bifenture EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)

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*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label instructions carefully.
Squash

- Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Tundra EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Steed, 3.5 to 4.7 fl oz. (3 days) (RUP)
  - Bifenthrin 10 DF, 8 to 16 oz/A. (3 days)
  - Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-Fenvalstar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Gladiator, 14 to 19 fl oz. (7 days) (RUP)
- Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.), or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (1 day) (RUP)
  - Malathion
    - Malathion 5 (2.75 pt for summer squash; 1.5 pt for winter squash) or Malathion 5 EC (3 pt.) or Malathion 8 (1.75 pt.) (1 day)
  - Mustang Max, 2.8 to 4 oz. (1 day) (RUP)
- Permethrin
  - Ambush 25 W, 6.4 to 12.8 oz. (0 days) (RUP)
  - Perm-UP 25DFD (6.4 to 12.8 oz.) or Perm-UP 3.2 EC (4 to 8 oz.) (0 days) (RUP)
  - Pounce 25 WP, 6.4 to 12.8 oz. (0 days) (RUP)
  - Pyrenone, 1 to 12 fl oz. (0 days)
  - Vetica, 12 to 17 fl oz. (7 days)
- APHIDS: Apply if numbers are high.
  - Acetamiprid
    - Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1.1 to 1.7 oz.) (0 days)
  - Actara, 1.5 to 3 oz. (0 days)
  - Athena, 7 to 17 fl oz. (7 days) (RUP)
  - Belay 50 WDG, 1.6 to 2.1 oz. (7 days)
  - Beleaff 50 SG, 2 to 2.8 oz. (0 days)
- Bifenthrin
  - Bifenthrin EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Brigade @ 2EC (2.6 to 6.4 fl oz.) or Brigade WSB (8 to 16 oz.) (3 days) (RUP)
  - Capture 2 EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Discipline 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Fanfare 2EC, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Sniper, 2.6 to 6.4 fl oz. (3 days) (RUP)
  - Tundra EC, 2.1 to 6.4 fl oz. (3 days) (RUP)
- Bifenthrin + Zeta-Cypermethrin
  - Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (3 days) (RUP)
  - Bifenthrin 10 DF, 8 to 16 oz/A. (3 days) (RUP)
  - Endigo ZC, 4.5 fl oz. (1 day) (RUP)
  - Exirel, 13.5-20.5 oz/A. (1)
  - Fulfill, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality.
  - Gladiator, 19 fl oz. (7 days) (RUP)
- Lambda-cyhalothrin
  - Lambda-Cy, 3.84 fl oz. (1 day) (RUP)
  - Warrior II with Zeon Technology (1.92 fl oz.) or Warrior with Zeon Technology (3.84 fl oz.) (1 day) (RUP)
- Malathion
  - Malathion 5 (1.5 pt.) or Malathion 5 EC (2 pt.) or Malathion 57 EC (1.5 to 2.8 pt for summer squash; 1.5 to 1.6 pt for winter squash) or Malathion 8 (1.75 pt.) or Malathion Aquamul (1.75 pt for summer squash; 1 pt for winter squash) (1 day)
- Methomyl
  - Lannate LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Lannate SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days) (RUP)
  - Nudrin LV (1.5 to 3 pt. (1.5 pt., 1 day; over 1.5 pt., 3 days)) or Nudrin SP (0.5 to 1 lb. (0.5 lb., 1 day; over 0.5 lb., 3 days) (RUP)
- Permethrin
  - Perm-UP 25DF (12.8 oz.) or Perm-UP 3.2 EC (8 oz.) (0 days) (RUP)
  - Pounce 25 WP, 12.8 oz. (0 days) (RUP)
  - Pyrene, 1 to 12 fl oz. (0 days)
  - Sivanto, 21 - 28 fl oz/A.
  - Voliam Flexi, 4 to 7 oz. (1 day)
  - Vydate L, 2 to 4 pt. (1 day) (RUP)
- THRIPS: Apply when damage is seen. Repeat as needed.
  - Athena, 13.5 to 17 fl oz. (7 days) (RUP)
  - Dibrom 8 Emulsive, 1 to 2 pt. (1 day) Summer squash only. (RUP)
- Dinotefuran
  - Scorpion 35SL, 2 to 7 fl oz. (1 day)
  - Venom, 1 to 4 oz. (1 day)
  - Endigo ZC, 4 to 4.5 fl oz. (1 day) (RUP)
  - Exirel, 13.5-20.5 oz/A. (1)
  - Lambda-Cy, 2.56 to 3.84 fl oz. (1 day) (RUP)
- Malathion
  - Malathion 8 (1.75 pt.) or Malathion Aquamul (1.75 pt for summer squash; 1 pt for winter squash) (1 day)
  - Pyrene, 1 to 12 fl oz. (0 days)
  - Radiant SC, 6 to 10 fl oz. (3 days)
  - Rimon 0.83EC, 12 fl oz. (1 day)
- Spinosad
  - Entrust (2 to 2.5 oz.) or Entrust SC (6 to 8 fl oz.) (3 days)
  - Vydate L, 2 to 4 pt. (1 day) (RUP)
- ARMYWORM:
  - Avaunt, 3.5 to 6 oz. (3 days)
- Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biobit HP, 0.5 to 2 lb. (0 days)
  - DiPel DF, 1 to 2 lb. (0 days)
  - Baythroid XL, 1.6 to 2.4 fl oz. (0 days) (RUP)
  - Bifenthrin 10 DF, 8 to 16 oz/A. (3 days)
  - Coragen, 3.5 to 5 fl oz. (1 day)
  - Danitol 2.4 EC, 10.66 to 16 fl oz. (7 days) (RUP)
  - Exirel, 7-13.5 oz/A. (1)
  - Gladiator, 19 fl oz. (7 days) (RUP)
  - Intrepid 2F, 4 to 10 fl oz. (3 days)
  - Radiant SC, 5 to 10 fl oz. (3 days)
  - Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Spinosad
  - Entrust (1.25 to 2.5 oz.) or Entrust SC (4 to 8 fl oz.) (3 days)
- CUTCWORM:
  - Baythroid XL, 0.8 to 1.6 fl oz. (0 days) (RUP)
  - Empower, 3.5 to 8.7 lb. (3 days) (RUP)
- Esfenvalerate
  - Adjourn, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Asana XL, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - S-Fenvalstar, 5.8 to 9.6 fl oz. (3 days) (RUP)
  - Gladiator, 6 to 19 fl oz. (7 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
FOLIAR TREATMENT:

**PATHOPHTHORA:** Apply to production fields before planting. **Note:** Most fumigants applied to the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.

Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.

1.3 Dichloropropene/chloropicrin
- Telone C35, 13-35 gal. (RUP)
- Metam Potassium
  - Sectagon-K54, 30-60 gal. (RUP)
- Metam Sodium
  - Sectagon 42, 37.5-75 gal. (RUP)

**GREENHOUSE PREPLANT INCORPORATION:**

**DAMPING OFF (Pythium spp.), ROOT ROT (Rhizoctonia spp.):**
- Gliocladium virens GL-21
  - SoilGard 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

**PREPLANT INCORPORATED:**

**DAMPING OFF and COTTONY LEAK (Pythium spp.):**
- Mefenoxam. **Note:** Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.
- Ridomil Gold WSP, 1 to 2 lb.
- Ultra Flourish, 2 to 4 pt.

**DRIP APPLICATION:**

**DOWNY MILDEW (Pseudoperonospora cubensis), PHYTOPHTHORA BLIGHT (Phytophthora capsici):**
- Fluopicolide
  - Presidio, 3-4 fl oz. (2 days)
- Ametroctadin + Dimethomorph
  - Zampro, 14 fl oz. (0 days)

**FOLIAR TREATMENT:**

**POWDERY MILDEW (Sphaerotheca fuliginea or Erysiphe cichoracearum):** Treat at disease appearance.
- Azoxystrobin + Difenoconazole
  - Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
- Cyflufenamid
  - Torino, 3.4 oz. (0 day)
- Kresoxim-methyl
  - Sovran, 3.2 to 4.8 oz. (0 days)
- Myclobutanil
  - Rally 40 WSP, 2.5 to 5 oz. 7 to 10 day schedule. (0 days) Do not apply more than 1.5 lb per acre per crop.
- Penthiopyrad
  - Fontelis, 12 - 16 fl oz. (1 day)
Squash

- Pyraclostrobin
  - Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- Pyraclostrobin/Boscalid
  - Pristine, 12.5 to 18.5 oz. (0 days)
- Quinoxyfen
  - Quintec, 4 to 6 fl oz. (3 days) Winter squash only.
- Thiophanate-Methyl
  - Cercobin 4.1F, 10.9 fl oz. (1 day)
  - Tospin 4.5 FL, 10 fl oz. (1 day)
  - Tospin M 70 WP, Tospin M WSB, 0.5 lb. (1 day)
- Trifloxystrobin
  - Flint, 1 1/2 to 2 oz, 7- to 14-day intervals. (0 days) Maximum 1 consecutive application, 4 applications/year and 16 oz/season.

Azoxystrobin

- Quadris, 11.0 to 15.5 fl oz. (1 day)
  Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- Azoxystrobin + Chlorothalonil
  - Quadris Opti, 3.2 pt see label for interval. (1 day)
  - Bacillus amyloliquefaciens
    - Senfel, 4 - 16 fl oz. (0 day)
  - Bacillus subtilis
    - Serenade ASO, 2 - 6 qt. (0 days)
    - Serenade Max, 1 - 3 lb every 7 to 10 days. (0 days)
  - Boscalid
    - Endura, 6.5 oz. (0 days) Suppression only

Chlorothalonil

- Bravo Ultrace, Equus DF, 1.8 to 2.7 lb. (0 days) Sphaerotheca only
- Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt, 7-day intervals. (0 days) Sphaerotheca only
- Echo 90 DF, 1,625 to 2.5 lb. (0 days) Sphaerotheca only

Copper Ammonium Carbonate

- Copper Count N, 1.5 to 2 qt. (0 days)
- Copper Hydroxide
  - Champ DP Dry Prill, 1 1/3 lb. (0 days)
  - Champ Formula 2 F, 1 1/3 pt. (0 days)
  - Kocide 2000, 1 1/2 lb. (0 days)
  - Kocide 3000, 0.5-1.25 lb. (0 day)
  - Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)
  - Nu-Cop 50 DF, 1 1/2 to 2 lb. (0 days)
  - Nu-Cop HB, 1 lb. (0 days)
- Copper Hydroxide + Copper Oxychloride
  - Badge SC, 1 to 2.5 pt. (0 days)
  - Badge X2, 0.5 to 1.25 lb. (0 days)
- Copper Sulfate
  - Basic Copper 53, 2 lb. (0 days)
  - Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)
- Difenoconazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)
- Fluxapyroxad + Pyraclostrobin
  - Merivon Xemium Brand Fungicide, 4 - 5.5 fl oz. (0 days)
- Metrafenone
  - Vivando, 15.4 fl oz. (0 day)
- Neem Oil
  - Trilogy, 2 pt. (0 days)
- Sulfur
  - Kumulus DF, Micro Sulf, Microthiol Disperss, Thiolux, 5 to 10 lb. (0 days)

- Tebuconazole
  - Orius 3.6F, Tebuozul 3.6, 4-6 fl oz. (7 days) 12 hr REI.
- Triflumizole
  - Procure 480 SC, 4 to 8 fl oz every 7-14 days. (0 days)

SCAB (Cladosporium cucumerinum): Treat every 7 to 10 days after plants are 2 to 3 inches tall.

- Chlorothalonil
  - Bravo Ultrace, Equus DF, 1.8 to 2.7 lb. (0 days)
  - Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
- Mancozeb
  - Koverall, 2 - 3 lb. (5 days)
  - Manzate Max, 1.6 to 2.4 qt. (5 days)
  - Manzate Pro-Stick, 2 to 3 lb. (5 days)
- Mancozeb + Copper Hydroxide
  - ManKocide, 2-3 lb. (5 days)
- Neem Oil
  - Trilogy, 2 pt. (0 days)
- Potassium phosphite/chlorothalonil
  - Catamaran, 6 pt. (1 day)

ALTERNARIA LEAF SPOT (Alternaria cucumerina): Treat every 7 to 10 days when conditions favor disease.

- Azoxystrobin
  - Quadris, 11.0 to 15.5 fl oz. (1 day)
  Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- Azoxystrobin + Chlorothalonil
  - Quadris Opti, 3.2 pt see label for interval. (1 day)
- Azoxystrobin + Difenonazole
  - Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.
- Chlorothalonil
  - Bravo Ultrace, Equus DF, 1.8 to 2.7 lb. (0 days)
  - Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
  - Echo 90 DF, 1,625 to 2.5 lb. (0 days) Sphaerotheca only

- Difenonazole + Cyprodinil
  - Inspire Super, 16 to 20 fl oz. (7 days)
- Fluxapyroxad + Pyraclostrobin
  - Merivon Xemium Brand Fungicide, 4 - 5.5 fl oz. (0 days)
- Pyraclostrobin
  - Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- Pyraclostrobin/Boscalid
  - Pristine, 12.5 to 18.5 oz. (0 days)
- Bacillus amyloliquefaciens
  - Senfel, 4 - 16 fl oz. (0 day)

- Neem Oil
  - Trilogy, 2 pt. (0 days)
  
- Copper Ammonium Carbonate
  - Copper Count N, 1.5 to 2 qt. (0 days)
- Copper Hydroxide
  - Champ DP Dry Prill, 1 1/3 lb. (0 days)
  - Champ Formula 2 F, 1 1/3 pt. (0 days)
  - Kocide 2000, 1 1/2 lb. (0 days)
  - Kocide 3000, 0.5-1.25 lb. (0 day)
  - Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)
  - Nu-Cop 50 DF, 1 1/2 to 2 lb. (0 days)
  - Nu-Cop HB, 1 lb. (0 days)
- Copper Hydroxide + Copper Oxychloride
  - Badge SC, 1 to 2.5 pt. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Materials marked with an asterisk are particularly recommended for problem infestations.

**Anthracnose** (*Colletotrichum lagenarium*): Treat every 7 to 14 days after disease appears.

*Azoxystrobin*

- *Quadris*, 11.0 to 15.5 fl oz. (1 day)
- Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

*Azoxystrobin* + Chlorothalonil

- *Quadris Opti*, 3.2 pt see label for interval. (1 day)
- *Azoxystrobin* + Difenoconazole
- *Quadris Top*, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

*Chlorothalonil*

- *Bravo Ultrex*, *Equus DF*, 1.4 to 1.8 lb. (0 days)
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 1.5 to 2 pt. (0 days)
- *Echo 90 DF*, 1.25 to 1.625 lb. (0 days)

*Mancozeb*

- *Dithane DF Rainshield*, *Manzate Pro-Stick*, 2 to 3 lb. (5 days)
- *Koverall*, 2 - 3 lb. (5 days)
- *Manzate Max*, 1.6 to 2.4 qt. (5 days)
- *Penncotez 75 DF*, 2 to 3 lb. (5 days) Summer squash only

*Pyraclostrobin*

- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

*Pyraclostrobin/Boscalid*

- *Pristine*, 18.5 oz. (0 days)
- *Thiophanate-Methyl*
- *Cercobin 4.1F*, 10.9 fl oz. (1 day)
- *Topsin 4.5 FL*, 10 fl oz. (1 day)
- *Topsin M 70 WP*, *Topsin M WSB*, 0.5 lb. (0 days)

*Bacillus amyloliquefaciens*

- *Senjet*, 4 - 16 fl oz. (0 day)

*Copper Ammonium Carbonate*

- *Copper Count N*, 1.5 to 2 qt. (0 days)

*Copper Hydroxide*

- *Champ DP Dry Prill*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)

- *Kocide 3000*, 0.5-1.25 lb. (0 days)
- *Nu-Cop 3 L*, 1 1/3 to 2 2/3 pt. (0 days)
- *Nu-Cop 50 DF*, 1 1/2 to 2 lb. (0 days)
- *Nu-Cop HB*, 1 lb. (0 days)

*Copper Hydroxide + Copper Oxchloride*

- *Badger SC*, 1 to 2.5 pt. (0 days)
- *Badger X2*, 0.5 to 1.25 lb. (0 days)
- *Copper Oxchloride + Copper Sulfate*
- C-C-S WDG, 1 to 2 lb. (0 days)

*Copper Sulfate*

- *Basic Copper 53*, Basicop, 2 lb. (0 days)
- *Cuprofix Ultra 40 Disperss*, 1 to 2 lb. (0 days)
- *Difenoconazole + Cyprodinil*
- *Inspire Super*, 16 to 20 fl oz. (7 days)

*Mancozeb + Copper Hydroxide*

- *ManKocide*, 2-3 lb. (5 days)
- *Mefenoxam + Chlorothalonil*
- *Ridomil Gold Bravo*, 2.5 to 3.25 pt. (7 days) Maximum 4 applications. Do not apply to mature or senescent plants.

*Neem Oil*

- *Trilogy*, 2 pt. (0 days)
- *Potassium phosphate/chlorothalonil*
- *Catamaran*, 4 pt. (1 day)
- *Zoxamide + chlorothalonil*
- *Zing!*, 36 fl oz. (0 days)

**Angular Leaf Spot** (*Pseudomonas lachrymans*): Spray every 7 days, starting before the first fruit forms and continue to protect fruit at all stages of development.

*Copper Ammonium Carbonate*

- *Copper Count N*, 1.5 to 2 qt. (0 days)

*Copper Hydroxide*

- *Nu-Cop HB*, 1 lb. (0 days)

*Copper Hydroxide + Copper Oxchloride*

- *Champ DP Dry Prill*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)
- *Kocide 3000*, 0.5-1.25 lb. (0 days)
- *Nu-Cop 3 L*, 1 1/3 to 2 2/3 pt. (0 days)
- *Nu-Cop 50 DF*, 1 1/2 to 2 lb. (0 days)

*Gummy Stem Blight* (*Didymella bryoniae* also called *Mycosphaerella melonis*):

*Azoxystrobin*

- *Quadris*, 11.0 to 15.5 fl oz. (1 day)
- Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

*Azoxystrobin* + Chlorothalonil

- *Quadris Opti*, 3.2 pt see label for interval. (1 day)

*Azoxystrobin* + Difenoconazole

- *Quadris Top*, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

*Chlorothalonil*

- *Bravo Ultrex*, *Equus DF*, 1.4 to 1.8 lb. (0 days)
- *Bravo Weather Stik*, *Echo 720*, *Equus 720 SST*, 1.5 to 2 pt. (0 days)
- *Echo 90 DF*, 1.25 to 1.625 lb. (0 days)

*Mancozeb*

- *Dithane DF Rainshield*, *Manzate Pro-Stick*, 2 to 3 lb. (5 days)
- *Koverall*, 2 - 3 lb. (5 days)
- *Manzate Max*, 1.6 to 2.4 qt. (5 days)
- *Penncotez 75 DF*, 2 to 3 lb. (5 days) Summer squash only

*Pyraclostrobin*

- *Cabrio*, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.

*Pyraclostrobin/Boscalid*

- *Pristine*, 18.5 oz. (0 days)
- *Thiophanate-Methyl*
- *Cercobin 4.1F*, 10.9 fl oz. (1 day)
- *Topsin 4.5 FL*, 10 fl oz. (1 day)
- *Topsin M 70 WP*, *Topsin M WSB*, 0.5 lb. (0 days)

*Bacillus amyloliquefaciens*

- *Senjet*, 4 - 16 fl oz. (0 day)

*Copper Ammonium Carbonate*

- *Copper Count N*, 1.5 to 2 qt. (0 days)

*Copper Hydroxide*

- *Champ DP Dry Prill*, 1 1/3 lb. (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Kocide 2000*, 1 1/2 lb. (0 days)

*Materials marked with an asterisk are particularly recommended for problem infestations.*
*Chlorothalonil
  * Bravo Ultrex, Equus DF, 1.8 to 2.7 lb. (0 days)
  * Bravo Weather Stik, Echo 720, Equus 720 SST, 2 to 3 pt. (0 days)
* Echo 90 DF, 1.625 to 2.5 lb. (0 days)
* Pyraclostrobin
  * Cabrio, 12-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
* Pyraclostrobin/Boscalid
  * Pristine, 12.5 to 18.5 oz. (0 days)
* Thiophanate-Methyl
  * Cercobin 4.1F, 10.9 fl oz. (1 day)
  * Tospin 4.5 FL, 10 fl oz. (1 day)
  * Tospin M 70 WP, Tospin M WSB, 0.5 lb. (1 day)

_Bacillus amyloliquefaciens_
* Serifel, 4 - 16 fl oz. (0 day)
* Boscalid
  * Endura, 6.5 oz. (0 days)

_Copper Ammonium Carbonate_
* Copper Count N, 1.5 to 2 qt. (0 days)

_Copper Hydroxide_
* Champ DP Dry Prill, 1 1/3 lb. (0 days)
* Champ Formula 2 F, 1 1/3 pt. (0 days)
* Kocide 2000, 1 1/2 lb (0 days)
* Kocide 3000, 0.5-1.25 lb. (0 day)
* Nu-Cop 3 L, 1 1/3 to 2 2/3 pt. (0 days)
* Nu-Cop 50 DF, 1 1/2 to 2 lb. (0 days)
* Nu-Cop HB, 1 lb. (0 days)

_Copper Hydroxide + Copper Oxychloride_
* Badge SC, 1 to 2.5 pt. (0 days)
* Badge X2, 0.5 to 1.25 lb. (0 days)

_Copper Sulfate_
* Basic Copper 53, 2 lb. (0 days)
* Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)

_Difenoconazole + Cyprodinil_
* Inspire Super, 16 to 20 fl oz. (7 days)

_Kresoxim-methyl_
* Sovran, 4.8 oz. (0 days)

_Mancozeb_
* Koverall, 2 - 3 lb. (5 days)
* Manzate Max, 1.6 to 2.4 qt. (5 days)
* Manzate Pro-Stick, 2 to 3 lb. (5 days)

_Mancozeb + Copper Hydroxide_
* ManKocide, 2-3 lb. (5 days)

_Mefenoxam + Chlorothalonil_
* Ridomil Gold Bravo, 2.5 to 3.25 pt. (7 days)

_Penthiopyrad_
* Fontelis, 12 - 16 fl oz. (1 day)

_Potassium phosphate/chlorothalonil_
* Catamaran, 6 pt. (1 day)

_Potassium phosphate/chlorothalonil_
* Tebuconazole
* Orius 3.6F, Tebuozul 3.6, 8 fl oz. (7 days) Suppression only.

_DOWNY MILDEW (Pseudoperonospora cubensis):_
* Ametoctradin + Dimethomorph
* Zapro, 14 fl oz. (0 days)
* Chlorothalonil
* Bravo Ultrex, Equus DF, 1.4 to 1.8 lb. (0 days)
* Bravo Weather Stik, Echo 720, Equus 720 SST, 1.5 to 2 pt. (0 days)
* Echo 90 DF, 1.25 to 1.625 lb. (0 days)
* Cyazofamid
* Ranman 400SC, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)
* Cymoxanil
* Curzate 60 DF, 3.2 to 5 oz. (3 days)
* Famoxadone + Cymoxanil
* Tanos, 8 oz. (3 days)
* Mancozeb
* Dithane DF Rainshield, Manzate Pro-Stick, Penccozeb 75 DF, 2 to 3 lb. (5 days) Summer squash only
* Manzate Max, 1.6 to 2.4 qt. (5 days)
* Mancozeb + Zoxamide
* Gavel 75 DF, 1.5 - 2.0 lb. (5 days)
* Propamocarb
* Previcur Flex, 1.2 pt every 7 - 14 days. (2 days)

_Azoxystrobin_
* Quadris, 11.0 to 15.5 fl oz. (1 day)

_Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

_Azoxystrobin + Chlorothalonil_
* Quadris Opti, 3.2 pt see label for interval. (1 day)

_Azoxystrobin + Difenoconazole_
* Quadris Top, 12 to 14 fl oz. (1 day) One application before alternating with another chemical.

_Bacillus amyloliquefaciens_
* Serifel, 4 - 16 fl oz. (0 day)

_Copper Hydroxide + Copper Oxycyphorzone_
* Badge SC, 1 to 2.5 pt. (0 days)
* Badge X2, 0.5 to 1.25 lb. (0 days)

_Copper Sulfate_
* Basic Copper 53, 2 lb. (0 days)
* Cuprofix Ultra 40 Disperss, 1 to 2 lb. (0 days)

_Difenoconazole + Cyprodinil_
* Inspire Super, 16 to 20 fl oz. (7 days)

_Kresoxim-methyl_
* Sovran, 4.8 oz. (0 days)

_Mancozeb_
* Koverall, 2 - 3 lb. (5 days)
* Manzate Max, 1.6 to 2.4 qt. (5 days)
* Manzate Pro-Stick, 2 to 3 lb. (5 days)

_Mancozeb + Copper Hydroxide_
* ManKocide, 2-3 lb. (5 days)

_Mefenoxam + Chlorothalonil_
* Ridomil Gold Bravo, 2 lb. (7 days) Do not apply to mature or senescent plants.

_Mefenoxam + Chlorothalonil_
* Ridomil Gold Copper, 2 to 2 1/2 lb. (5 days) Maximum 4 applications.

_Mefenoxam + Mancozeb_
Summer squash.

_Mefenoxam + Copper Hydroxide_
* Ridomil Gold Copper, 2 to 2 1/2 lb. (5 days) Maximum 4 applications.

_Mefenoxam + Mancozeb_
* Summer squash.

_Mefenoxam + Copper Hydroxide_
* Ridomil Gold MZ, 2 1/2 lb. (5 days) Maximum 4 applications.

_Mono- dibasic sodium salts of phosphorous acid_
* Fosphite, 1 to 3 qt per 100 gal (ground) or 10 gal (aerial) of water. (0 days)

_Mono- dibasic sodium, potassium and ammonium phosphites_
* Phostrof, 2.5 to 5 pt every 7 - 14 days. (0 days)
* Prophyt, 2 to 4 pt. (0 days)

_Neem Oil_
* Trilogy, 2 pt. (0 days)

_Potassium phosphate/chlorothalonil_
* Catamaran, 4 pt. (1 day)

* Materials marked with an asterisk are particularly recommended for problem infestations.
Sweet Potatoes

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES

Root-lesion, root-knot and other nematodes are associated with sweet potato. If you believe you have a nematode problem associated with sweet potato production, a sample should be tested (see Appendix C). If plant-parasitic nematodes are present in population densities above estimated damage thresholds for sweet potatoes, management recommendations will be provided at that time.Vydate L, Mocap 6EC and Mocap 15G are labeled for use on sweet potatoes for nematode control. See label for application methods.

INSECTS

SOIL TREATMENT:

APHIDS, FLEA BEETLE, LEAFHOPPER:

- **Admire Pro**, 4.4 to 10.5 fl oz. (3 days leaves, 125 days corms)

FLEA BEETLE LARVAE:

- **Bifenthrin**

- **Bifenture EC**, (RUP)

- **Brigade @ 2EC**, (RUP)

- **Capture LFR**, (RUP)

- **Sniper**, (RUP)

- **Tundra EC**, (RUP)

- **Pro**, (RUP)

- **XLR**

See label for application methods.

FOLIAR TREATMENT:

APHIDS, LEAFHOPPERS:

- **Admire Pro**, 1.2 fl oz. (7 days)

- **Nuprid 1.6 F**, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

- **Lambda Cyhalothrin**

  - **Lambda-Cy**, 2.56 to 3.84 fl oz. (7 days) (RUP)

Always read and follow label instructions carefully.
Sweet Potatoes

- **Warrior II** with Zeon Technology (1.28 to 1.92 fl oz.) or **Warrior** with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)
- **Leverage** 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
- **Mustang Max**, 1.76 to 4 oz. (1 day) (RUP)
- **Pyrene**, 1 to 12 fl oz. (0 days)
- **Carbaryl** 4L, 1 to 2 qt. (7 days)
- **Sevin** 4 F (1 to 2 qt.) or **Sevin** 80 S (1.25 to 2.5 lb.) or **Sevin** XLR Plus (1 to 2 qt.) (7 days)
- **Steed**, 2.5 to 3.5 fl oz. (21 days) (RUP)
- **Volfan Flexi**, 4 oz. (14 days)

**ARMYWORM, CUTWORM:** Apply when feeding damage is first seen.
- **Malathion**
- **Leverage**
- **Lambda**
- **Brigadier**
- **Beleaf**
- **Actara**
- **Fulfill**
- **Digo** with Zeon Technology
- **Lambda** season.
- **Admire**
- **Assail**
- **All others**)

**EC**
- **Malathion**
- **with Zeon Technology**
- **Warrior**
- **Lambda** season.
- **Nuprid** days)
- **Assail**
- **with Zeon Technology**
- **Warrior**
- **Lambda** season.
- **Cyhalothrin**
- **Max**, 30 SG
- **Max**, 30 SG
- **Pro**, 1.2 fl oz. (7 days)
- **Nuprid** 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

**Lambda-cyhalothrin**
- **Lambda-Cy**, 1.92 to 3.2 fl oz. (7 days) (RUP)
- **Warrior II** with Zeon Technology (0.96 to 1.6 fl oz.) or **Warrior** with Zeon Technology (1.92 to 3.2 fl oz.) (7 days) (RUP)
- **Leverage** 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
- **Mustang Max**, 1.28 to 4 oz. (1 day) (RUP)
- **Steed**, 2.5 to 3.5 fl oz. (21 days) (RUP)

**TARNISHED PLANT BUG:**
- **Baythroid XL**, 1.6 to 2.8 fl oz. (0 days) (RUP)
- **Beleaf** 50 SG, 2 to 2.8 oz. (7 days)
- **Endigo** ZC, 4 to 4.5 fl oz. (14 days) (RUP)
- **Gladiator**, 19 fl oz. (14 days) (RUP)

**Lambda-cyhalothrin**
- **Lambda-Cy**, 2.56 to 3.84 fl oz. (7 days) (RUP)
- **Warrior II** with Zeon Technology (1.28 to 1.92 fl oz.) or **Warrior** with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)
- **Leverage** 360, 2.4 to 2.8 fl oz. (7 days) (RUP)
- **Mustang Max**, 3.2 to 4 oz. (1 day) (RUP)
- **Pyrene**, 1 to 12 fl oz. (0 days)

**ARMYWORM:**
- **Carbaryl**
- **Carbaryl** 4L, 2 qt. (7 days)
- **Sevin** 4 F (2 qt.) or **Sevin** 80 S (2.5 lb.) or **Sevin** XLR Plus (2 qt.) (7 days)
- **Coragen**, 3.5 to 5 fl oz. (1 day)
- **Endigo** ZC, 4 to 4.5 fl oz. (14 days) (RUP)
- **Gladiator**, 19 fl oz. (14 days) (RUP)
- **Intrepid** 2F, 6 to 10 fl oz. (7 days) 4 to 10 fl oz with PHI of 1 day when harvesting leaves.

**Lambda-cyhalothrin**
- **Lambda-Cy**, 2.56 to 3.84 fl oz. (7 days) (RUP)
- **Warrior II** with Zeon Technology (1.28 to 1.92 fl oz.) or **Warrior** with Zeon Technology (2.56 to 3.84 fl oz.) (7 days) (RUP)
- **Mustang Max**, 3.2 to 4 oz. (1 day) (RUP)
- **Radiant SC**, 6 to 8 fl oz. (7 days) See label for treating and harvesting of leaves.
- **Rimon** 0.83EC, 6 to 12 fl oz. (14 days)
- **Carbaryl** 4L, 2 qt. (7 days)
- **Sevin** 4 F (2 qt.) or **Sevin** 80 S (2.5 lb.) or **Sevin** XLR Plus (2 qt.) (7 days)

**Spinosad**
- **Blackhawk** (2.25-3.5 oz/A) or **Entrust** (1.5 to 3 oz.) or **Entrust** SC (4.5 to 10 fl oz.) (7 days)
- **Steed**, 3.5 to 4.7 fl oz. (21 days) (RUP)
- **Volfan Flexi**, 4 oz. (14 days)

**THRIPS:**
- **Blackhawk**, 2.25-3.5 oz/A. (3 days) Add adjuvant

**COLORADO POTATO BEETLE, POTATO PSYLID, WHITEFLIES:**
- **Sivanto**, 10.5 - 14 fl oz/A.

**THRIPS:**
- **Blackhawk**, 2.25-3.5 oz/A. (3 days) Add adjuvant

**COLORADO POTATO BEETLE, POTATO PSYLID, WHITEFLIES:**
- **Sivanto**, 10.5 - 14 fl oz/A.

*Materials marked with an asterisk are particularly recommended for problem infestations.*

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Always read and follow label Instructions carefully.
MITES
Abamectin
- Agri-Mek 0.15 EC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (14 days) Use with a non-ionic surfactant. (RUP)
Bifenazate
- Acracite 4SC, 16 to 24 fl oz. (14 days)
Bifenthrin
- Bifenture EC, 2.1 to 6.4 fl oz. (21 days) (RUP)
- Brigade @ 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)
Spiromesifen
- Oberon 2 SC, 8 to 16 fl oz. (7 days)
- Zeta-Cypermethrin + Avermectin
- Gladiator, 19 fl oz. (14 days) (RUP)

DISEASES
SEED (ROOT) TREATMENT:
- Mites
- Plant immediately.

DISEASES
BLACK ROT, SCURF (Ceratostomella simbriata, Monilochaetes infuscans): Dip roots and sprouts in one of the following suspensions.

Flies immediately.

PYTHIUM DAMPING OFF:
Mefenoxam
- Apron XL, 0.085 - 0.64 fl oz/100 lb seed. (0 days)

PREPLANT INCORPORATED:
DAMPING OFF (Pythium and Phytophthora spp.):
- Mefenoxam. Apply as a preplant incorporation or a surface application. For banded applications use a 7" band. Note: If natural rainfalls not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1" of sprinkler irrigation.
- Ridomil Gold WSP, 1 to 2 lb.
Pyrimethanil
- Scala, 7 fl oz every 7 - 14 days. (7 days) Maximum 35 fl oz/season.
Fenamidone
- Reason 500 SC, 5.5 - 8.2 fl oz every 5 to 10 days. (7 days) Note: It is recommended that a protectant partner such as an EDBC (mancozeb or metiram) or chlorothalonil product is added in tank mixture to any strobilurin product. Strobilurins should also be used in rotation with a fungicide with a different mode of action.

FOLIAR TREATMENT:
WHITE RUST (Albugo tragoponis):
Azoxystrobin
- Quadris, 6 to 15.5 fl oz. (14 days) Do not make more than one application before rotating with a non-Group 11 fungicide with a different mode of action
Fenamidone
- Reason 500 SC, 5.5 - 8.2 fl oz. (14 days) Do not make more than one application before rotating with a fungicide with a different resistance management group
Pyraclostrobin
- Cabrio, 8 to 16 oz. (0 days) Do not make more than one application before rotating with a non-Group 11 fungicide with a different mode of action
ALTERNARIA BLIGHT (Alternaria spp.):
Azoxystrobin
- Quadris, 6 to 15.5 fl oz. (0 days) Do not make more than one application before rotating with a non-Group 11 fungicide with a different mode of action

Boscalid
- Endura, 2.5 to 4.5 oz. (10 days) Do not make more than two applications before rotating with a fungicide with a different resistance management group for at least one applications
- Switch, 62.5 WG, 11 to 14 oz. (7 days) Do not make more than two applications before rotating with a fungicide with a different resistance management group for two applications
Cypselad + Fludioxonil
- Endura, 2.5 to 4.5 oz. (10 days) Do not make more than two applications before rotating with a fungicide with a different resistance management group for at least one applications
- Switch, 62.5 WG, 11 to 14 oz. (7 days) Do not make more than two applications before rotating with a fungicide with a different resistance management group for two applications
Fenamidone
- Reason 500 SC, 5.5 - 8.2 fl oz. (14 days) Do not make more than one application before rotating with a fungicide with a different resistance management group
Pyraclostrobin
- Cabrio, 8 to 12 oz. (0 days) Do not make more than one application before rotating with a non-Group 11 fungicide with a different mode of action
Pyrimethanil
- Scala, 7 fl oz. (7 days)

Tomatoes
Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

NEMATODES
Root-knot and root-lesion nematodes can reduce tomato yields. Fields with soil or root problems of undetermined cause should be tested for nematodes (see Appendix C). If the plant-parasitic nematodes are present in population densities above the economic threshold for tomatoes, crop rotation or application of a nematicide is recommended. The following nematicides are suitable for control of root-knot and root-lesion nematodes in tomato production.

1-3-D
- Telone II, 9-18 gal/A (mineral soil).
Fumigate in the fall when soil temperatures at a 6-inch depth are above 50°F. Inject the fumigant to a soil depth of 6 to 8 inches and lightly seal the soil immediately after application. Use soil fumigants only as directed on the label. In some limited situations soil fumigants can be applied in the spring in Michigan.
Correct soil moisture, temperature and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or by immediate tarping.

PREPLANT NEMATICIDE TREATMENT:
Fluensulfone
- Nimitz 480 EC, 3.5 - 5.0 pints/A. apply broadcast and incorporate either mechanically or with water to a depth of 6-8 inches at least 7 days prior to transplanting or planting. Do not apply if heavy rainfall is expected within 48 hours of application. This material can be applied in bands or by drip but apparently is most effective if applied broadcast and incorporated. Do not apply to extremely cold soils (<40 F) as nematodes have to be active for the product to be effective. Product has not been evaluated in Michigan.
Tomatoes

INSECTS

SOIL TREATMENT:
LEAFHOPPER, THRIPS, FLEA BEETLE, WHITEFLIES, APHIDS, COLORADO POTATO BEETLE: Additional generic brands available.
Imidacloprid
- Admire Pro, 7 to 10.5 fl oz. (21 days)
- Nupur 2 F, 16 to 24 fl oz. (21 days)
Thiamethoxam
- Platinum (5 to 11 fl oz.) or Platinum 75 SG (1.66 to 3.67 oz.) (30 days) See label for application methods.
CUTWORM:
Brigadier, 3.4 to 6.8 fl oz. See label for application methods. (RUP)
Diazinon
- Diazinon 50 W (4 to 8 lb.) or Diazinon AG 500 (2 to 4 qt.) or Diazinon AG600 (51 to 102 fl oz.) Broadcast just before planting and immediately incorporate into soil. (RUP)
WIREWORM:
Athena, 8.5 to 17 fl oz. (RUP)
Bifenture 10 DF, 8 to 12.8 oz/A. (1 day)
Brigade WSB, 8 to 12.8 oz. Apply infurrow with seed or transplant. (RUP)
Brigadier, 3.4 to 6.8 fl oz. See label for application methods. (RUP)
Diazinon
- Diazinon 50 W (6 to 8 lb.) or Diazinon AG 500 (3 to 4 qt.) or Diazinon AG600 (76.5 to 102 fl oz.) Broadcast just before planting and immediately incorporate into soil. (RUP)
COLORADO POTATO BEETLE, FLEA BEETLE, LEAFHOPPERS, THRIPS, WHITEFLIES:
Dinotefuran
- Scorpion 3SSL (9 to 10.5 fl oz.) or Venom (5 to 6 oz.) (21 days)
APHIDS, ARMYWORM, COLORADO POTATO BEETLE, FLEA BEETLE, HORNWORMS, LEAFHOPPERS, THRIPS, WHITEFLIES:
ARMYWORM, LOOPERS, TOMATO FRUITWORM:
Coragen, 3.5 to 5 fl oz. (1 day)
CUTWORM, ARMYWORM, FLEA BEETLE LARVAE, WIREWORM:
Capture LFR, 3.4 to 6.8 fl oz. See label for application methods. (RUP)
ARMYWORM:
Verimark, 5-10 oz/A. (1)
FLEA BEETLE, LEAFMINERS, LOOPERS, APHIDS, WHITEFLY, THRIPS:
Verimark, 6.75-13.5 oz/A. (1)
LEAFHOPPERS, APHIDS, PSYLID, WHITEFLIES:
Sivanto, 21 - 28 fl oz/A.
SOIL INJECTION:
ARMYWORM, COLORADO POTATO BEETLE, HORNWORM, TOMATO FRUITWORM:
Verimark, 5-10 oz/A. (1)
FLEA BEETLE, LEAFMINERS, LOOPERS, APHIDS, WHITEFLY, THRIPS:
Verimark, 6.75-10 oz/A. (1)
EUROPEAN CORN BORER:
Verimark, (1)
FOLIAR TREATMENT:
CUTWORM, ARMYWORM: Apply if there is more than 1 cutworm per 100 plants on transplants or if defoliation is >10% on larger plants.
Athena, 7 to 17 fl oz. (7 days) (RUP)
Baythroid XL, 2.1 to 2.8 fl oz. (0 days) (RUP)
Belt SC, 1.5 fl oz. (1 day)
Bifenthrin
- Bifenture EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Brigade @ 2EC (2.1 to 5.2 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (1 day) (RUP)
- Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Discipline 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Fanfare 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Sniper, 2.1 to 5.12 fl oz. (1 day) (RUP)
- Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
Bifenthrin + Imidacloprid
- Brigadier, 3.8 to 9.85 fl oz. (1 day) (RUP)
- Swagger, 10.2 to 19.7 fl oz. (1 day) (RUP)
Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (1 day) (RUP)
- Bifenture 10 DF, 5.3 to 12.8 oz/A. (1 day)
- Confirm 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)
- Danitol 2.4 EC, 10.67 fl oz. (3 days) (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)
Esfenvalerate
- Adjoint, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-Fenvalasate, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
Permethrin
- Ambush 25 W, 3.2 to 12.8 oz. (0 days) (RUP)
- Perm-UP 2SF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 3.2 to 12.8 oz. (0 days) (RUP)
- Pyrene 1, 1 to 12 oz. (0 days)
- Vetica, 12 to 17 fl oz. (1 day)
FLEA BEETLE: Apply if necessary.
Actara, 2 to 3 oz. (0 days) Do not apply if a neonicitinoid was used at planting.
Athena, 7 to 17 fl oz. (7 days) (RUP)
Baythroid XL, 2.8 fl oz. (0 days) (RUP)
Belay 50 WDG, 1.6 to 2.1 oz. (7 days) (RUP)
Bifenthrin
- Bifenture EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Brigade @ 2EC (2.1 to 5.2 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (1 day) (RUP)
- Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Discipline 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Fanfare 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Sniper, 2.1 to 5.12 fl oz. (1 day) (RUP)
- Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
Bifenthrin + Imidacloprid
- Brigadier, 3.8 to 9.85 fl oz. (1 day) (RUP)
- Swagger, 10.2 to 19.7 fl oz. (1 day) (RUP)
Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (1 day) (RUP)
- Bifenture 10 DF, 5.3 to 12.8 oz/A. (1 day)
- Confirm 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)
- Danitol 2.4 EC, 10.67 fl oz. (3 days) (RUP)
- Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)
- Esfenvalerate
- Adjoint, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-Fenvalasate, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Gladiator, 10 to 19 fl oz. (7 days) (RUP)
- Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
- Permethrin
- Ambush 25 W, 3.2 to 12.8 oz. (0 days) (RUP)
- Perm-UP 2SF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 3.2 to 12.8 oz. (0 days) (RUP)
- Pyrene 1, 1 to 12 oz. (0 days)
- Vetica, 12 to 17 fl oz. (1 day)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label Instructions carefully.
Dinotefuran
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)
Do not use if neonicotinoids were used at planting.

Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)

Endosulfan 3 EC, 0.66 to 1.33 qt. (4 days) (RUP)

Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-FenvaLoStar, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Gladiator, 19 fl oz. (7 days) (RUP)

Imidacloprid, Additional generic brands available.
- Adire Pro, 1.3 to 2.2 fl oz. (0 days)
- Nuprid 1.6 F, 3.8 to 6.2 fl oz. (0 days)
Do not use if neonicotinoids were used at planting. Do not apply more than 19.2 oz/acre per season.

Kryocide, 8 to 16 lb. (14 days)

Lambdacyhalothrin
- Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
- Warrior II, with or without Zeon Technology (1.28 to 1.92 fl oz.) or Warrior II with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)

Leverage, 360, 3.8 to 4.1 fl oz. (0 days) (RUP)

Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)

Pyrenone, 1 to 12 fl oz. (0 days)

Carbaryl XL, 0.5 to 1 qt. (3 days)

Sevin 4 F (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)

Voliam Flexi, 4 to 7 oz. (1 day)

COLORADO POTATO BEETLE: Apply to entire field or field borders if needed to protect new transplants or if defoliation on older plants is greater than 10%.

Abamectin
- Agri-Mek 0.15 EC (6 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)

Acetamiprid
- Assail 30 SG (1.5 to 2.5 oz.) or Assail 70WP (0.6 to 1.1 oz.) (7 days)

Actara, 2 to 3 oz. (0 days) Do not apply if a neonicotinoid was used at planting.

Athene, 7 to 17 fl oz. (7 days) (RUP)

Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)

Belay 50 WDG, 1.6 to 2.1 oz. (7 days) (RUP)

Bifenthrin + Imidacloprid
- Brigadier, 3.8 to 9.85 fl oz. (1 day) (RUP)
- Swagger, 10.2 to 19.7 fl oz. (1 day) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (1 day) (RUP)
- Steed, 3.5 to 4.7 fl oz. (1 day) (RUP)

Carbaryl
- Carbaryl 4L, 1 to 2 qt. (3 days)

Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

Coragen, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.

Dinotefuran
- Scorpion 35SL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)

Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)

Endosulfan 3 EC, 0.66 to 1.33 qt. (4 days) (RUP)

Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-FenvaLoStar, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Gladiator, 19 fl oz. (7 days) (RUP)

Always read and follow label instructions carefully

*Materials marked with an asterisk are particularly recommended for problem infestations.
**Tomatoes**

_Fulfil, 2.75 oz. (7 days) May require 5 to 7 days for aphid mortality._
_Gladiator, 14 to 19 fl oz. (7 days) (RUP)_

Imidacloprid. Additional generic brands available.

- Admire Pro, 1.3 to 2.2 fl oz. (0 days)
- Nuprid 1.6 F, 3.8 to 6.2 fl oz. (0 days)

Do not use if neonicotinoids were used at planting. Do not apply more than 19.2 oz/acre per season.

**Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)**

**Malathion**

- Malathion 5 (1 pt.) or Malathion 5 EC (1.5 pt.) or Malathion 57 EC (1 to 2.5 pt.) or Malathion 8 (1.5 pt.) or Malathion 8 Aquamul (1 to 1.56 pt.) (3 days for Malathion 5 EC, 1 day for others)

**Methomyl**

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Movento, 4 to 5 fl oz. (1 day) Must be tank mixed with adjuvant having spreading and penetrating properties.
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
- Pyreneone, 1 to 12 fl oz. (0 days)
- Sivanto, 7 - 12 fl oz/A.
- Voliam Flexi, 4 to 7 oz. (1 day)
- Vydate L, 2 to 4 pt. (3 days) (RUP)

**LEAFHOPPERS:** Occasionally a problem early in the season. Apply as needed.

- Actara, 2 to 3 oz. (0 days)
- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)
- Belay 50 WDG, 1.6 to 2.1 oz. (7 days)

**Bifenthrin**

- Bifenture EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Brigade @ 2EC (2.1 to 5.2 fl oz.) or Brigade WSB (6.3 to 12.8 oz.) (1 day) (RUP)
- Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Discipline 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Fanfare 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Sniper, 2.1 to 5.12 fl oz. (1 day) (RUP)
- Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)

**Bifenthrin + Imidacloprid**

- Brigadier, 5.1 to 9.85 fl oz. (1 day) (RUP)
- Swagger, 7.6 to 19.7 fl oz. (1 day) (RUP)

**Bifenthrin + Zeta-Cypermethrin**

- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (1 day) (RUP)
- Steed, 3.5 to 4.7 fl oz. (1 day) (RUP)

**Carbaryl**

- Carbaryl 4L, 0.5 to 1 qt. (3 days)
- Sevin 4 F  (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)

**Dimethoate**

- Dimethoate 4 EC, Dimethoate 400, Dimethoate 4E, 0.5 to 1 pt. (7 days)

**Dinotefuran**

- Scorpion 3SSL, 2 to 7 fl oz. (1 day)
- Venom, 1 to 4 oz. (1 day)

Do not use if neonicotinoids were used at planting.

**Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)**

**Gladiator, 10 to 19 fl oz. (7 days) (RUP)**

**Imidacloprid**. Additional generic brands available.

- Admire Pro, 1.3 to 2.2 fl oz. (0 days)
- Nuprid 1.6 F, 3.8 to 6.2 fl oz. (0 days)

Do not use if neonicotinoids were used at planting. Do not apply more than 19.2 oz/acre per season.

**Lambda-cyhalothrin**

- Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)

**Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)**

**Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)**

**Mustang Max, 2.24 to 4 oz. (1 day) (RUP)**

**Pyreneone, 1 to 12 fl oz. (0 days)**

**Carbaryl 4L, 0.5 to 1 qt. (3 days)**

**Sevin 4 F  (0.5 to 1 qt.) or Sevin 80 S (0.63 to 1.25 lb.) or Sevin 80 WSP (0.67 to 1.25 lb.) or Sevin XLR Plus (0.5 to 1 qt.) (3 days)**

**Sivanto, 7 - 10.5 fl oz/A.**

**Vetica, 14 to 17 fl oz. (1 day)**

**Voliam Flexi, 4 to 7 oz. (1 day)**

**HORNWORMS:** Apply if numbers exceed 1/plant.

- Athena, 7 to 17 fl oz. (7 days) (RUP)
- Avaunt, 2.5 to 3.5 oz. (3 days)

**Bacillus thuringiensis**

- Agree WG, 0.5 to 2 lb. (0 days)
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF (0.25 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- XenTan, 0.5 to 1.5 lb. (0 days)

**Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)**

**Belt SC, 1.5 fl oz. (1 day)**

**Bifenthrin + Zeta-Cypermethrin**

- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (1 day) (RUP)
- Steed, 3.9 to 4.7 fl oz. (1 day) (RUP)

**Carbaryl**

- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

**Confirm 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season); (7 days)**

**Coragen, 2 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.**

**Danitol 2.4 EC, 10.67 fl oz. (3 days) (RUP)**

**Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)**

**Endosulfan 3 EC, 0.66 to 1.33 qt. (4 days) (RUP)**

**Esfenvalerate**

- Adjoum, 2.9 to 5.8 fl oz. (1 day) (RUP)
- Asana XL, 2.9 to 5.8 fl oz. (1 day) (RUP)
- S-Fenvalstar, 2.9 to 5.8 fl oz. (1 day) (RUP)
- Exirel, 7-13.5 oz/A. (1)

**Gladiator, 10 to 19 fl oz. (7 days) (RUP)***

**Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)**

**Kryocide, 8 to 16 lb. (14 days)**

**Lambda-cyhalothrin**

- Lambda-Cy, 1.92 to 3.2 fl oz. (5 days) (RUP)

**Warrior II with Zeon Technology (0.96 to 1.6 fl oz.) or Warrior with Zeon Technology (1.92 to 3.2 fl oz.) (5 days) (RUP)**

**Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)**

**Methomyl**

- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Mustang Max, 2.24 to 4 oz. (1 day) (RUP)

**Permethrin**

- Ambush 25 W, 3.2 to 12.8 oz. (0 days) (RUP)

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*Materials marked with an asterisk are particularly recommended for problem infestations.*
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Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)

Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Mustang Max, 3.2 to 4 oz. (1 day) (RUP)

Permethrin
- Ambush 25 W, 3.2 to 12.8 oz. (0 days) (RUP)
- Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (0 days) (RUP)
- Pounce 25 WP, 3.2 to 12.8 oz. (0 days) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (5 days) (RUP)
- Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
- Pyrene, 1 to 12 fl oz. (0 days)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

Spinosad
- Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
- Vetica, 12 to 17 fl oz. (1 day)
- Voliam Flexi, 4 to 7 oz. (1 day)

CABBAGE LOOPERS: Apply to prevent larvae from pupating on ripe fruit or if defoliation is greater than 10%.

ATHENA, 7 to 17 fl oz. (7 days) (RUP)

Avant, 2.5 to 3.5 oz. (3 days)

**Bacillus thuringiensis**
- Agree WG, 0.5 to 2 lb. (0 days)
- Biobit HP, 0.5 to 1 lb. (0 days)
- DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
- Javelin WG, 0.12 to 1.5 lb. (0 days)
- Xentari, 0.5 to 1.5 lb. (0 days)
- Baythroid XL, 2.1 to 2.8 fl oz. (0 days) (RUP)
- Belt SC, 1.5 fl oz. (1 day)

Bifenthrin
- Bifenture EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Brigade @ 2EC (2.1 to 5.2 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (1 day) (RUP)
- Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Disciplin 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Fanfare 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- Sniper, 2.1 to 5.12 fl oz. (1 day) (RUP)
- Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)

Bifenthrin + Imidacloprid
- Brigadier, 3.8 to 9.85 fl oz. (1 day) (RUP)
- Swagger, 10.2 to 19.7 fl oz. (1 day) (RUP)

Bifenthrin + Zeta-Cypermethrin
- Hero (4 to 10.3 oz.) or Hero EW (4.5 to 11.2 oz.) (1 day) (RUP)
- Steed, 3.5 to 4.7 fl oz. (1 day) (RUP)
- Bifenture 10 DF, 5.3 to 12.8 oz/A. (1 day)
- Confirm 2F, 6 to 8 fl oz. (early-season); 8 to 16 fl oz. (mid- to late-season). (7 days)
- Coragen, 3.5 to 5 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz per season.
- Endigo ZC, 4 to 4.5 fl oz. (5 days) (RUP)
- Endosulfan 3 EC, 1 to 1.33 qt. (4 days) (RUP)

Esfenvalerate
- Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
- S-FenvaloStar, 5.8 to 9.6 fl oz. (1 day) (RUP)
- Exirel, 7-13.5 oz/A. (1)
- Gladiator, 10 to 19 oz. (7 days) (RUP)
- Intrepid 2F, 4 to 8 fl oz (early-season applications to young, small crops) or 8 to 10 fl oz (mid- to late-season applications). (1 day)
- Kryocide, 8 to 16 lb. (14 days)

Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)

Tomatoes

*Always read and follow label instructions carefully*
Tomatoes

Mustang Max, 2.24 to 4 oz. (1 day) (RUP)
Permethrin
• Ambush 25 W, 3.2 to 12.8 oz. (0 days) (RUP)
• Perm-UP 25DF (3.2 to 12.8 oz.) or Perm-UP 3.2 EC (2 to 8 oz.) (0 days) (RUP)
• Pounce 25 WP, 3.2 to 12.8 oz. (0 days) (RUP)
Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)
Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
Pyrethrin
• 1 to 12 fl oz. (0 days)
Radiant SC, 5 to 10 fl oz. (1 day)
Rimon 0.83EC, 9 to 12 fl oz. (1 day)
Carbaryl 4L, 1 to 2 qt. (3 days)
Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
Spinosad
• Entrust (1 to 2 oz.) or Entrust SC (3 to 6 fl oz.) (1 day)
Vetica, 12 to 17 fl oz. (1 day)
Voliom Flexi, 4 to 7 oz. (1 day)
FRUIT FLIES: May be a problem on certain varieties during harvest season. Eggs are laid in cracks of ripening fruit. Apply as needed.
Diazinon AG 500, 0.5 to 1.5 pt. (1 day) (RUP)
Malathion
• Malathion 5, Malathion 5 EC, or Malathion 57 EC (2.5 pt.) or Malathion 8 (2 pt.) or Malathion 8 Aquamul (1.56 pt.) (3 days for Malathion 5 EC, 1 day for others)
Pyrethrin
• 1 to 12 fl oz. (0 days)
THRIPS:
Acetamiprid
• Assail 30 SG (4 oz.) or Assail 70WP (1.7 oz.) (7 days)
Agri-Mek 0.15 EC, 8 to 16 fl oz. (7 days) (RUP)
Athena, 13.5 to 17 fl oz. (7 days) (RUP)
Baythroid XL, 2.1 to 2.8 fl oz. (0 days) (RUP)
Bifenthrin
• Bifenture EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Brigade @ 2EC (2.1 to 5.2 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (1 day) (RUP)
• Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Discipline 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Fanfare 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Sniper, 2.1 to 5.12 fl oz. (1 day) (RUP)
• Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
Bifenthrin + Imidacloprid
• Brigadier, 5.1 to 9.85 fl oz. (1 day) (RUP)
• Swagger, 7.6 to 19.7 fl oz. (1 day) (RUP)
Bifenture 10 DF, 5.3 to 12.8 oz/A. (1 day) (RUP)
Dinofuran
• Scorpion 3SSL, 2 to 7 fl oz. (1 day)
• Venom, 1 to 4 oz. (1 day) (RUP)
Do not use if neonicotinoids were used at planting.
Do not use if neonictinoids were used at planting.
Exire, 13.5-20.5 oz/A. (1) foliar feeding only
Hero, 10.3 oz. (7 days) (RUP)
Lambda-cyhalothrin
• Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
• Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)
• Warrior II with Zeon Technology (1.28 to 1.92 fl oz.), or Warrior with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)
Leverage 360, 3.8 to 4.1 fl oz. (0 days) (RUP)
Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
Proaxis, 2.56 to 3.84 fl oz. (5 days) (RUP)
Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or Warrior with Zeon Technology (2.56 to 3.84 fl oz.)(5 days) (RUP)
Pyreneone, 1 to 12 fl oz. (0 days)
Radiant SC, 6 to 10 fl oz. (1 day)
Rimon 0.83EC, 12 fl oz. (1 day)
Spinosad
• Entrust (1.25 to 2.5 oz.) or Entrust SC (4 to 8 fl oz.) (1 day)
WHITEFLIES:
Acetamiprid
• Assail 30 SG (2.5 to 4 oz.) or Assail 70WP (1.1 to 1.7 oz.) (7 days)
Actara, 3 to 5.5 oz. (0 days) Do not apply if a neonicotinoid was used at planting.
Athena, 13.5 to 17 fl oz. (7 days) (RUP)
Bifenthrin
• Bifenture EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Brigade @ 2EC (2.1 to 5.2 fl oz.) or Brigade WSB (5.3 to 12.8 oz.) (1 day) (RUP)
• Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Discipline 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Fanfare 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
• Sniper, 2.1 to 5.12 fl oz. (1 day) (RUP)
• Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
Bifenthrin + Zeta-Cypermethrin
• Hero (10.3 oz.) or Hero EW (11.2 oz.) (1 day) (RUP)
Brigadier, 5.1 to 9.85 fl oz. (1 day) (RUP)
Dinofuran
• Scorpion 3SSL, 2 to 7 fl oz. (1 day)
• Venom, 1 to 4 oz. (1 day) (RUP)
Do not use if neonicotinoids were used at planting.
Endosulfan 3 EC, 1.33 qt. (4 days) (RUP)
Esfenvalerate
• Adjourn, 5.8 to 9.6 fl oz. (1 day) (RUP)
• Asana XL, 5.8 to 9.6 fl oz. (1 day) (RUP)
• S-FenvaloStar, 5.8 to 9.6 fl oz. (1 day) (RUP)
Gladiator, 14 to 19 fl oz. (7 days) (RUP)
Imidacloprid, Additional generic brands available.
• Admire Pro, 1.3 to 2.2 fl oz. (0 days)
• Nuprid 1.6 F, 3.8 to 6.2 fl oz. (0 days)
Do not use if a neonicotinoid was used at planting. Do not apply more than 19.2 oz per season
Leverage 360, 4.1 fl oz. (0 days) (RUP)
Movento, 4 to 5 fl oz. (1 day) Must be tank mixed with adjuvant having spreading and penetrating properties.
Mustang Max, 3.2 to 4 oz. (1 day) (RUP)
Oberon 2 SC, 7 to 8.5 fl oz. (7 days)
Portal, 2.0 pt. (1 day)
Pyreneone, 1 to 12 fl oz. (0 days)
Rimon 0.83EC, 12 fl oz. (1 day)
Vetica, 14 to 17 fl oz. (1 day)
Voliom Flexi, 4 to 7 oz. (1 day)
CUTWORM:
Bacillus thuringiensis
• Biobit HP, 0.5 to 1 lb. (0 days)
• DiPel DF (0.5 to 1 lb.) or DiPel ES (1 to 2 pt.) (0 days)
• XenTan, 0.5 to 1.5 lb. (0 days)
Carbaryl
• Carbaryl 4L, 2 qt. (3 days)
• Sevin 4 F (2 qt.) or Sevin 80 S (2.5 lb.) or Sevin 80 WSP (2.5 lb.) or Sevin XLR Plus (2 qt.) (3 days)
Lambda-cyhalothrin
• Lambda-Cy, 1.92 to 3.2 fl oz. (5 days) (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.
Materials marked with an asterisk are particularly recommended for problem infestations.

**CHEMIGATION TREATMENT:**

- **Warrior II** with Zeon Technology (0.96 to 1.6 fl oz.) or **Warrior** with Zeon Technology (1.92 to 3.2 fl oz.) (5 days) (RUP)
- **Methomyl**
  - Lannate LV (1.5 pt.) or Lannate SP (0.5 lb.) (1 day) (RUP)
- **Nudrin LV** (1.5 pt.) or **Nudrin SP** (0.5 lb.) (1 day) (RUP)
- Proaxis, 1.92 to 3.2 fl oz. (5 days) (RUP)
- **Carbaryl 4L**, 2 qt. (3 days)
- Sevin 4 F (2 qt.) or Sevin 80 S (2.5 lb.) or Sevin 80 WSP (2.5 lb.) or Sevin XLR Plus (2 pt.) (3 days)
- Steed, 3.5 to 4.7 fl oz. (1 day) (RUP)

**ARMYWORM:**

- Avaunt, 3.5 oz. (3 days)
- Bacillus thuringiensis
  - Agree WG, 0.5 to 2 lb. (0 days)
  - Biobit HP, 0.5 to 2 lb. (0 days)
  - DiPel DF (1 to 2 lb.) or DiPel ES (2 to 4 pt.) (0 days)
  - XenTari, 0.5 to 2 lb. (0 days)
- Carbaryl
  - Carbaryl 4L, 1 to 2 qt. (3 days)
  - Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)
- Coragen, 3.5 to 6 fl oz. (1 day) Minimum of 5 days between applications; do not apply more than 15.4 fl oz. per season.
- Danitol 2.4 EC, 10.67 fl oz. (3 days) (RUP)
- Diazinon AG 500, 0.75 to 1 pt. (1 day) (RUP)
- Endosulfan 3 EC, 1.33 qt. (4 days) (RUP)
- Exirel, 7-13.5 oz/1A. (1)
- Lambda-cyhalothrin
  - Lambda-Cy, 2.56 to 3.84 fl oz. (5 days) (RUP)
  - Warrior II with Zeon Technology (1.28 to 1.92 fl oz.) or **Warrior** with Zeon Technology (2.56 to 3.84 fl oz.) (5 days) (RUP)
- Malathion
  - Malathion 57 EC (1 to 2.5 pt.) or Malathion 8 Aquamul (1.56 pt.) (1 day)
  - Methomyl
- Lannate LV (1.5 to 3 pt.) or Lannate SP (0.5 to 1 lb.) (1 day) (RUP)
- Nudrin LV (1.5 to 3 pt.) or Nudrin SP (0.5 to 1 lb.) (1 day) (RUP)
- Proclaim, 2.4 to 4.8 oz. (7 days) (RUP)
- Radiant SC, 5 to 10 fl oz. (1 day)
- Rimon 0.83EC, 9 to 12 fl oz. (1 day)
- Carbaryl 4L, 1 to 2 qt. (3 days)
- Sevin 4 F (1 to 2 qt.) or Sevin 80 S (1.25 to 2.5 lb.) or Sevin 80 WSP (1.25 to 2.5 lb.) or Sevin XLR Plus (1 to 2 qt.) (3 days)

**Spinosad**

- Entrust (1.25 to 2.5 oz.) or **Entrust SC** (4 to 8 fl oz.) (1 day)
- Voliam Flexi, 4 to 7 oz. (1 day)

**SWEET POTATO WHITEFLY, SILVER LEAF WHITEFLY:**

- Acetamiprid
  - Assail 30 SG, 2.5 to 4 oz. (7 days)
  - Assail 70WP, 1.1 to 1.7 oz. (7 days)
- PSYLIID, WHITEFLIES:
  - Sivanto, 10.5 - 14 fl oz/A.

**CHEMIGATION TREATMENT:**

- **ARMYWORM, COLORADO POTATO BEETLE, HORNWORM, TOMATO FRUITWORM:**
  - Verimark, 5-10 oz/A. (1)
- **FLEA BEETLE, LEAFMINERS, LOOPERS, APHIDS, WHITEFLY, THRIPS:**
  - Verimark, 6.75-10 oz/A. (1)

**EUROPEAN CORN BORER:**

- Verimark, 10 oz/A. (1)

**mites**

- Usually two-spotted. May be a problem in hot, dry weather.
- **Abamectin**
  - Agri-Mek 0.15 SC (8 to 16 fl oz.) or Agri-Mek SC (1.75 to 3.5 fl oz.) (7 days) Use with a non-ionic surfactant. (RUP)
- **Bifenazate**
  - Acramite 50WS, 0.75 to 1 lb. (3 days)
- **Bifenithrin**
  - Bifenture EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
  - Bifenture 10 DF, 12.8 to 16 oz/A. (1 day)
  - Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (1 day) (RUP)
  - Capture 2 EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
  - Diabline 2EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
  - Fanfare 2EC, 5.12 to 6.4 fl oz. (1 day) (RUP)
  - Sniper, 5.12 to 6.4 fl oz. (1 day) (RUP)
  - Tundra EC, 2.1 to 5.2 fl oz. (1 day) (RUP)
- **Bifenithrin + Avermectin**
  - Athena, 13.5 to 17 fl oz. (7 days) (RUP)
  - Bifenithrin + Zeta-Cypermethrin
  - Hero (10.3 oz.) or Hero EW (11.2 oz.) (1 day) (RUP)
- **Fenpropathrin**
  - Danitol 2.4 EC, 10 2/3 fl oz. (3 days) (RUP)
- **Fenpyroximate**
  - Portal, 2 pt. (1 day)
- **Malathion**
  - Malathion 5, Malathion 5 EC, or Malathion 8 (1.5 pt.) or Malathion 8 Aquamul (1 to 1.56 pt.) (3 days for Malathion 5 EC, 1 day for others)
- **Spiromesifen**
  - Oberon 2 SC, 7 to 8.5 fl oz. (7 days)
  - Zeta-Cypermethrin + Avermectin
  - Gladiator, 19 fl oz. (7 days) (RUP)

**SLUGS**

- **Deadline M-Ps** 4% (20 to 40 lb) or **Metaldehyde** 3.5 G (30 to 40 lb) Apply between rows. Avoid contact to edible product.

**Diseases**

**SEED TREATMENT:**

- **DAMPING OFF, PRE-EMERGENCE (Pythium spp., Rhizoctonia solani, Phytophthora spp.)**
  - **Thiram**
    - 42-S Thiram, Thiram 480DP, Thiram 50 WP Dyed, 6 oz/100 lb seed. Apply to seed before planting.
- **Preplant Soil Fumigation:**
  - **Fusarium Wilt** (Fusarium oxysporum), **Verticillium Wilt** (Verticillium albo-atrum). Apply to production fields in the spring before planting. **Note:** Most fumigants applied in the soil for control of disease organisms will also control soil insects, nematodes and weed seeds.
  
  Soil sterilization by fumigation is best achieved by proper application of material. Correct soil moisture, temperature, and soil structure is needed for effective control of soil-borne pests. Special care is needed to seal fumigants in target zone for required time periods. This can be achieved by soil packing or immediate tarping.
  - 1,3-Dichloropropene/chloropicrin
  - Telone C35, 13-35 gal. (RUP)
  - Metam Potassium
  - Sectagon-K34, 30-60 gal. (RUP)
  - Metam Sodium
  - Sectagon 42, 37.5-75 gal.. (RUP)

*Materials marked with an asterisk are particularly recommended for problem infestations.

Always read and follow label instructions carefully.
Tomatoes

GREENHOUSE PREPLANT INCORPORATION:

**DAMPING OFF (Pythium spp.), ROOT ROT (Rhizoctonia spp.):**

Gliocladium virens GL-21
- SoilGard 12 G, 1 to 1.5 lb per cubic yard. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.

PREPLANT INCORPORATED:

**DAMPING OFF (Pythium spp.):**

Mefenoxam. Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7 in. band. **Note:** If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1 in. of sprinkler irrigation.
- Ridomil Gold GR, 20 lb.
- Ridomil Gold SL, 1 pt. (7 days)
- Ultra Flourish, 2 to 4 pt.

ROOT and FRUIT ROT (Pythium spp., Phytophthora spp.):
Mefenoxam. Apply Ridomil 4 to 6 weeks after planting as a surface application or a soil surface spray under vines followed by 1/2 to 1 in. of water or injected based on a 7 in. band. A second application before the last irrigation may be made up to 4 weeks before harvest.
- Ridomil Gold GR, 20 lb (4 weeks), (4 weeks) A third application at 10 lb can be made 4 weeks before harvest.
- Ridomil Gold SL, 1 pt. (7 days)
- Ultra Flourish, 2 to 4 pt (4 weeks). (weeks) **Note:** Observe limit of active ingredient/crop on label.

GREENHOUSE TREATMENT:

BACTERIAL CANKER (Clavibacter michiganensis subsp. michiganensis), BACTERIAL SPOT (Xanthomonas vesicatoria),

BACTERIAL SPECK (Pseudomonas tomato): Apply every 7 to 10 days after disease appearance.

Acibenzolar-S-methyl
- Actigard, 1/3 to 3/4 oz per 100 gal of water. (14 days) Do not apply more than 6 oz of Actigard per acre per season.

Copper Ammonium Carbonate
- Copper Count N, 4 tablespoons (speck) or 4 to 8 tablespoons (spot) per 1000 sq ft.

Copper Hydroxide
- Champ DP Dry Prill, Champ Formula 2 F, 1 1/2 to 2 1/4 tablespoons per 1000 sq ft (speck and spot).
- Kocide 3000, 0.5-1.5 tbl / 1000 ft. (0 day)

Copper Hydroxide + Copper Oxychloride
- Badge X2, 0.75 to 1.75 lb. (0 days)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1.8 pt. (0 days)

Mancozeb
- Dithane DF Rainshied, Dithane M-45, 1 1/2 to 3 lb. (5 days) Tank mix 1/2 to full rate of Dithane with a full rate of fixed copper fungicide, and apply at intervals recommended by the copper fungicide label (speck and spot).
- Dithane F-45 Rainshied, 1.2 to 2.4 qt. Tank mix 1/2 to full rate of Dithane with a full rate of fixed copper fungicide, and apply at intervals recommended by the copper fungicide label (speck and spot)

**Note:** Most fungicides that protect against bacterial speck and/or spot may provide protection against bacterial canker.

DRIP APPLICATION:

LATE BLIGHT (Phytophthora infestans), PHYTOPHTHORA BLIGHT (Phytophthora capsici):
- Amelotracidin + Dimethomorph
- Presidio, 3-4 fl oz. (2 days)
- Zampro, 14 fl oz. (4 days)

* Materials marked with an asterisk are particularly recommended for problem infestations.

**FOLIAR TREATMENT:**

**DAMPING OFF (Pythium spp.):**

Fosetyl-Aluminum
- Aliette WDG, 2.5 to 5 lb, 7- to 14-day intervals. (14 days) **Note:** Do not tank mix with copper products.

WHITE MOLD (Sclerotinia sclerotiorum):
- Mancozeb
  - Dithane DF Rainshied, Dithane M-45, Dithane WSP, 1 1/2 to 3 lb. (5 days)
  - Dithane F-45 Rainshied, 1 1/5 to 2 2/5 qt. (5 days)
  - Manzate Pro-Stick, 1 1/2 to 3 lb, 7- to 10-day intervals. (5 days)
  - Penncozeb 75 DF, 3/4 to 3 lb (Cladosporium). (5 days)
  - Fluxapyroxad + Pyraclostrobin
    - Praxor Xemium Brand Fungicide, 4 - 8 fl oz suppression. (0 days) Supression only.

Pyraclostrobin
- Cabrio, 12-16 oz (suppression). (0 days)

BACTERIAL CANKER (Clavibacter michiganensis subsp. michiganensis), BACTERIAL SPOT (Xanthomonas vesicatoria),

BACTERIAL SPECK (Pseudomonas tomato):

Bacillus subtilis
- Serenade, 2 to 6 qt. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.
- Serenade Max, 1 - 3 lb every 7 to 10 days. (0 days)

Copper Ammonium Carbonate
- Copper Count N, 1 1/2 to 2 1/2 qt (processing), 1 1/2 to 3 qt (fresh market) (speck, spot). (0 days)

Copper Hydroxide
- Champ DP Dry Prill, 1 1/3 lb 10 to 30 day intervals (speck) or 1 1/3 to 2 3/3 lb (spot), 7-to-10-day intervals. (0 days)
- Champ Formula 2 F, 1 1/3 pt. (0 days)
- Champ WG, 1.06 lb (spot) or 2 lb (speck). (0 days)
- Kocide 3000, 0.75 to 1.5 lb. (0 day)
- Nu-Cop 3 L, 1 1/3 pt (processing), 1 1/3 to 4 pt (fresh market). (0 days)
- Nu-Cop 50 DF, 1 lb (processing), 3.2 lb (fresh market). (0 days)
- Nu-Cop HB, 1 lb (processing), 1 to 3.2 lb (fresh market). (0 days)

Copper Hydroxide + Copper Oxychloride
- Badge SC, 1.8 pt. (0 days)

Copper Oxychloride + Copper Sulfate
- C-O-C-S WDG, 1 lb (processing), 1 to 3.1 lb (fresh market) (spot). (0 days)

Copper Sulfate
- Basic Copper 53, 0.75 to 1 lb (processing), 3 lb (fresh market) (speck, spot). (0 days) May be used through irrigation equipment.
- Cuprofix Ultra 40 Disperss, 0.75 to 3 lb (fresh market), 0.75 to 1.33 lb (processing). (0 days)

Famoxadone + Cymoxanil
- Tanos, 8 oz. (3 days)

Mancozeb
- Koverall, 1.5 - 3 lb. (5 days)

Mancozeb + Copper Hydroxide
- ManKocide, 1.7 lb (processing), 1 to 3 lb (fresh market) (speck, spot). (5 days)

Quinoxyfen
- Quintec, 6 fl oz. Supression only

**Note:** Fungicides that protect against bacterial speck and/or spot may provide protection against bacterial canker.
**EARLY BLIGHT (Alternaria solani):**

- *Azoxystrin*
  - *Quadris*, 5 to 6.2 fl oz. (0 days)
  - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
- *Azoxystrin + Chlorothalonil*
  - *Quadris Opti*, 1.3 to 1.6 pt every 7 - 21 days. (0 days)
- *Azoxystrin + Difenonazolone*
  - *Quadris Top*, 8 fl oz. (1 day) No more than two consecutive applications before alternating with another fungicide with a different mode of action.
- *Boscalid*
  - *Endura*, 2.5 to 3.5 oz. (0 days)
- *Chlorothalonil*
  - *Bravo Ultrex*, 1.3 to 1.8 lb (foliage) or 1.8 to 2.6 lb (fruit). (0 days)
  - *Bravo Weather Stik, Equus 720 SST, 1 3/8 to 2 pt (foliage) or 2 to 2.75 pt (fruit). (0 days)
  - *Echo 90 DF*, 1 1/8 to 1 5/8 lb (foliage) or 1 5/8 to 2 1/2 lb (fruit). (0 days)
  - *Equus DF*, 1.3 to 1.8 lb (foliage) or 1.8 to 2.6 lb (fruit). (0 days)
  - *Difenonazolone + Cypyrrolin*
  - *Inspire Super*, 16 to 20 fl oz. (0 days)
- *Mancozeb*
  - *Dithane F-45 Rainshield, Dithane M-45, Dithane WSP*, 1 1/2 to 3 lb. (5 days)
  - *Dithane F-45 Rainshield*, 1 1/5 to 2 2/5 qt. (5 days)
  - *Koverall*, 0.75 - 1.5 lb. (5 days)
  - *Manzate 80 WP (1 1/2 to 3 lb) or Manzate Pro-Stick (0.75 to 1.5 lb)* (5 days)
  - *Manzate Max*, 0.6 to 2.4 qt. (5 days)
  - *Penccozeb 75 DF*, 0.75 to 3 lb. (5 days)
- *Pyraclostrobin*
  - *Cabrio*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
- *Trifloxystrobin*
  - *Flint*, Gem 500, 2 to 3 oz. (3 days)
- *Ziram*
  - *Ziram 76 DF*, 3 to 4 lb, 7- to 14-day intervals. (7 days) Do not use on cherry tomatoes.

*Bacillus amyloliquefaciens:*

- *Senfel*, 4 - 16 fl oz. (0 day)

*Bacillus subtilis:*

- *Serenade*, 2 to 6 qt. (0 days) Biological control product that needs to be applied before disease development. Control will be limited under heavy disease pressure.

*Bacillus subtilis Max:*

- *Serenade Max*, 1 - 3 lb. (0 days)

*Chlorothalonil:*

- *Echo 720*, 1 3/8 to 2 pt (foliage) or 2 to 3 pt (fruit).
- *Copper Ammonium Carbonate*
  - *Copper Count N*, 1 1/2 to 2 1/2 qt (processing), 1 1/2 to 3 qt (fresher market) (speck, spot). (0 days)
- *Copper Hydroxide*
  - *Champ DF Dry Prill*, 1 1/3 to 2 lb (fresh market), 1.4 lb (processing). (0 days)
  - *Champ Formula 2 F*, 1 1/3 pt. (0 days)
  - *Champ WG*, 1.06 lb. (0 days)
  - *Kocide 3000*, 0.75 to 1.75 lb. (0 day)
  - *Nu-Cop 3 L*, 1 1/3 pt (processing), 1 1/3 to 4 pt (fresh market). (0 days)
  - *Nu-Cop 50 DF*, 1 lb (processing), 3.2 lb (fresh market). (0 days)
  - *Nu-Cop HB*, 1 lb (processing), 1 to 3.2 lb (fresh market). (0 days)
  - *Copper Hydroxide + Copper Oxichloride*
  - *Badge SC*, 1.8 pt. (0 days)
  - *Badge X2*, 0.75 to 1.75 lb. (0 days)
  - *Copper Oxichloride + Copper Sulfate*
  - *C-O-C-S WD, 1 lb (processing), 1 to 3.1 lb (fresh market). (0 days)
  - *Copper Sulfate*
    - *Basic Copper 53*, 0.75 to 1 lb (processing), 3 lb (fresh market) (speck, spot). (0 days)
    - *Cuprofix Ultra 40 Dispers, 0.75 to 3 lb (fresh market), 0.75 to 1.33 lb (processing). (0 days)
  - *Farnoxadone + Cymoxanil*
    - *Tanos*, 6 to 8 oz. (3 days)
    - *Fenamidine*
      - *Reason 500 SC, 5.5 - 8.2 fl oz. (14 days) No more than 1 application before alternating.
      - *Fluxapyroxad + Pyraclostrobin*
    - *Prinxar Xemium Brand Fungicide, 4 - 8 fl oz. (0 days)
    - *Mancozeb + Copper Hydroxide*
      - *ManKocide, 1.7 lb (processing), 1 to 3 lb (fresh market). (5 days)
    - *Mancozeb + Zaxamide*
      - *Gavel 75 DF, 1.5 - 2.0 lb. (5 days)
      - *Manipropamid + Difenonazolone*
        - *Revus Top, 5.5-7 fl oz. (1 day)
      - *Mefenoxam + Chlorothalonil*
        - *Ridomil Gold Bravo, 2.5 pt. (5 days)
  - *Neem Oil*
    - *Trilogy*, 2 pt. (0 days)
  - *Penflorpyrad*
    - *Fontelis*, 16 - 24 fl oz. (0 days)
    - *Potassium Bicarbonate*
    - *Armillar 100, 2.5 to 5 lb. (0 days)
    - *Potassium phosphate/chlorothalonil*
    - *Catamaran, 4.5 to 5.5 pt (folicie) or 7 pt (fruit). (0 days)
  - *Propamocarb*
    - *Previcur Flex, 0.7 to 1.5 pt every 7 to 10 days. (5 days) Use a tank mix partner (see label).
  - *Pyrimethanil*
    - *Scala*, 7 fl oz. (1 day)
    - *Zoxamide + chlorothalonil*
      - *Zing!, 36 fl oz. (5 days)

**LATE BLIGHT (Phytophthora infestans):**

- *Ametoctradin + Dimethomorph*
    - *Zampro*, 14 fl oz. (4 days)
- *Azoxystrin + Chlorothalonil*
  - *Quadris Opti*, 1.3 to 1.6 pt every 7 - 21 days. (0 days)
- *Chlorothalonil*
  - *Bravo Ultrex*, 1.3 to 1.8 lb (foliage) or 1.8 to 2.6 lb (fruit). (0 days)
  - *Bravo Weather Stik, Equus 720 SST, 1 3/8 to 2 pt (foliage) or 2 to 2.75 pt (fruit). (0 days)
  - *Echo 720*, 1 3/8 to 2 pt (foliage) or 2 to 3 pt (fruit). (0 days)
  - *Echo 90 DF*, 1 1/8 to 1 5/8 lb (folicie) or 1 5/8 to 2 1/2 lb (fruit). (0 days)
  - *Equus DF*, 1.3 to 1.8 lb (folicie) or 1.8 to 2.6 lb (fruit). (0 days)
  - *Cuprozolamin*
    - *Ramfan 400SC, 2.1 to 2.75 fl oz every 7 to 10 days. (0 days)
    - *Cymoxanil*
      - *Curate 60 DF, 3.2 to 5 oz every 5 - 7 days. (3 days) Use only in combination with a labeled rate of a protectant fungicide.
- *Dimethomorph*
  - *Forum, 6 fl oz. (4 days)

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*Materials marked with an asterisk are particularly recommended for problem infestations.*

Always read and follow label instructions carefully.
Tomatoes

*Fenamidone
  - *Reason* 500 SC, 5.5 to 8.2 fl oz every 5 to 10 days. (14 days) No more than 1 application before alternating.
  - *Fluxapyroxad + Pyraclostrobin
  - *Priaxor Xemium Brand Fungicide, 8 fl oz. (0 days) Suppression only.
  - *Mancozeb + Zoaxamide
    - Gavel 75 DF, 1.5-2.0 lb. (5 days)
  - *Mancozeb + Copper Hydroxide
    - Revus, 5.5 to 8 fl oz. (1 day) No more than 2 consecutive applications.
  - *Mefenoxam + Chlorothalonil
    - *Ridomil Gold Bravo, 2.5 pt. (5 days) Maximum 3 applications.
  - *Mefenoxam + Copper Hydroxide
    - *Ridomil Gold Copper, 1.35 lb (processing), 2 lb (fresh market). (14 days) Maximum 3 applications.
  - *Mefenoxam + Mancozeb
    - *Ridomil Gold MZ, 2.5 lb, 14-day intervals. (5 days) Maximum 3 applications.
  - *Pyraclostrobin
    - *Cabrio, 8-16 oz. (0 days) Do not apply more than one application before alternating with another chemical.
  - *Azoxystrobin
    - *Quadris, 5 to 6.2 fl oz. (0 days)
    - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action
    - Baclitus amyloliquefaciens
    - *Senfet, 4 - 16 fl oz. (0 day)
    - Bacillus subtilis
    - *Serenade, 4 to 8 lb. (0 days) Provides suppression. Biological control product that needs to be applied before disease development. Control may be limited under heavy disease pressure.
    - *Serenade Max, 1 - 3 lb. (0 days)
  - Copper Ammonium Carbonate
    - *Copper Count N, 1 1/2 to 2 1/2 qt (processing), 1 1/2 to 3 qt (fresh market) (spec), spot. (0 days)
  - Copper Hydroxide
    - *Champ DP Dry Prill, 1 1/3 to 2 lb (fresh market), 1.4 lb (processing). (0 days)
    - *Champ Formula 2 F, 1 1/3 pt. (0 days)
    - *Champ WG, 1.06 lb. (0 days)
    - Kocide 3000, 0.75 to 1.75 lb. (0 days)
    - *Nu-Cop 3 L, 1 1/3 pt (processing), 1 1/3 to 4 pt (fresh market). (0 days)
    - *Nu-Cop 50 DF, 1 lb (processing), 3.2 lb (fresh market).
    - *Nu-Cop HB, 1 lb (processing), 1 to 3.2 lb (fresh market). (0 days)
  - Copper Hydroxide + Copper Oxychloride
    - *Badge SC, 1.8 pt. (0 days)
    - *Badge K2, 0.75 to 1.75 lb. (0 days)
  - Copper Oxychloride + Copper Sulfate
    - *C-O-C-S WDG, 1 lb (processing), 1 to 3.1 lb (fresh market). (0 days)
  - Copper Sulfate
    - *Basic Copper 53, 0.75 to 1 lb (processing), 3 lb (fresh market) (spec, spot). (0 days)
    - *Cuprofix Ultra 40 Dispers, 0.75 to 3 lb (fresh market), 0.75 to 1.33 lb (processing). (0 days)
    - *Famoxadone + Cymoxanil
    - *Tanos, 8 oz. (3 days)
  - Fluopicolide
    - *Presidio, 3-4 fl oz. (2 days)
  - Mancozeb
    - *Dithane DF Rainshield, Dithane M-45, Dithane WSP, 1 1/2 to 3 lb. (5 days)
    - *Dithane F-45 Rainshield, 1 1/5 to 2 2/5 qt. (5 days)
    - *Koverall, 0.75 - 1.5 lb. (5 days)
    - *Manzate Max, 0.6 to 2.4 qt. (5 days)
    - *Manzate Pro-Stick, 0.75 to 1.5 lb. (5 days)
    - *Penncozeb 75 DF, 0.75 to 3 lb. (5 days)
    - *Mancozeb + Copper Hydroxide
      - *ManKocide, 1.7 lb (processing), 1 to 3 lb (fresh market) (speck, spot). (5 days)
    - *Mancozeb + Difenconazole
      - *Revus Top, 5.5-7 fl oz. (1 day)
    - Mono- dibasic sodium salts of phosphorous acid
      - *Fosphite, 1 to 3 qt per 100 gal (ground) or 10 gal (aerial) of water. (0 days)
    - Neem Oil
      - *Trilogy, 2 pt. (0 days)
    - Potassium phosphite/chlorothalonil
    - *Catamaran, 4.5 to 5.5 pt (foliage) or 7 pt (fruit). (0 days)
    - *Propamocarb
      - *Previcur Flex, 0.7 to 1.5 pt every 7 to 10 days. (5 days) Use a tank mix partner (see label).
    - Trifloxystrobin
      - *Flint, 4 oz. (3 days) Tank mix only with protectant. 12 hr REI.
      - *Gem 500, 3.8 fl oz. (3 days) Tank mix only with protectant.
      - *Zoxamide + chlorothalonil
      - *Zing!, 36 fl oz. (5 days)
    - Note: Most fungicides that protect against early blight also provide limited late blight protection.

SEPTORIA LEAF SPOT (Septoria lycopersici):

*Azoxystrobin
  - *Quadris, 5 to 6.2 fl oz.
  - Do not apply more than one foliar application of Amistar and Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.
  - *Azoxystrobin + Chlorothalonil
  - *Quadris Opti, 1.6 pt every 7 - 21 days. (0 days)
  - *Chlorothalonil
  - *Bravo Ultrex, 1.3 to 1.8 lb. (0 days)
  - *Bravo Weather Stik, Equus 720 SST, 1 3/8 to 2 pt. (0 days)
  - *Echo 720, 1 3/8 to 2 pt (foliage) or 2 to 3 pt (fruit). (0 days)
  - *Echo 90 DF, 1 1/8 to 1 5/8 lb. (0 days)
  - *Equus DF, 1.3 to 1.8 lb. (0 days)
  - *Fluxapyroxad + Pyraclostrobin
    - *Priaxor Xemium Brand Fungicide, 4 - 8 fl oz. (0 days)
  - *Mancozeb
    - *Dithane DF Rainshield, Dithane M-45, Dithane WSP, 1 1/2 to 3 lb. (5 days)
    - *Dithane F-45 Rainshield, 1 1/5 to 2 2/5 qt. (5 days)
    - *Manzate Max, 0.6 to 2.4 qt. (5 days)
    - *Manzate Pro-Stick, 0.75 to 1.5 lb. (5 days)
    - *Penncozeb 75 DF, 0.75 to 3 lb. (5 days)
  - *Pyraclostrobin
    - *Cabrio, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.
  - *Trifloxystrobin
    - *Flint, 3 to 4 oz suppression. (3 days)
    - *Gem 500, 3 to 3.8 fl oz suppression. (3 days)
ANTHRACNOSE (*Colletotrichum coccodes*):

- Azoxystrobin
  - *Quadris*, 5 to 6.2 fl oz. (0 days)
- Difenoconazole
  - *Quadris Top*, 8 fl oz. (0 days) No more than two consecutive applications before alternating with another fungicide with a different mode of action.

- Neem Oil
  - *Quadris Opti*, 1.6 pt every 7 - 21 days. (0 days)

Bacillus amyloliquefaciens

- *Serfem*, 4 - 16 fl oz. (0 day)

Copper Hydroxide

- *Chlorothalonil*
  - *Bravo Ultrex*, 1.8 to 2.6 lb. (0 days)
  - *Bravo Weather Stik*, *Equus* 720 SST, 2 to 2.75 pt. (0 days)
  - *Echo 720*, 2 to 3 pt. (0 days)
  - *Echo 90 DF*, 1.5 to 2 1/2 lb. (0 days)
  - *Equus DF*, 1.8 to 2.6 lb. (0 days)

- *Mancozeb*
  - *Dithane DF Rainshield*, *Dithane M-45*, *Dithane WSP*, 1 1/2 to 3 lb. (5 days)
  - *Dithane F-45 Rainshield*, 1 1/5 to 2 2/5 qt. (5 days)
  - *Manzate Max*, 0.6 to 2.4 qt. (5 days)
  - *Manzate Pro-Stick*, 0.75 to 1.5 lb. (5 days)
  - *Pennozeb 75 DF*, 0.75 to 3 lb. (5 days)

- Pyraclostrobin
  - *Carbon*, 8-12 oz. (0 days) Do not apply more than one application before alternating with another chemical.

- *Ziram*
  - *Ziram 76 DF*, 3 to 4 lb, 7- to 14-day intervals. (7 days) Do not use on cherry tomatoes.

- Azoxystrobin + Chlorothalonil
  - *Quadris Opti*, 1.6 pt every 7 - 21 days. (0 days)

Copper Hydroxide

- *Champ DP Dry Prill*, 1 1/3 to 2 2/3 lb (fresh market), 1.4 lb (processing). (0 days)
- *Champ Formula 2 F*, 1 1/3 pt. (0 days)
- *Champ WG*, 1.06 lb. (0 days)
- *Kocide 3000*, 0.75 to 1.75 lb. (0 day)
- *Nu-Cop 3 L*, 1 1/3 pt (processing), 1 1/3 to 4 pt (fresh market). (0 days)
- *Nu-Cop 50 DF*, 1 lb (processing), 3.2 lb (fresh market).
- *Nu-Cop HB*, 1 lb (processing), 1 to 3.2 lb (fresh market). (0 days)

Copper Hydroxide + Copper Oxchloride

- *Badge SC*, 1.8 pt. (0 days)
- *Badge X2*, 0.75 to 1.75 lb. (0 days)

Copper Oxchloride + Copper Sulfate

- *C-O-C-S WDG*, 1 lb (processing), 1 to 3.1 lb (fresh market). (0 days)

Copper Sulfate

- *Basic Copper 53*, 0.75 to 1 lb (processing), 3 lb (fresh market) (spec, spot). (0 days)
- *Cuprofix Ultra 40 Dispers*, 0.75 to 3 lb (fresh market), 0.75 to 1.33 lb (processing). (0 days)

Difenoconazole + Cyprodinil

- *Inspire Super*, 16 to 20 fl oz. (0 days)

Famoxadone + Cyoxamn

- *Tanos*, 8 oz. (3 days)

Fenamidone

- *Reason 500 SC*, 5.5 to 8.2 fl oz every 5 to 10 days. (14 days) Suppression. No more than 1 application before alternating.

Mancozeb + Copper Hydroxide

- *ManKocide*, 1.7 lb (processing), 1 to 3 lb (fresh market). (5 days)

Mancozeb + Zoxamide

- *Gavel 75 DF*, 1.5 - 2.0 lb. (5 days)
- *Mandipropamid + Difenoconazole*
- *Revs Top*, 5.5-7 fl oz. (1 day)

Mefenoxam + Chlorothalonil

- *Ridomil Gold Bravo*, 2.5 pt. (5 days)

Penthiopyrad

- *Fortelis*, 16 - 24 fl oz. (0 days)

Potassium Bicarbonate

- *Amicarb 100*, 2.5 to 5 lb. (0 days)

Potassium phosphate/chlorothalonil

- *Catamaran*, 4.5 to 5.5 pt. (0 days)

Zoxamide + chlorothalonil

- *Zing*, 36 fl oz. (5 days)

**Materials marked with an asterisk are particularly recommended for problem infestations.**
**Turnips**

- **Materials marked with an asterisk are particularly recommended for problem infestations.**

**Root Rot (Phytophthora parasitica):**

- *Mefenoxam + Chlorothalonil*
- *Ridomil Gold Bravo, 2.5 to 3.25 pt. (5 days) 3 applications maximum.*
- *Mefenoxam + Copper Hydroxide*
- *Ridomil Gold Copper, 1.35 lb (processing), 2 lb (fresh market). (14 days) Maximum 3 applications.***

**Azoxystrobin**

- *Quadris Opti, 1.6 pt every 7 - 21 days. (0 days)*

**Fluopicolide**

- *Presidio, 3-4 fl oz. (2 days)*
- *Mancozeb + Zoxamide*
- *Gavel 75 DF, 1.5 - 2.0 lb. (5 days)*

**LEAF MOLD (Cladosporium fulvum):**

- *Azoxystrobin + Difenoconazole*
- *Quadris Top, 8 fl oz. (1 day) One application before alternating with another chemical.*

**Copper Hydroxide + Copper Oxyclohe**

- *Badger SC, 1.8 pt. (0 days)*
- *Badger X2, 0.75 to 1.75 lb. (0 days)*

**Difenoconazole + Cyprodinil**

- *Inspire Super, 16 to 20 fl oz. (0 days)*

**Mancozeb**

- *Koverall, 0.75 - 1.5 lb. (5 days)*
- *Manzate Max, 0.6 to 2.4 qt. (5 days)*
- *Manzate Pro-Stick, 0.75 to 1.5 lb. (5 days)*

**Gray Mold (Botrytis cinerea):**

- *Bacillus amyloliquefaciens*
- *Sentil, 4 - 16 fl oz. (0 day)*

**Boscalid**

- *Endura, 9 to 12.5 oz. (0 days)*

**Fluxapyroxad + Pyraclostrobin**

- *Prixor Xemium Brand Fungicide, 4 - 8 fl oz. (0 days) Suppression only*

**Penhiopyrad**

- *Fontelis, 12 - 16 fl oz. (0 days)*

**Pyrimethanil**

- *Scala, 7 fl oz. (1 day) 12 hr REI.*

**ROOT ROT (Phytophthora spp.):**

- *Ametocradin + Dimethomorph*
- *Zampro, 14 fl oz. (4 days)*

**Fosetyl-Aluminum**

- *Aliette WDG, 2.5 to 5 lb. (14 days) Do not tank mix with copper products*
- *Monoo-, dibasic sodium, potassium and ammonium phosphites*
- *Phostroil, 2.5 to 5 pt every 7 - 14 days. (0 days)*

**Turnips**

Amount of chemical formulation to apply per acre (unless otherwise directed). Apply no closer to harvest than number of days given in parentheses. (RUP) = Restricted Use Pesticide.

**INSECTS**

**SOIL TREATMENT:**

**CABBAGE MAGGOT:**

- *Chlorpyrifos 15G (4.6 to 9.3 oz/1000 row ft at planting) or Chlorpyrifos 4E AG (4.5 pt as pre-plant; 1.6 to 2.75 fl oz/1000 row ft at planting) (30 days) (RUP)*
- *Goverm, 4.5 pt as pre-plant; 1.6 to 2.75 fl oz/1000 row ft at planting. (30 days) (RUP)*
- *Hatchet, 4.5 pt as pre-plant; 1.6 to 2.75 fl oz/1000 row ft at planting. (30 days) (RUP)*
- *Lorsban 15 G (4.6 to 9.2 oz/1,000 row ft.) or Lorsban 4 E / Lorsban Advanced (4.5 pt as pre-plant, 1.6 to 2.75 fl oz/1,000 row ft at planting) or Lorsban 75 WG (3 lb as pre-plant, 1.1 to 1.8 oz/1000 row ft at planting) (30 days) Apply in a 4-inch band over row at time of seeding. (RUP)*
- *Nufox 4E, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)*
- *Saurus, 4.6 to 9.2 oz/1000 row ft at planting. (30 days)*
- *Vulcan, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)*
- *Warhawk, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)*
- *Whirlwind, 1.6 to 2.75 fl oz/1,000 row ft. (30 days) (RUP)*

**APHIDS, FLEA BEETLE:** See label for application methods.

**Imidacloprid**

- *Admire Pro, 4.4 to 10.5 fl oz. (21 days) See label for application methods.*
- *Nuprid 2 F, 10 to 24 fl oz. (21 days) Apply preplant, in furrow, or as a post-planting drench.*

**Thiamethoxam**

- *Platinum (5 to 12 fl oz.) or Platinum 75 SG (1.7 to 4.01 oz.) (30 days) See label for application methods.*

**APHIDS, LEAFHOPPERS:**

- *Sivanto, 7 - 10.5 fl oz/A.*
- *WHITEFLIES:* *Sivanto, 10.5 - 14 fl oz/A.*

**FOLIAR TREATMENT:**

**FLEA BEETLE:** Apply if foliar injury is observed to prevent larval injury to roots.

- *Actara, 1.5 to 3 oz. (7 days)*
- *Baythroid XL, 1.6 to 2.8 fl oz. (0 days) (RUP)*

**Bifenthrin**

- *Bifenture EC, 5.12 to 6.4 fl oz. (21 days) (RUP)*
- *Brigade @ 2EC (5.12 to 6.4 fl oz.) or Brigade WSB (12.8 to 16 oz.) (21 days) (RUP)*
- *Fanfare 2EC, 5.12 to 6.4 fl oz. (21 days) (RUP)*
- *Sniper, 5.12 to 6.4 fl oz. (21 days) (RUP)*
- *Tundra EC, 5.12 to 6.4 fl oz. (21 days) (RUP)*

**Bifenture 10 DF, 12.8 to 16 oz/A. (21 days)**

**Carbaryl**

- *Carbaryl 4L, 0.5 to 1 qt. (7 days)*
- *Sevin 4 F, Sevin XLR Plus, 0.5 to 1 qt.. (7 days)*

**Esfenvalerate**

- *Adjourn, 5.8 to 9.6 fl oz. (7 days) (RUP)*
- *Asana XL, 5.8 to 9.6 fl oz. (7 days) (RUP)*
- *S-FenvalStar, 5.8 to 9.6 fl oz. (7 days) (RUP)*
Materials marked with an asterisk are particularly recommended for problem infestations.

**Imidacloprid**
- **Admire Pro**, 1.2 fl oz. (7 days)
- **Nuprid**, 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

**Malathion** 8 Aquamul, 1.25 pt. (1 day)
**Mustang Max**, 1.76 to 4 oz. (1 day) (RUP)
**Pyreneone**, 1 to 12 fl oz. (0 days)
**Carbaryl 4L**, 0.5 to 1 qt. (7 days)
**Sevin 4 F, Sevin XLR Plus**, 0.5 to 1 qt. (7 days)

**Spinosal**
- **Entrust** (1 to 2 oz.) or **Entrust SC** (3 to 6 fl oz.) (3 days)

**Steed**, 2.5 to 3.5 fl oz. (21 days) (RUP)

**CABBAGE "WORM"**: Apply if needed.

**Bacillus thuringiensis**
- **Agree WG**, 0.5 to 2 lb. (0 days)
- **DiPel DF**, 0.25 to 1 lb. (0 days)
- **Javelin WG**, 0.12 to 1.5 lb. (0 days)
- **XenTari**, . (0 days)

**Bifenthrin**
- **Bifenture EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Brigade @ 2EC** (5.12 to 6.4 fl oz.) or **Brigade WSB** (12.8 to 16 oz.) (21 days) (RUP)
- **Fanfare 2EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Sniper**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Tundra EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)

**Bifenture 10 DF**, 12.8 to 16 oz/A. (21 days)
**Confirm 2F**, 6 to 8 fl oz. (7 days)

**Esfenvalerate**
- **Adjourn**, 5.8 to 9.6 fl oz. (7 days) (RUP)
- **Asana XL**, 5.8 to 9.6 fl oz. (7 days) (RUP)
- **S-FenvalStar**, 5.8 to 9.6 fl oz. (7 days) (RUP)

**Intrepid 2F**, 6 to 16 fl oz. (14 days) 4 to 10 fl oz with PHI of 1 day when harvesting leaves.

**Malathion**
- **Malathion 5 EC**, or **Malathion 57 EC** (1 to 2 pt.) or **Malathion 8 Aquamul** (1.25 pt.) (7 days for Malathion 5 EC, 1 day for others)

**Mustang Max**, 3.2 to 4 oz. (1 day) (RUP)
**Perm-UP 3.2 EC**, 2 to 4 oz. (1 day) (RUP)
**Pyreneone**, 1 to 12 fl oz. (0 days)
**Radiant SC**, 5 to 10 fl oz. (7 days)

**APHIDS**: As needed to prevent population buildup.

**Actara**, 1.5 to 3 oz. (7 days)
**Beleaf 50 SG**, 2 to 2.8 oz. (3 days)

**Bifenthrin**
- **Bifenture EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Brigade @ 2EC** (5.12 to 6.4 fl oz.) or **Brigade WSB** (12.8 to 16 oz.) (21 days) (RUP)
- **Fanfare 2EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Sniper**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Tundra EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)

**Bifenture 10 DF**, 12.8 to 16 oz/A. (21 days)

**Dimethoate**
- **Dimethoate 4 EC**, **Dimethoate 400**, **Dimethoate 4E**, 0.5 pt.. (14 days)

**Imidacloprid**
- **Admire Pro**, 1.2 fl oz. (7 days)
- **Nuprid**, 1.6 F, 3.5 fl oz. (7 days) Do not exceed 10.5 oz/Acre per season.

**Malathion**
- **Malathion 5** (1.5 to 2 pt.) or **Malathion 5 EC** (1 to 2 pt.) or **Malathion 57 EC** (1 to 2 pt.) or **Malathion 8 Aquamul** (1.25 pt.) (7 days for Malathion 5 & 5 EC, 1 day for others)

**Pyreneone**, 1 to 12 fl oz. (0 days)
**Sivanto**, 7 - 10.5 fl oz/A.
**Steed**, 3.5 to 4.7 fl oz. (21 days) (RUP)

**ARMYWORM**:

**Bacillus thuringiensis**
- **Agree WG**, 0.5 to 2 lb. (0 days)
- **DiPel DF**, 1 to 2 lb. (0 days)
- **Javelin WG**, 0.12 to 1.5 lb. (0 days)
- **Coragen**, 3.5 to 5 fl oz. (1 day)
- **Intrepid 2F**, 6 to 16 fl oz. (14 days) 4 to 10 fl oz with PHI of 1 day when harvesting leaves.
- **Mustang Max**, 3.2 to 4 oz. (1 day) (RUP)
- **Pyreneone**, 1 to 12 fl oz. (0 days)
- **Radiant SC**, 6 to 8 fl oz. (3 days) See label for treating and harvesting of leaves.

**Spinosal**
- **Entrust** (1 to 2 oz.) or **Entrust SC** (3 to 6 fl oz.) (3 days)

**Steed**, 3.5 to 4.7 fl oz. (21 days) (RUP)

**LEAFHOPPERS**:
- **Sivanto**, 7 - 10.5 fl oz/A.

**WHITEFLIES**:
- **Sivanto**, 10.5 - 14 fl oz/A.

**MITES**

**Bifenthrin**
- **Bifenture EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Bifenture 10 DF**, 12.8 to 16 oz/A. (21 days)
- **Brigade @ 2EC** (5.12 to 6.4 fl oz.) or **Brigade WSB** (12.8 to 16 oz.) (21 days) (RUP)
- **Fanfare 2EC**, 5.12 to 6.4 fl oz. (21 days) (RUP)
- **Sniper**, 5.12 to 6.4 fl oz. (21 days) (RUP)

**DISEASES**

**SEED TREATMENT**:

**DAMPING OFF** (*Pythium spp., Rhizoctonia solani*): Apply treatment as dust or slurry.

**Captain**
- **Captain 4 Flowable**, 3 fl oz.

**Fludioxonil**
- **Maxim 4 FS**, 0.08 to 0.16 fl oz/100 lb seed (**Rhizoctonia**). Commercial seed treatment plants only.

**Mefenoxam**
- **Apron XL**, 0.085 - 0.64 fl oz/100 lb seed (**Pythium**). (0 days)

**Thiram**
- **42-S Thiram** (8 oz/100 lb seed) or **Thiram 480DP** or **Thiram 50 WP** Dyed (8 oz/100 lb seed)

**PREPLANT INCORPORATED**:

**DAMPING OFF** (*Pythium and Phytophthora spp.**):

**Mefenoxam**: Apply as a broadcast preplant incorporation or a surface application. For banded applications use a 7" band. **Note**: If natural rainfall is not expected before seeds germinate, incorporate mechanically before planting or water into the seed zone after planting with 1/2 to 1" of sprinkler irrigation.


**FOLIAR TREATMENT**:

**DOWNY MILDEW** (*Peronospora parasitica*):
- **Mono-**, & **dibasic sodium salts of phosphorous acid**
- **Fosphite**, 1 to 3 qt. (7 days) Maximum 12 oz/year. 12 hr REI.

**CERCOSPORA LEAF SPOT** (*Cercospora spp.*):

**Penthiopyrad**
- **Fonteline**, 16 - 30 fl oz. (0 days)
Turnips

Tebuconazole
- Orius 3.6F, Tebuzol 3.6, 4-7.2 fl oz. (7 days) Maximum 28.8 fl oz/acre/season. 12 hr REI.

Trifloxystrobin
- Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) Maximum 12 oz/season. 12 hr REI.

POWDERY MILDEW:
* Penthiopyrad
- Fontelis, 16 - 30 fl oz. (0 days)

Trifloxystrobin
- Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days) Maximum 12 oz/year, 12 hr REI.

ALTERNARIA BLIGHT (Alternaria spp.):
* Trifloxystrobin
- Flint (2 to 3 oz) or Gem 500 (1.9 to 2.9 fl oz) (7 days)

Azoxystrobin
- Quadris, 6.2 - 15.4 fl oz. (0 days) Do not apply more than one foliar application of Quadris or other strobilurin fungicide before alternating with a fungicide that has a different mode of action.

Penthiopyrad
- Fontelis, 16 - 30 fl oz. (0 days)

Pyraclostrobin
- Cabrio, 8 to 12 oz. (0 days)

WHITE RUST:
Azoxystrobin
- Cabrio, 8-16 oz. (0 days)
- Quadris, 6 to 15.5 fl oz. (0 days) Do not apply more than one application of Quadris or Group 11 fungicides before alternation with a fungicide that is not Group 11.

Pyraclostrobin
- Cabrio, 8-16 oz. (0 days)
- Quadris, 6 to 15.5 fl oz. (0 days) Do not apply more than one application of Quadris or Group 11 fungicides before alternation with a fungicide that is not Group 11.
APPENDIX A
Seedbed Preparation

SEEDBED PREPARATION

Clean soil is necessary for good seedbed production. Organisms that cause damage to vegetable seedlings may be present in any soil or growing mixture. Soils may be sterilized by a number of chemical or physical techniques, such as steam or dry heat.

Warnings: All the listed fumigants may be used both in the seedbeds and to treat soils in which vegetables are grown to maturity, with the following exceptions: 1) METHYL BROMIDE and FORMALDEHYDE can be used only for seedbeds. 2) None of the materials can be used where living plants are growing. Carefully read the directions in the table below, and especially those of manufacturers, to avoid danger and to obtain successful results.

SEED TREATMENT

Dust method—place the seed and suggested wettable powders in a closed container and agitate vigorously for several minutes or until seed is coated with dust. For best results, use a container with twice the capacity of the seed treated.

Slurry method—to suggested wettable powders, add enough water to make a sloppy paste or slurry. Treat by stirring or swirling seed in the slurry until thoroughly coated. Dry the seed before planting. Slurries are preferred to dusts because they adhere to the seed better and are less irritating to use.

CHEMICALS SUGGESTED FOR SEEDBED STERILIZATION

All soil fumigants were re-registered in 2011, resulting in new labels. Buffer zones and fumigation management plans are required. Additional information about the requirements can be obtained at epa.gov/fumiganttoolbox. Michigan’s soil fumigant distributors can provide e-templates for the management plans.

CHLOROPICRIN
(E.G. CHLOR-O-PIC, PICFUME)

Warnings: Fumes are very irritating to eyes and are poisonous to growing plants. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator with the proper carbon filter.

Rate and Method of Application
Insect 1.6 to 2.3 cc of material 6 inches deep and at 8-inch intervals using a hand operated fumigation gun. Treat only when soil temperature 6 inches deep is above 65°F. Pack treated soil and apply water seal (wet to a depth of several inches) or cover with plastic for 48 hours. Cultivate to speed aeration and avoid planting for 2 weeks, or until odor of fumigant is no longer detectable.

FORMALDEHYDE

NOTE: Not effective for nematodes. Especially suited for cabbage and cauliflower.

Warnings: Fumes are irritating to eyes and nasal passages and poisonous to growing plants. Avoid prolonged contact with skin. Wash off with soap and water. Wear goggles, rubber footwear and rubber gloves when handling. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator with the proper carbon filter. Ventilate when treating a confined area. Rate of Method of Application

Mix 1 pt (37% to 40% strength) with 5 gallons of water and apply with a sprinkling can at the rate of 1/2 gal/sq ft of soil surface. Treat only if soil temperature 6 inches deep is above 60°F. Cover treated soil with a plastic cover. Leave undisturbed for 48 hours, then cultivate one or more times. Avoid planting for 2 weeks or until odor of fumigant is no longer detectable. Do not use near living plants. As a disinfectant for equipment and storage interiors or greenhouses, spray surfaces with a mixture of 1 pt (37% to 40% strength) in 5 gallons of water. Cover equipment with plastic and keep storage or greenhouse closed for 24 to 48 hours after treatment, then air out well before planting.

1,3-D (DICHLOROPROPENE; TELONE II)

Warnings: Fumes are irritating to eyes and nasal passages. Prolonged inhalation is dangerous; poisonous to growing plants. Avoid contact with skin. Wash off with soap and water. Wear goggles, rubber footwear and rubber gloves when handling. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator with the proper carbon filter.

Rate and Method of Application
Apply as a preplant broadcast treatment at least 14 to 21 days prior to planting. Late summer or early autumn is usually best for applying fumigants in Michigan. Inject at 8 inches deep with chisels spaced 10 to 12 inches apart when soil temperature is between 50° and 80°F. Seal immediately after application. If soil is waterlogged or temperature is below 60°F, allow additional time before planting. Use only on crops listed on the respective label.
1,3-D AND CHLOROPICRIN (E.G., TELONE C-17)

**Warnings:** Fumes are irritating to eyes and nasal passages. Prolonged inhalation is dangerous; poisonous to growing plants. Avoid contact with skin. Wash off with soap and water. Wear goggles, rubber footwear and rubber gloves when handling. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator with the proper carbon filter.

**Rate and Method of Application**

Apply as a preplant broadcast treatment at least 14 to 21 days prior to planting. Late summer or early autumn is usually best for applying soil fumigants in Michigan. Inject 8 inches deep with chisels spaced 10 to 12 inches apart when soil temperature is between 50° and 80°F. Seal immediately after application. If soil is waterlogged or temperature is below 60°F, allow additional time before planting. Use only on crops listed on the respective label.

SODIUM METHYLDITHIOCARBAMATE (METHAM) (E.G., VAPAM OR VAPAM HL)

**Warnings:** Avoid breathing vapor or spray mist. Do not get in eyes, on skin, or clothing. Causes skin irritation. May be fatal if absorbed through skin. Wash with soap and water. Wear full coverage protective clothing and a MSHA/NIOSH-approved respirator to reduce exposure.

**Rate and Method of Application**

With a sprinkling can, fill with 1 to 1 1/2 pt metham and water and sprinkle uniformly over 50 sq ft of well-prepared soil. Sprinkle immediately with water until soil is sealed, or tarp for 48 hours. Seven days after treatment cultivate area to a depth of 2 inches to aerate soil. Do not seed earlier than 21 days after application if tarp is used. For soil injection, space injectors 5 inches apart and inject metham 4 inches into well-prepared soil. Follow immediately with a roller to smooth and compact the soil surface. Light watering or a tarp after rolling helps to prevent gas escape. For seedbeds, 75 to 100 gal/A (1 1/2 pt to 2 pt per 100 sq ft) is recommended.

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**APPENDIX B**

**Nematodes and Michigan Vegetable Production**

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Nematodes are believed to be the most common animals on our planet. They inhabit most soil, fresh water and marine environments. At least 12 types of nematodes are known to parasitize or cause infectious diseases of Michigan vegetable crops. Hundreds of other species are involved in making nutrients available for plant growth. The objectives of this article are to: 1) provide an overview of the nematode problems associated with vegetable production in Michigan, 2) discuss the management options for plant-parasitic nematodes, 3) describe how nematodes are involved in nitrogen mineralization and 4) provide some recommendations on how to enhance the role of nematodes in making nutrients available for plant growth.

The 12 types of plant parasitic nematodes that feed on vegetable crops in Michigan cause diverse symptoms, attack a wide variety of crops and have different behaviors.

**ROOT-KNOT NEMATODES**

Only one species, the Northern Root-Knot Nematode is known to over-winter under Michigan conditions. Other species can be brought into the state on transplants produced in the south.

**Crop Symptoms** - Root galls, yellowing, wilting, stunted top growth, stunted root growth, low crop yield and poor crop quality.

**Crops Attacked** - Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cauliflower, Celery, Cucumber, Eggplant, Garlic, Leeks, Lettuce, Melons, Onions, Parsnips, Peppers, Potatoes, Pumpkins, Squash, Tomatoes.

**Nematode Behavior** - Second-stage juveniles invade root tissue a short distance behind the root tip. They migrate towards the root tip, stop, turn and then migrate to where the vascular cylinder is being formed. Here, the plant forms nurse cells for use by the nematodes for their growth and development. The plant also forms root galls for protection of the hundreds of eggs in each egg mass. Extensive amounts of plant matter and energy are used in this process, resulting in unsatisfactory crop growth and development. A close relative, the False Root-Knot Nematode, has been found associated with sugar beets in Michigan and has the potential to feed on beets and potato.
This species, however, has not been detected in Michigan during the last 25 years.

**CYST NEMATODES**

Michigan is the home to nine different species of cyst nematodes. Three of them, Carrot Cyst Nematode, Soybean Cyst Nematode and Sugar Beet Cyst Nematode can be serious problems in Michigan vegetable production.  

*Crop Symptoms* - Yellowing, stunted top growth, swollen root tips, reduced crop yield and poor crop quality.  

*Crops Attacked* - Carrot Cyst Nematode (carrots), Soybean Cyst Nematode (snap beans, peas) and Sugar Beet Cyst Nematode (beets, broccoli, Brussels sprouts, cabbage).  

*Nematode Behavior* - Second-stage juveniles invade root tissue about one half of an inch behind the root tip. They burrow where the vascular cylinder is being formed and induce the plant to form nurse cells for nematode feeding. The female swells and breaks through the root tissue. When she has filled her body with eggs, she dies and drops from the root. Her body hardens to become a protective cyst that can survive in soil in the absence of a host for up to 12 years. Extensive amounts of plant matter and energy are used in this process, resulting in poor crop growth and development.

**ROOT-LESION NEMATODES**

The Penetrans Root-Leesion Nematode is the most common plant parasitic nematode in Michigan and feeds on the root systems of many crops. A second nematode, the False Root-Leesion Nematode causes damage to mint grown in muck soil.  

*Crop Symptoms* - Yellowing, stunted top growth, stunted root growth, root lesions, poor crop yield and poor crop quality.  

*Crops Attacked* - Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cauliflower, Celery, Corn, Cucumber, Eggplant, Garlic, Leeks, Lettuce, Melons, Mint, Onions, Parsnips, Peppers, Potatoes, Pumpkins, Squash, and Tomatoes.  

*Nematode Behavior* - All stages of root-lesion nematodes are mobile and penetrate root tissue as endoparasites. After root penetration, the nematodes migrate throughout the root cortex, where females deposit their eggs. This migration, combined with chemical exudates, results in reduced uptake and transport of water and nutrients throughout the plant. Root-lesion nematodes are known to interact with soil-borne fungi to cause disease complexes. The best known of these is the Potato Early-Die Disease Complex.

**NEEDLE NEMATODES**

There are two types of Needle Nematodes in Michigan, the Common Needle Nematode and the Corn Needle Nematode. They can exist in both muck and mineral soil.  

*Crop Symptoms* - Greatly stunted top growth, barren areas, swollen root-tips, reduced crop yield and poor crop quality.  

*Crops Attacked* - Celery, Corn, Garlic, Onions.  

*Nematode Behavior* - Needle nematodes are large ectoparasites and only the nematodes' stylets penetrate root tissue. The Corn Needle Nematode feeds early in the growing season and then migrates deep into the soil. Its distribution is limited to very coarse textured sandy soils. The Corn Needle Nematode has a narrow host range and can easily be managed through crop rotation. Needle nematodes have the ability to vector viruses.

**BULB AND STEM NEMATODES**

Bulb and Stem Nematodes feed on shoot and not root tissue. There are two very different species associated with Michigan vegetable production systems. One attacks onion and celery, and the other feeds in potato tubers. Both are rarely detected in vegetable fields in Michigan.  

*Crop Symptoms* - Yellowing, stunted top growth, a highly characteristic odor, bloated leaves and bulbs or tuber rot, reduced yields and unsatisfactory crop quality.  

*Crops Attacked* - Onions, Garlic and Potato.  

*Nematode Behavior* - The Bulb and Stem Nematode is a migratory endoparasite of shoot tissue. Fourth-stage juveniles penetrate onion tissue at the junction of the root and shoot system. They migrate through leaf and bulb tissue resulting in greatly deformed growth.

**PIN NEMATODES**

There are two types of Pin Nematodes associated with Michigan vegetable production, one limited to muck vegetable production and the other associated with mineral soil production systems. Crop Symptoms - Stunted top growth, no feeder roots (witches-broom), reduced yield.  

*Crops Attacked* - Carrots, Celery, and Corn.  

*Nematode Behavior* - Pin Nematodes are small ectoparasites that feed only from the outside of root tissue. Theses nematodes have a long stylet that can be inserted into the central vascular system of roots.

**STUBBY-ROOT NEMATODES**

Although several species of Stubby-Root Nematodes are known to exist in Michigan, they have not been detected as often recently as in the past. Crop Symptoms - Yellowing, stunted tops, stubby roots and poor yields. Crops Attacked - Corn and Onions. Nematode Behavior -
Stubby-Root Nematodes are small ectoparasites. They feed close to the root-tip and prevent cell division and root elongation.

MANAGEMENT OF PLANT PARASITIC NEMATODES IN MICHIGAN VEGETABLE PRODUCTION

The first part of any pest management program is proper identification of the problem. While the cause of some nematode problems can be confirmed under field conditions, a laboratory analysis is usually needed. Michigan growers are encouraged to submit soil and plant tissue samples to MSU Diagnostic Services for confirmation of the cause of an existing problem or information for use in problem avoidance. MSU has two Nematode Diagnosticians responsible for nematode analyses. Additional details about this service can be obtained by contacting www.pestid.msu.edu or your local county office of MSU Extension.

As with all pest issues, problem avoidance is always the first-line defense and best strategy. This can be achieved by growing or purchasing high-quality nematode-free transplants or propagation material. Most of the other tactics related to problem avoidance or exclusion are based on common sense. For example, a field with a documented nematode infestation should not be worked immediately before moving equipment to a high quality nematode-free site. With proper planning, it is often possible to isolate or contain a nematode problem to a single field without infesting the rest of the farm. When this fails, control or nematode population reduction is usually required. In many cases this is expensive and results in a significant reduction in potential profits.

Once a Michigan vegetable production site is infested, crop rotation is the first control tactic that should be considered. For example, corn and wheat are not hosts for the Northern Root-Knot Nematode and can be used to reduce population densities of this species below its damage threshold. Crop rotation with agronomic crops is the main reason that current Michigan mineral soil carrot producers have very few nematode problems. In general, muck soil carrot growers have not had this option and have had to contend with serious nematode problems. Although the only known host in Michigan for the Carrot Cyst Nematode is carrots, this species can survive for up to a decade in the absence of a host, making the use of crop rotation impractical. Corn Needle Nematode problems can be resolved with a year or two of a non-host crop. Cover, trap and green manure crops that produce decomposition chemicals with nematicidal properties have been used in Michigan vegetable production. Cover crops, however, are variety specific in relation to their suitability for use in nematode management systems. For example, Defender oilseed radish is an excellent trap crop for control of the sugarbeet cyst nematode but most other varieties of oilseed radishes are good hosts and their use with result in increased numbers of these nematodes. Because of this complexity, it is often necessary to interact with a consultant or MSU Diagnostic Services for assistance in designing of the best possible nematode management program.

Nematode population reduction can also be achieved through the use of nematicides. There are basically two types, fumigant and non-fumigant nematicides. Telone II and metham are the most commonly used soil fumigants in Michigan vegetable production. Telone II must be injected into the soil; whereas, metham (Vapam and others) can be injected or applied as a chemigant in irrigation water. Methyl bromide, Telone C-17, Telone C-35 and chloropicrin can also be used under special circumstances. The non-fumigant options are organophosphates or organocarbamates. Vurate and Mocap are the most commonly used non-fumigant nematicides. These materials are all very different in relation to the best methods of application and suitability for specific nematode species. Information about the use of nematicides is present in this MSU Extension Bulletin (E-312).

ROLE OF NEMATODES IN NITROGEN MINERALIZATION

Plants take-up inorganic forms of nitrogen from soil for use in their growth and development. While we often think that the fertilizers applied serves this role, the situation is often more indirect and complex. Fertilizers often feed microbes and subsequently the microbes feed the plants. Bacterial and fungal feeding nematodes play important roles in this process. For example, plant root-exudates or decomposing organic matter serve as food for bacteria. The bacteria serve as food for bacterial feeding nematodes which receive excess organic nitrogen from this process. The excess nitrogen is transformed into an inorganic form and excreted from the nematode into the area immediately adjacent to the root surface when it is taken-up by the plant for use in the growth and development process. It is important to maintain high population densities of bacterial and fungal feeding nematodes. Most of these species have relatively short life cycles (72 hours); whereas, life cycles of plant-parasitic nematode range from 30 days to two years, with the exception of the cysts which may remain viable in the absence of a host for up to 12 years.

NEMATODES AND SOIL QUALITY

Soil quality can be defined as the ability of a soil to resist degradation and respond to management. Soils with nematode problems are not high quality soils. Anything that can be done to increase quality soil organic matter
Appendix C

Detecting and Avoiding Nematode Problems

Sample objective

The results from the samples are used to decide how to deal with nematode problems and how to avoid problems.

Diagnosing problems

When plants exhibit symptoms such as stunting, yellowing, wilting, early-die, yield reduction, root-galling, root-lesions or plant mortality that cannot be attributed to other causes, take samples of appropriate soil, root system, or shoot systems, and submit them for nematode analysis.

Avoiding nematode problems

Generally soil from Michigan agricultural sites should be analyzed for nematodes every 3-5 years at the minimum. If nematodes are a major limiting factor in the production of particular crops (e.g. northern root-knot nematodes on carrot), sites should be sampled every fall or spring prior to the growing of these crops. The test results are used to make decisions for avoiding nematode problems.

When to sample

Generally, soil and root samples can be taken, submitted and reliably processed whenever the soil is not frozen. For the best possible results, however, do not take samples until 45 days after annual root growth, and not after the soil is frozen in late fall or winter. When considering fall soil fumigation, collect and submit samples between August and November. To determine if non-fumigant nematicide use is warranted, sample between March and May.
How to sample

**Sampling instrument:** Take samples with a soil sampling tube, trowel, or narrow-bladed shovel at a 2-to 12-inch depth. Include as many feeder roots as possible. Feeder roots or shoot tissue must always be included for samples submitted for best assessing the population densities of endoparasitic nematodes.

**Sample size:** Each sample should consist of a pint to a quart of soil taken from a larger sample composed of 10 or more subsamples. The number of samples needed depends on the size, history, and uniform soil texture of the area being investigated.

- Small area (less than 5,000 sq. ft.), take at least 10 subsamples (soil cores or borings).
- Medium area (5,000 sq. ft. to 1 acre), take at least 25 subsamples.
- Large area (1 to 80 acres), take at least 50 subsamples. In Michigan, no one sample should represent more than 80 acres, and each sample should be from an area of uniform soil texture.

The sampling pattern depends on the commodity and field history. Mix subsamples in a clean pail or a plastic bag and submit one pint to a quart for nematode analysis.

Subsamples from problem area: Plant-parasitic nematodes feed only on living tissues and are rarely found in dead roots. Therefore, take samples from the margin of the problem areas where the plants are still living.

**Sampling container:** A plastic bag can be used for nematode samples. Place samples in plastic bags as soon as possible. Nematodes will be killed if the sample is allowed to dry, and it is important that nematodes are living when the sample arrives at the laboratory.

**Sample storage:** Soil and root samples should be regarded as perishable. Handle accordingly, and process as quickly as possible. Ideally, they should be stored at 10-15C (50-58F). Do not expose them to direct sunlight or store them in hot areas, such as the trunk of your car. Temperatures greater than 40C (100F) will kill nematodes.

How to submit samples

Samples are usually submitted to the MSU Nematode Laboratory through the local extension office, accompanied by a completed form. The information required on the form is essential for diagnosing nematode problems and proper recommendations for nematode population management.

It generally takes two weeks from the time a sample is taken until the results are returned to the grower. The results may be returned through the local extension agent, a private consultant, or directly. The rapid root and soil assays used for mineral soils, however, are not always satisfactory for analysis of organic soils. In a few cases, a bioassay that requires a 45-day incubation period is used to analyze organic soils. When this procedure is recommended, the grower will be immediately notified of the delay and will receive the results within two months after the sample was received.

Results and recommendations

The types and numbers of nematodes will be recorded on the assay form along with an indication of whether or not nematodes are a problem. If nematodes appear to be a problem, you will be occasionally referred to an appropriate extension bulletin for a recommendation. The recommendation should be discussed in detail with the local extension agent or private consultant.