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This fungicide guide is based on the latest information available from the North Dakota Agricultural Experiment Station, U.S. Department of Agriculture, U.S. Environmental Protection Agency (EPA) and the agricultural chemical industry. The information conformed to federal and state regulations at the time of printing. The user should determine that the intended use is consistent with label directions. ***Designation that a product is labeled for control of a crop disease does not imply endorsement by the authors of use of that product or the degree of efficacy of that product for that use.***

Always follow the label directions. See individual fungicide labels for important information on:

- Safety recommendations and worker protection requirements
- Guidelines for ground, irrigation or aerial application
- Mixing procedures and tank mixes allowed
- Rotational and grazing restrictions
- Resistance management statements

LABEL PRECAUTIONS, RESTRICTIONS

Field re-entry, handling and loading precautions

Most fungicide labels state that workers either should not enter a sprayed field until the sprays have dried or should not enter for 24 hours unless they wear appropriate protective clothing. Information on use of protective clothing during mixing and loading also is given on the label. See the label for details.

Replant restrictions

Labels for all formulations of Ridomil have restrictions on what crops can be planted in less than a year following application of the product. These restrictions may vary somewhat depending on the formulation. Check these and all other labels **before** application to determine if replant restrictions will cause problems when determining what crop to plant next season.

Dosages

All dosages given in this guide are stated as the amount of formulated product (lb., oz., fl. oz., quarts) to use.

Restricted-use fungicides

Fungicides containing triphenyltin hydroxide are restricted-use fungicides. These include products such as Super Tin, Agri Tin and Super Tin 4L. These are designated as RUP and Restricted-use Pesticide in the tables.

Disclaimer

The information given herein is for educational purposes only. North Dakota State University does not endorse commercial products or companies, even though reference may be made to trade names, trademarks or service names. **Omission of labeled products is possible if information about the product was not available at the time of printing or if it had questionable efficacy. Products not normally available in North Dakota are omitted from the guide. Seed treatment chemicals that are primarily insecticides with subminimal amounts of fungicide also are omitted.**

The plant pathology faculty at North Dakota State University assume no responsibility for property damage, personal injury or other loss due to the use of fungicides listed in this publication because they have no control over the use or misuse of these products.

FUNGICIDE FORMULATIONS

Most fungicides are solids that are not soluble in water. To use them, they must be made into a formulation (preparation). Some of the more common formulations are listed below. The common abbreviation for each formulation is given in parentheses following the name.

Wettable powders (WP)

Many fungicides are wettable powders consisting of solid fungicide and a wetting agent. When mixed with water, they form a suspension. Many of these suspensions settle out quickly, so an agitator is needed in the spray tank to keep the particles in suspension.

Water-soluble pouch (WSP)

Some fungicides are available in water-soluble pouch containers. These pouches dissolve in the mixing tank and release the fungicide. This reduces the exposure of mixer and loader personnel to dust from the fungicide.

Dusts (D)

Dusts are powders that are mixed with inert ingredients to form a product with a low percent of active material. These are used around the home garden, and a few formulations are used in commercial applications.

Granules (G)

The active ingredient is incorporated into small granules of inert material such as clay. Granules are incorporated into the soil.

Emulsifiable concentrates (EC)

A fungicide that is insoluble in water is dissolved in an organic solvent. An emulsifying agent is incorporated in the formulation so an emulsion is formed when the product is mixed with water. An emulsion is a suspension of very tiny drops of the solvent/fungicide in the water. It usually has a milky appearance (milk itself is an emulsion of fats in water).

Flowables (F)

Flowables are insoluble fungicides ground into a very fine product, usually by a wet-grinding process. These particles are nearly colloidal and are suspended in water to form a thick liquid. They remain suspended in water for relatively long periods of time but should be agitated before use. They are dust-free, easy to mix, remain in suspension longer than wettable powders and also may resist washing off the plant better than the wettable powders. Examples of flowables include Champ Flowable, Kocide 4.5 LF, Vitavax 200 and Dithane F-45. They need to be protected from freezing.

Dry flowable (DF)

See dispersible granules. (Next page)

Dispersible granules (DG)

Dispersible granules also are called dry flowable formulations. They are small granules that pour from a container like a liquid but do not stick to the sides of the container and do not need to be protected from freezing. They are virtually dust-free and disperse readily in water to form a suspension. Examples include Bravo Ultrex DG, Dithane DF, Rainshield NT, Manzate 75 DF and Penncozeb DF.

Fumigants

Fumigants are liquids that turn into a gas after application. They generally are used for soil fumigation.

MODE OF ACTION OF FUNGICIDES

The action of most fungicides takes place outside the host and is called "*protection*." A fungicide that acts outside the host is called a "protectant fungicide." Most older fungicides sprayed on leaves and fruit are of this type. "*Therapy*" is chemical action inside the host. For example, fungicides are locally systemic and move into the plant at the site of deposition. Several triazole fungicides have several days of therapeutic action against wheat leaf rust and also reduce the production of viable spores; that is, spores capable of growing.

Most protectant fungicides are relatively stable by themselves. Generally, they are relatively insoluble in water and resist removal or chemical change by water, yet must be toxic to fungi. Often a chemical change is brought about by the fungus, the host or the environment before toxicity occurs. Toxicity simply means the ability to damage the fungus cells.

Fungicides may act to produce a toxic reaction in the fungus in several different ways. (1) Some may inhibit (slow down or stop) cell wall formation. (2) Some affect the permeability of the cell wall, causing a leaking of nutrient materials from the cell. (3) Some fungicides may combine with essential metals in a way that they become unavailable for normal cell functions, including the functioning of essential enzymes. (4) Other fungicides may inhibit respiration or nuclear division, or may break dormancy of spores.

Some fungicides also may be toxic to plants if applied at rates too high or if applied under unfavorable environmental conditions. This is called *phytotoxicity*. Formulations of maneb + zinc are less phytotoxic to many vegetables than formulations that contain only maneb. Sometimes the method of formulation may make a fungicide less phytotoxic.

TOXICITY OF FUNGICIDES

Effects of Chemicals on Humans

Fungicides have various levels of toxicity to humans. Human exposure (skin, eye, internal) to fungicides can result in mild to severe reaction. Due to high levels of toxicity, some fungicides are restricted-use only.

Symptoms associated with chemical poisoning are listed below. All symptoms are not associated with every pesticide. Some of these symptoms are described below, but consulting a physician always is wise. Avoid diagnosing the effects on yourself or others.

Eyes watering excessively
Stomach cramps
Dizziness
Vomiting
Excessive sweating
Pupils of the eye reduced in size
Rapid heart beat
Muscle tremors or convulsions
Extreme nervousness
Mental confusion, lack of coordination
Uncontrolled drooling or watering at the mouth
Severe burns of the skin
Loss of ability to use muscles
Difficulty in breathing
Unconsciousness

First aid
The following list should be considered:

Stop exposure
Call a physician
Remove contaminated and restrictive clothing
Drench contaminated area with water; flush repeatedly
Provide fresh air, but prevent chilling and overheating
Avoid giving alcohol
Provide milk for patient to drink
Antidote - to be administered only by a physician

North Dakota Poison Control Center
Toll Free: (800) 732-2200

Toxicity Ratings of Pesticides

Pesticides generally are categorized according to acute **oral toxicity** (the toxicity when taken by mouth), but because users may absorb a significant quantity of the pesticide through their skin, **dermal toxicity** (toxicity when absorbed through the skin) is of equal or greater practical importance.

LD_{50} values generally show relative toxicities among the chemicals and are not truly representative of effects on humans, especially since they usually are obtained on rats. Actual toxicities do not constitute the only hazards associated with exposure to the chemicals. For instance, a chemical with low toxicity may be hazardous due to concentration, high volatility, careless use or effects of long-term exposure.

LD_{50} depends upon body weight. Thus, a given amount of chemical would have greater effect on a child than on an adult. LD_{50} also is proportional to the percent of active ingredient. A material only 50 percent active requires twice as much to produce a toxic effect as l00 percent pure material.

The lower the LD_{50} value, the greater the toxicity. A common standard for comparison is aspirin, which has an LD_{50} of l,200 mg/kg and is considered slightly toxic.

The following table illustrates the various toxicity classes:

Oral Toxicity		Dermal (Skin) Toxicity	
LD_{50}-mg/kg	Toxicity Class	LD_{50}-mg/kg	Toxicity Class
1-50	High	1-200	Severe
50-500	Moderate	200-2,000	Moderate
500-5,000	Low	2,000-20,000	Mild
Over 5,000	Very Low	Over 20,000	Very Mild

Information on the LD_{50} of a specific fungicide and other toxicology information are available on the MSDS (Material Safety Data Sheet) for each product. These generally may be found at www.cdms.net/.

Protecting Groundwater

Pesticides differ in their persistence and mobility in soil. Those that are highly persistent or highly mobile are more liable to contaminate groundwater than those that are not. Areas of the state where groundwater is most at risk are areas with coarse-textured soils, are low in organic matter and have a high water table. Most fungicides are relatively immobile, especially in clay soils with high organic matter, because they are adsorbed on clay particles or on the organic matter.

A few fungicides are somewhat mobile. Take care in the use of these fungicides, particularly the application of these products through a sprinkler irrigation system in high-risk areas. Risks may be reduced by minimizing the amount of water used for application through a sprinkler system, more use of ground or aerial application instead of application through the sprinkler system, and use of a different fungicide that is less mobile.

The persistence and mobility of fungicides commonly used in North Dakota may be found in NDSU Extension Service publication EB-49, “Persistence and Mobility of Pesticides in Soil and Water.”

Handling Chemicals

Avoid splashing and spilling. Wear a mask especially when handling dusts or powders. Some chemicals, when combined, have increased toxicity (potentiation).

Rinse containers several times after using chemicals. Pour rinsate into the spray tank when using the same chemical. Dispose of containers as indicated in the next section. Keep a record of plant disease control chemicals used and methods of handling.

Fungicide Labels

Fungicides are named according to their chemical composition or the *chemical name*. An example of a chemical name is a coordination production of zinc ion and manganese ethylene bisdithiocarbamate; the chemical names are required on the label. Since chemical names often are long, *common names* frequently are used; for example, the common name for the above chemical is mancozeb. Manufacturers use *trade names* to identify their specific products. For example, there are various trade names for mancozeb, such as Dithane, Manzate and Penncozeb.

In addition to the names on labels, various other required label information includes: precautions in handling, antidotes or telephone contacts to use in case of accidental poisoning, recommendations for use, materials contained in the package and their percentages, the manufacturer's or distributor's name and address, and the EPA registration number.

Some fungicides are made up in various formulations for different uses or methods of application, such as: wettable powders, dusts, emulsifiable concentrates, granules, flowables, dispersible granules or solutions. The nature of the chemical sometimes restricts it to one or a few of these formulations.

Note: Although maneb and mancozeb are very similar products, there are some differences in registration. Be sure to consult and follow label directions.

Seed Treatment

Cereals

Fungicidal seed treatment helps protect the seed from rotting and the emerging seedlings from damping off and seedling blight. These are caused by soil-borne pathogens. When seeds germinate under favorable soil conditions, there is less danger of seed and seedling attack from soil-borne pathogens unless seed is of poor quality. Treatment of seed with a protectant fungicide may help protect against soil-borne pathogens and thus help stand establishment when seeds are germinating under unfavorable conditions, such as cold, wet weather. Many products are available for protection against seedling blight.

Treating seeds with a fungicide also helps protect them from diseases that are seed-borne. These include the covered smuts, bunt, scab, black point and black semi-loose smut of barley, and loose smuts of wheat, barley and oats. Loose smuts of wheat and barley are internally seed-borne. Loose smut of oats is seed-borne as spores under the hulls. These smuts cannot be controlled by

conventional protectant seed treatment fungicides, but are controlled by systemic seed treatment products. The embryo test can be used by the North Dakota State Seed Department to determine if loose smut is present in barley seed. This test cannot be used for the loose smuts of oats or wheat or black semiloose smut of barley. All current barley varieties are susceptible to loose smut. An embryo test is recommended for barley seed; if infection is 2 percent or greater, seed treatment of barley with carboxin or triadimenol is advised.

Common (*Bipolaris, Helminthosporium* or *Cochliobolus*) root rot of wheat and barley is a chronic problem in North Dakota, causing average yield losses of 5 percent to 11 percent, with much greater losses in some fields in certain years. Several seed treatment products are labeled for suppression of common root rot.

Chickpeas

Treating chickpea seed to protect against *Pythium* is essential for good emergence. A seed treatment to protect against seed-borne *Ascochyta* is important because this is a common and serious disease.

Dry beans and soybeans

Treating seed may reduce seedling blight during weather that is unfavorable for emergence. Do not use streptomycin with Rhizobium inoculant. If using captan seed treatments, in-furrow inoculant is preferable because inoculant does not survive well on captan-treated seed. Several products can be used to reduce the root rot potential, and many newer products have a broad spectrum of activity.

Flax

Treating flax seed with a fungicide helps protect against seed rot, damping off and seedling blight. Seed treatment is especially important in cases where the seed coats are broken, allowing entry of pathogens. Seed from fields heavily infected with Pasmo (*Septoria linicola*) may be susceptible to seedling blight and should be seed treated.

Potatoes

Treatment of cut-seed pieces helps protect the cut surface against seed-piece decay. Most seed treatments are fungicides that will protect against fungi such as *Pythium, Rhizoctonia* and *Fusarium*. Fungicides do not protect against bacteria such as *Erwinia* or *Clavibacter*. However, control of fungi indirectly helps control *Erwinia* bacteria because seed decay is greater in seed infected with fungi. The addition of streptomycin to fungicide has limited value because it will control only bacteria contaminating cut surfaces and may inhibit wound healing. Seed treatment will reduce or help control new infections but will not cure existing decay, prevent lenticel infection or prevent infection of roots and stolons away from the seed piece due to soil or environmental inoculum. Seed treatment is no substitute for using good, sound, healthy seed. Seed should be stored at less than 40 F during the winter. In the spring, warm the seed to 50 to 60 F for 1 1/2 to two weeks before planting or until it just begins to sprout. Do not handle the seed until it is warm. Plant the cut seed in warm (50 to 58 F at planting depth), moist soil. If cut seed must be held, store in a well-ventilated area for suberization at 50 to 60 F with a relative humidity of 85 percent. Hold for one week, then lower the temperature to 50 to 60 F. Ideally, plant when seed and soil are the same temperature; the optimum is 50 F.

Safflower

Safflower rust is both seed-borne and soil-borne. The most devastating phase of the disease is a seedling blight, and root and foot rot. Typical rust pustules develop later on the leaves. Seed-borne safflower rust is controlled by seed treatment.

Sunflower

Soil-borne downy mildew infections were controlled with metalaxyl or mefenoxam seed treatment in the past. The downy mildew fungus, however, has developed insensitivity to metalaxyl and mefenoxam in much of North Dakota, South Dakota and Minnesota, so these fungicides are not effective. Several fungicides or fungicide-insecticide combinations have received state or federal labels for seed treatment of sunflower for seed rot and seedling blights.

Application of Seed Treatment

Seed may be treated commercially or it may be treated on the farm. Commercial seed treatment may use a slurry treater or various automatic seed treaters. The various automatic seed treaters differ considerably, so they cannot be discussed here. Commercial seed treatment has become more common in recent years for many crops.

On-farm treatment may use various home-type or slurry mixers. Drill-box seed treatment is popular because no extra steps are required; the seed is treated in the drill-box at planting time. Good disease control depends on uniform fungicide coverage of the seed, but this is more difficult to accomplish in drill-box treatment because there's an inadequate means of mixing the seed and fungicide. For effective drill-box treatment, fill the box with one-third the quantity of seed and fungicide and mix carefully with a paddle; repeat with the next third and then the final third. The paddle should not be used for any other purpose and should be stored in a safe place, out of reach of children and animals.

On-farm auger seed treatment methods are common. The fungicide is metered into the base of the auger used to fill the drill box. This method assures fairly good mixing and coverage.

All seed treatments have certain basic precautions. Use care in handling seed treatment products; many are irritating to the eyes, nose and skin. Treated seed usually is identified by the dye used in the chemical, and treated seed should not be fed to livestock or used for human food. Pesticide containers should be disposed of properly in a landfill or buried in an area with no surface drainage to nearby waterways. If seed treatment cannot be done

outdoors, it should be done in a well-ventilated room. Commercial seed treaters should have an adequate air exhaust system for treatment rooms. Workers exposed to seed treatment chemicals for long periods of time should have an approved chemical mask. The filter should be changed frequently. Recommended rates of application should be followed carefully because higher rates may injure the seed and lower rates may not give satisfactory disease control.

Forage legume seed should be treated well in advance of planting and inoculated with nitrogen-fixing *Rhizobia* at planting time. If dry beans have been treated with streptomycin for control of externally borne blight bacteria, inoculating with *Rhizobia* is not available.

Field Crop Foliar Sprays

Foliar fungicides are used to control fungal disease organisms that attack the above-ground portions of plants. Fungicides are used to protect the potential yield and quality of a crop. Many fungicides protect foliage from infection; therefore, these fungicides must be on the foliage before the fungus spores germinate.

Several foliar fungicides act differently from the protectants described above. For example, benzimidazole fungicides thiabendazole and thiophanate methyl are absorbed by the plant and translocated up the plant by the conducting tissues. They are called systemic fungicides. They only move up the plant; they do not move down. Thus, to control white mold on dry beans, complete coverage of stems, lower leaves and blossoms is required. Spraying only the upper leaves is not satisfactory because the fungicide will not move down to the location where it is needed. Strobilurin and triazole fungicides are locally systemic; they have some upward mobility and translaminar movement and some limited therapeutic action. Metalaxyl will move down from potato foliage into tubers in limited amounts to provide tuber protection against metalaxyl-sensitive strains of the late blight fungus and pink rot infection.

Spray control programs to prevent disease have been developed from data through years of research. Because each disease develops in a distinct manner, the decision to use a disease prevention program is based on weather conditions, disease development, potential yield of the crop and the dollars returned to management with use of the fungicides.

Many fungicides are registered for application through a sprinkler irrigation system, as well as by a spray. If a fungicide can be applied through a sprinkler system (fungigation), this is noted under application.

Most fungicide labels contain information on field re-entry, handling and loading precautions. Most labels state that workers either should not enter a sprayed field until the sprays have dried or should not enter for 24 hours unless they wear appropriate protective clothing. Information on the use of protective clothing during mixing and loading also is given on the label.
See the label for details.

Spraying

Spraying can be done with many different types of ground and air equipment. Getting good coverage is important: At least 5 gallons per acre (gal/A) should be used for aerial application and higher gallon amounts are required for ground equipment.

Droplet size for aerial application should be 200 to 400 microns (l/64 to 1/128 inch) in diameter. Generally, if nozzles are pointed back, appropriate nozzles are used and pressures do not exceed 30 or 35 pounds per square inch (psi), the correct droplet size will result. Application should be made with the boom 6 to 8 feet above the crop.

Some plant surfaces have a waxy or hairy coating, making good coverage difficult. The spray will collect in large, erect droplets, which then run off. Wheat and cabbage leaves are good examples. Frequently, using a wetting agent with wettable powders is necessary. Usually this is a spreader-sticker. Certain fungicides may work better with certain spreader-stickers than others. This type of information usually can be found on the label or in supplemental brochures. Spreader-stickers may be incorporated into some flowable formulations, so adding a spreader-sticker to the spray tank is not necessary. However, the label must be checked on each product recommendation for this use.

Resistance to Fungicides

Fungi may develop tolerance or resistance to certain fungicides. The sugar beet leafspot fungus (*Cercospora*) has developed resistance to the systemic benzimidazole fungicides (benomyl, thiabendazole and thiophanate methyl) in the Red River Valley and southern Minnesota. These fungicides should be not used at all in the southern Red River Valley and no more than once a season in a tank mix with an unrelated fungicide in the northern Red River Valley.

Resistance to the benzimidazole fungicides thiabendazole (TBZ or Mertect) and thiophanate methyl (Topsin M) has developed recently in the potato Fusarium dry rot pathogen *Fusarium sambucinum* and the potato silver scurf pathogen *Helminthosporium solani*. This resistance is common throughout the United States and Canada.

Resistance to iprodione has been reported from other parts of the country. Cross-resistance to the chemically related product vinclozolin is common when resistance to iprodione develops.

The A2 mating type of the late blight fungus, which is common in North Dakota and Minnesota, is resistant to metalaxyl and mefenoxam.

In North Dakota, reduced sensitivity to strobilurin fungicides have been observed in populations of the earlyblight fungus *Alternaria* sp. on potato and to the aschochyta pathogen on chickpeas.

Tolerance of the leafspot fungus to triphenyltin hydroxide was widespread in southern Minnesota and the southern Red River Valley in 1999 and common in the Northern Red River Valley. However, tin-tolerant do not survive as well as sensitive isolates when alternative fungicides are used. With appropriate FRAC rotations tin-tolerant isolates have largely disappeared.

In contrast, benzimidazole-resistant strains survive well when alternative fungicides are used and persist for a long time. The best way to combat resistance is to prevent or delay it by alternating the different classes of fungicides and by avoiding constant use of fungicides known to trigger development of resistant fungi. Using tank mixes of unrelated fungicides also is reported to retard the development of resistance.

Fungicide Resistance Management Statements

The following statements are recommendations from the Fungicide Resistance Action Committee (FRAC), whose Web site is www.frac.info/.

1. Methyl benzimidazole carbamates (MBC; Group 1) – High risk. Both mixtures and alternations with non-Group 1 fungicides are acceptable methods of preventing/managing resistance to Group 1 fungicides. For high-risk pathogens, mixtures are preferred to alternations.

2. Dicarboximides (Group 2) – Medium to high risk. Minimize the selection pressure by minimizing the number of applications. As a guide, do not apply more than two to three per crop per season. Maintain regular, prolonged times without exposure to Group 2 fungicides. When applying for *Botrytis* control, restrict applications to those times when *Botrytis* infection pressure is high. Where *Botrytis* resistance is well-established, use combinations to stabilize *Botrytis* control, but their application must follow the same rules as for Group 2 fungicides alone.

3. Sterol biosynthesis inhibitors (SBI; Groups 3, 5, 17 and 18) – Low to medium risk. Repeated applications of SBI fungicides alone should not be used on the same crop in one season against a high-risk pathogen in areas of high disease pressure for that particular pathogen. For crop/pathogen situations where repeated spray applications are made during the season, alternation or mixtures with an effective noncross-resistant fungicide are recommended. Where alternation or the use of mixtures is not feasible because of a lack of effective or compatible noncross-resistant partner fungicides, then input of SBIs should be reserved for critical parts of the season or crop growth stage. If SBI performance should decline and sensitivity testing has confirmed the presence of less sensitive forms, SBIs should be used only in mixture or alternation with effective noncross-resistant partner fungicides. The introduction of the new classes of chemistry offers new opportunities for more effective resistance management. The use of different mode of actions should be maximized for the most effective resistance management strategies. Users must adhere to the manufacturers' recommendations. In many cases, reports of "resistance" have, on investigation, been attributed to cutting recommended rates of use, or to poor or miss-timed application. Fungicide input is only one aspect of crop management. Fungicide use does not replace the need for resistant crop varieties, good agronomic practice, plant hygiene/sanitation, etc.

4. Phenylamides (PA; Group 4) – High risk. The Group 4 fungicides should be used on a preventative and not curative or eradicative basis. For foliar applications, Group 4 fungicides should be used in prepacked mixtures with an unrelated effective partner and used in a sound management program. Where using residual partners, use between three-fourths and full recommended rates. The Group 4 fungicide dosage in the mixture depends on its intrinsic activity and is defined by the respective company. The Group 4 fungicides should not be used as soil treatments against airborne diseases. When solo formulations are made available for soil use, strategies that prevent any possibilities for foliar applications must be implemented. For seed treatment, mixtures rather than straight Group 4 fungicides should be used whenever possible. The number of Group 4 fungicide applications should be limited (two to four consecutive applications per crop and year). The application intervals should not exceed 14 days and may be shorter in cases of high disease pressure. If rates and application intervals are reduced, the total amount of the Group 4 fungicide used per season should not exceed that of the full rate, and the total exposure time should remain the same. The rate of the mixing partners should remain the same for both intervals. Group 4 fungicide sprays are recommended early season during the period of active vegetative growth of the crop. The grower should switch to non-Group 4 products not later than the normal standard application interval of the non-Group 4 product.

5. Quinone outside inhibitors (QoI; Group 11) – High risk. When using a Group 11 fungicide as a solo product, the number of applications should be no more than one-third of the total number of fungicide applications per season. In programs with tank mixes or pre-mixes of a Group 11 fungicide, applications should be no more than one-half of the total number of fungicide applications per season. In programs in which applications of Group 11 fungicides are made with both solo products and mixtures, the number of Group 11 fungicide-containing applications should be no more than half of the total number of fungicide applications per season.

Fungicide Groups

The soil application and foliar sprays tables in this guide have a numerical or letter designation (in parentheses) for each chemical component of the listed commercial fungicides. This number or letter code indicates the fungicide group to which the chemical belongs. The fungicide groups have been designated by the Fungicide Resistance Action Committee (FRAC). FRAC is a Specialist Technical Group of the Global Crop Protection Federation. The members of this committee are

representatives from all major crop protection companies widely accepted in the literature.

The purpose of FRAC is to prolong the effectiveness of fungicides liable to encounter resistance problems and to limit crop losses should resistance appear. If field resistance is known to one member of the fungicide group, it is possible that cross-resistance to other chemicals within that group will be present. This Fungicide Guide is providing information on fungicide groups so that users are aware of potential resistance problems with continued use of chemicals in the same fungicide group. The intrinsic risk for resistance to develop to a given fungicide group varies among chemistries; for example, resistance development among the strobilurins, Group 11, is much more likely than resistance development among the mancozebs or manebs, Group Y. For more information about fungicide resistance and the FRAC Fungicide list, see the following Web site: www.frac.info/frac.

Section 18 Emergency Uses Requested For 2010

See the North Dakota Department of Agriculture Web site (www.agdepartment.com/Programs/Plant/Section18Exemptions.html) for Section 18 (emergency use) fungicides available in 2010.

The FRAC code of numbers and letters are represented by:
Fungicide Group Names

1. Methyl benzimidazole carbamates (MBC)
2. Dicarboximides
3. Demethylation inhibitors (DMI) (SBI: Class I)
4. Phenylamides (PA)
5. Amines (SBI: Class II)
6. Phosphoro-thiolates; dithiolanes
7. Carboxamides
8. Hydroxy-(2-amino-) pyrimidines
9. Anilino-pyrimidines (AP)
10. N-phenyl carbamates
11. Quinone outside inhibitors (QoI)
12. Phenylpyrroles (PP)
13. Quinolines
14. Aromatic hydrocarbons (AH); heteroaromatics
15. Cinnamic acids

16.1. Melanin biosynthesis inhibitors-reductase (MBI-R)
16.2. Melanin biosynthesis inhibitors-dehydratase (MBI-D)

17. Hydroxyanilides (SBI: Class III)
18. SBI: Class IV
19. Polyoxins
20. Phenylureas
21. Quinone inside inhibitors (QiI)
22. Benzamides
23. Enopyranuronic acid antibiotic
24. Hexopyranosyl antibiotic
25. Glucopyranosyl antibiotic
26. Glucopyranosyl antibiotic
27. Cyanoacetamide-oximes
28. Carbamates
29. Unnamed
30. Organo tin compounds
31. Carboxylic acids
32. Heteroaromatics
33. Phosphonates
34. Phthalamic acids
35. Benzotriazines
36. Benzene-sulfonamides
37. Pyridazinones
44. Microbials

P. Several (host plant defense induction)
U. Several
M. Several (multisite contact activity)

Alfalfa - Clover - Small-seeded Legumes
SEED TREATMENT

Chemical	Application	Dosage[1]	Disease Control[2] Seedling Blight[3]	Remarks
Mefenoxam Apron XL LS, 32.3 %	Slurry	0.64 fl oz/cwt	X	For control of Pythium damping off and early season Phytophthora only.
Metalaxyl Allegiance FL, 28.35% Acquire, 28.35% Dyna-Shield, 28.35% Sebring 318 FS, 28.35%	Slurry or mist	0.75 fl oz/cwt	X	For control of Pythium damping off and early season Phytophthora only.
Allegiance Dry Seed Protectant, 12.5%	Drill box	4 oz/cwt	X	
Thiram 42-S Thiram, 42% Signet 480 FS, 42%	Liquid or slurry	8 fl oz/cwt	X	For small-seeded legumes.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.

Alfalfa - Clover - Small-seeded Legumes
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks
			Leaf Rust	White Mold	
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Aerial sprays or fungigation	2-6 qt/A	X	X	Begin application when environmental conditions and plant stage are conducive to disease development.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.

Barley-Oat-Rye-Wheat
SEED TREATMENT

Chemical	Appl.	Dosage[1]	Disease Control[2]				Remarks
			Covered Smut	Loose Smut	Seedling[3] Blight	Common Root Rot	
Azoxystrobin Dynasty, 9.6%	Slurry	0.153-0.382 fl oz/cwt			X		For wheat and barley. Also controls dwarf bunt and common bunt. Always use Dynasty with Dividend Extreme or Dividend XL RTA.
Carboxin + PCNB Vitavax-PCNB, 17%:17%	Slurry or mist	3-4 fl oz/cwt wheat, oats, barley	X	X	X		Not registered for rye.
Carboxin + Thiram Vitavax 200 Flowable 17%:17%	Slurry or mist	3-4 fl oz/cwt	X	X	X		Neither registered for rye. RTU-Vitavax-Thiram registered for triticale.
RTU-Vitavax-Thiram, 10%:10%	Liquid or slurry	5-6.8 fl oz/cwt	X	X	X		

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to fungal infections of the seed such as black point and scab.

Barley-Oat-Rye-Wheat (continued)
SEED TREATMENT

Chemical	Appl.	Dosage[1]	Disease Control[2]				Remarks
			Covered Smut	Loose Smut	Seedling[3] Blight	Common Root Rot	
Difenoconazole + Mefenoxam Dividend XL RTA 3.21% : 0.27% Incentive RTA 3.21%:0.27%	Ready to apply	2.5 fl oz/cwt common bunt, loose smut, Fusarium seed scab	X(bunt)	X	X	X	**For spring and winter wheat.** Do not graze until 55 days after planting. Do not plant any crop other than wheat within 30 days to fields in which treated seeds were planted. For commercial or on-farm use.
		5 fl oz/cwt common bunt, loose smut, seed-borne Septoria, general seed rots, seed-borne Fusarium, Pythium damping off, plus partial control of common root rot	X(bunt)	X	X		
		10 fl oz/cwt - above diseases plus partial control of take-all, common root rot and Rhizoctonia root rot	X(bunt)	X	X	X	
Dividend Extreme 7.73%: 1.87%	Slurry	1 fl oz/cwt common bunt, loose smut, Fusarium seed scab	X(bunt)	X	X		For spring wheat and barley. See label for winter wheat recommendations. **Registered on barley** to suppress root rots and covered smut, and control seedling blight, at a rate of 2-4 fl oz/cwt.
		2 fl oz/cwt as above, plus seed-borne Septoria, Penicillium and Aspergillus seed rots, Pythium damping off, early season common root rot (Cochliobolus) and Rhizoctonia root rot	X(bunt)	X	X	X	
		4 fl oz/cwt as above, plus flag smut, early season take-all root rot	X (bunt)	X	X	X	
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt			X		For control of seed-borne and soil-borne fungi that cause seed decay, damping off and seedling blight. Cereal forage may be grazed 30 days after planting.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to fungal infections of the seed such as black point and scab.

Barley-Oat-Rye-Wheat (continued)
SEED TREATMENT

Chemical	Appl.	Dosage[1]	Disease Control[2]				Remarks
			Covered Smut	Loose Smut	Seedling[3] Blight	Common Root Rot	
Imazalil Nu-Zone 10 ME, 10%	Slurry	0.8-1.5 fl oz/cwt			X	X	Not registered for oats or rye. Registered for suppression of common root rot of wheat and barley and for barley stripe. Registered for control of seed-borne net blotch and *Septoria nodorum*. May be used with other fungicides. Do not graze or feed foliage from treated acres to livestock for 6 weeks after planting.
Mancozeb Dithane WSP, 80%	For planter box trmt. only	Consult labels for appropriate rate for each crop	X		X		
Manzate ProStick, 75%	Slurry		X		X		
Penncozeb 75DF 75%	Planter box trmt. only	Consult label	X		X		
Penncozeb 80WP 80%	Planter box trmt. Only	Consult label	X		X		
Maneb Manex, 37%	Slurry	2-3.2 fl oz/bu	X		X		.
Mefenoxam Apron XL-LS, 32.3%	Mist or slurry	0.32-0.64 fl oz/cwt			X		For Pythium damping off control. See label for Dividend-Apron XL-LS combination.
Mefenoxam + difenoconazole Cruiser Maxx Cereals 0.56%:3.36%	Slurry	5.0 fl oz/cwt	X	X	X	X	Not registered for rye or oats. Also contains 2.80% thiamethoxam for insect control.
Metalaxyl Allegiance FL, 28.35% Sebring 318 FS, 28.35%	Mist or slurry	0.375-0.75 fl oz/cwt			X		For control of Pythium damping off only.
Dyna-Shield, 28.35%	Slurry	0.75 fl oz/cwt			X		
Aquire, 28.35%	Mist or slurry	0.75 fl oz/cwt			X		

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to fungal infections of the seed such as black point and scab.

Barley-Oat-Rye-Wheat (continued)
SEED TREATMENT

Chemical	Appl.	Dosage[1]	Disease Control[2]				Remarks
			Covered Smut	Loose Smut	Seedling[3] Blight	Common Root Rot	
PCNB (Terraclor) PCNB Seed Coat, 24%	Slurry	2-4 oz/bu barley, oats 2 oz/bu wheat	X		X		Not registered for rye.
Pyraclostrobin Stamina, 18.4%	Slurry or mist	0.38-0.76 fl oz/cwt			x		Registered for wheat, barley and rye.
Thiram 42-S Thiram, 42% Signet 480 FS, 42%	Liquid or slurry	2 fl oz/bu			X		Not registered for oats.
Prothioconazole+ Tebuconazole + Metalaxyl + Proceed MD, 1.47%:0.29%:0.59 %	Slurry or mist	5-7.5 fl oz/cwt	X	X	X	X	Proceed is not registered for use on rye. Do not graze wheat barley or triticale green forage for 31 days.
Tebuconazole + Metalaxyl Raxil MD, 0.48%:0.64% Sativa M RTU, 0.48%:0.64%	Slurry or mist	5 fl oz/cwt	X	X	X	X	Not registered for rye. Do not graze barley, wheat or oat green forage for 31, 31 and 51 days, respectively.
Raxil XT, 15.0%:20%	Slurry (WP pouch)	0.16 oz/cwt or 1 pouch/50 cwt	X	X	X	X	
Raxil MD-W 0.461%:0.615%	Slurry or mist	5 fl oz/cwt	X	X	X	X	Raxil MD-W also contains 1.538% imidacloprid for wireworm suppression.
Sativa IM RTU 0.46%:0.615%	Slurry or mist	3.4–5 fl oz/cwt	X	X	X	X	Sativa IM Max also contains 11.4% imidacloprid for insect control.
Sativa IM Max 0.46%:0.615%	Slurry or mist	5-6.5 fl oz/cwt	X	X	X	X	Not registered for rye.
Tebuconazole + Metalaxyl + Imazalil Raxil MD Extra, 0.34%:0.58%: 1.0%	Slurry or mist	5 fl oz/cwt	X	X	X	X	Not registered for rye or oats.
Raxil MD Extra-W 0.415%:0.560%:0. 965%	Slurry or mist	5.14 fl oz/cwt	X	X	X	X	Contains 1.384% lmid-acloprid for wireworm control.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to fungal infections of the seed such as black point and scab.

Barley-Oat-Rye-Wheat (continued)
SEED TREATMENT

Chemical	Appl.	Dosage[1]	Disease Control[2]				Remarks
			Covered Smut	Loose Smut	Seedling[3] Blight	Common Root Rot	
Tebuconazole + Thiram Raxil-Thiram, 0.6%:20.0%	Liquid or slurry	3.5-4.6 fl oz/cwt	X	X	X	X*	Not registered for rye. Effective against seed-borne Fusarium and *Septoria nodorum*. Do not graze wheat or barley for 31 days and oats for 30 days after planting.
Triticonazole Charter, 2.4%	Concen-trated product	3.1 fl oz/cwt	X	X	X	X	Apply with water in a 2:1 ratio of water:Charter. Registered for wheat and barley. Suppression of root rot.
Triticonazole + Thiram Charter PB 1:25%:12.5%	Ready to apply	5.5 fl oz/cwt	X	X	X	X	Charter PB can be used as a ready-to-apply product or in a slurry with water. Registered for wheat and barley only.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to fungal infections of the seed such as black point and scab.

Barley-Oat-Rye-Wheat
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]					Remarks
			Leaf[4] Spot	Leaf Rust	Stem Rust	Powdery Mildew	Fusarium Head Blight	
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Aerial sprays or fungigation	2-6 qt/A	X	X		X		Begin applications when environmental conditions and plant stage are conducive to disease development.
***Bacillus subtilis* strain QST 2808 (44)** BalladPLUS	Aerial sprays or fungigation	1-4 qt/A	X	X		X		Begin applications when environmental conditions and plant stage are conducive to disease development.
Copper (M) Champ DP, 57.6%	Spray or fungigation	1-1.33 lb/A	X					None registered for rye.
Champ WG 77%	Spray or fungigation	1.5-2 lb/A	X					Make first application at early heading and follow with second spray 10 days later.
Champ Formula 2, Flowable, 37.5%	Spray or fungigation	1-1.33 pt/A	X					
Cuprofix Ultra 40 Disperss 71.1%	Spray or fungigation	1-1.25 lb/A	X					
Kocide 2000, DF 53.8%	Spray or fungigation	1.25-1.5 lb/A	X					Kocide 3000 can be applied as a foliar application for early season disease control and again at early heading and followed with another application 10 days later.
Kocide 3000, DF 46.1%	Spray or fungigation	0.5-0.75 lb	X					
Kocide 4.5 LF, 37.5%	Spray or fungigation	1-1.33 pt/A	X					

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Leaf spots includes fungal leaf diseases such as tan spot, Septoria blotch and spot blotch on wheat, and spot blotch and net blot on barley.

Barley-Oat-Rye-Wheat (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]					Remarks
			Leaf Spot[4]	Leaf Rust	Stem Rust	Powdery Mildew	Fusarium Head Blight	
Mancozeb (M3) Dithane DF Rainshield NT, 75%	Spray or fungigation	2.1 lb/A	X	X				Do not make more than 3 applications of mancozeb. Do not apply mancozeb within 26 days of harvest. Do not graze livestock in treated areas prior to harvest. Addition of spreader/sticker will improve performance.
Dithane F-45, 37%	Spray or fungigation	1.6 qt/A	X	X				
Dithane M-45, 80%	Spray or fungigation	2 lb/A	X	X				
Dithane WSP, 80%	Spray or fungigation	2 lb/A	X	X				
Manzate Flowable, 37%	Spray or fungigation	1.6 qt/A	X	X				0.75 to 1 quart rate of Dithane F-45 or 1 lb rate Dithane DF Rainshield NT is for application at the tillering stage to barley and wheat in North Dakota, South Dakota and Minnesota; this is covered by a Section 2 (ee) label.
Manzate ProStick, 75%								
Penncozeb, 80 WP, 80%	Spray or fungigation	2 lb/A	X	X				Penncozeb labels state control of Fusarium head blight as well.
Penncozeb 75 DF, 75%	Spray or fungigation	1-2 lb/A	X	X				
	Spray or fungigation	1-2 lb/A	X	X				
Mancozeb (M3) + Copper (M) ManKocide, 15% + 46.1%	Spray or fungigation	2-2.5 lbs/A	X					Not registered for rye. Apply at early heading and follow with second spray 10 days later. Do not apply within 26 days of harvest. Use higher rates when conditions favor disease. Do not graze livestock in treated areas prior to harvest.
Cuprofix MZ Disperss, 30.4% + 22.1%	Spray or fungigation	2.5-4.75 lb/A	X					
Triazoles Metconazole (3) Caramba, 8.6%	Spray or fungigation	10-17 fl oz/A	X	X	X	X	X	Maximum of 2 applications per season. Apply 13.5-17 fl oz at early flowering for Fusarium head blight. Maximum rate per season 34 fl oz; 30-day preharvest interval

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[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Leaf spots includes fungal leaf diseases such as tan spot, Septoria blotch and spot blotch on wheat, and spot blotch and net blot on barley.
[5]See fungicide resistance management statements on Pages 9-10.

Barley-Oat-Rye-Wheat (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]					Remarks
			Leaf Spot[4]	Leaf Rust	Stem Rust	Powdery Mildew	Fusarium Head Blight	
Triazoles cont.								
Propiconazole (3) Tilt 3.6EC, 41.8%	Spray or fungigation	2-4 fl oz/A	X	X	X	X	X	A 2-4 fl oz/A application for early season leaf disease control and 4 fl oz for a full head emergence (up to Feekes 10.5) application in wheat. Do not apply more than 8 fl oz per season. The preharvest interval is 40 days in wheat. The PHI for barley, oat and rye is 45 days. See labels for grazing and haying restrictions.
PropiMax EC, 41.8%	Spray or fungigation	2-4 fl oz/A	X	X	X	X	X	
Bumper 41.8%	Spray or fungigation	2-4 fl oz	X	X	X	X	X	
Propiconazole E-AG, 41.8%	Spray	2-4 fl oz/A	X	X	X	X	X	
Prothioconazole (3) Proline 480 SC, 41%	Spray	4.3-5.7 fl oz/A	X	X	X	X	X	Registered for use in wheat (including durum) and barley. Apply for Fusarium head blight (Scab) when the main stems of barley plants are fully headed or when 15% of the main-stem plants of wheat have started flowering. Do not make more than two applications of Proline per year. For maximum disease control, tank mix with the lowest rate of a nonionic surfactant and then apply in 15-20 gpa by ground or 5 gpa by air. Do not apply within 32 days of barley harvest or 30 days of wheat harvest.
Tebuconazole (3), 38.7% Folicur, Embrace, Monsoon, Muscle, Onset, Orius, Tebucon, Tebustar, Tebuzol, and Toledo	Spray	4 fl oz/A		X	X		X	For wheat and barley for suppression of Fusarium head blight (Scab) and rust control. Do not apply more than 4 fl oz per year. Do not apply within 30 days of harvest.
Prothioconazole + Tebuconazole (3) Prosaro 421 SC, 19.0%:19.0%	Spray	6.5-8.2 fl oz/A	X	X	X	X	X	Registered for wheat (including durum) and barley. Prosaro has a 30 day PHI. Apply Prosaro for Fusarium head blight (Scab) when the main stems of barley plants are fully headed or when 15% of the main stem plants of wheat have started flowering. Do not apply more than 8.2 oz of Prosaro per year.

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[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Leaf spots includes fungal leaf diseases such as tan spot, Septoria blotch and spot blotch on wheat, and spot blotch and net blot on barley.
[5]See fungicide resistance management statements on Pages 9-10.

Barley-Oat-Rye-Wheat (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]					Remarks
			Leaf Spot[4]	Leaf Rust	Stem Rust	Powdery Mildew	Fusarium Head Blight	
QoIs **Azoxystrobin (11)** Quadris, 22.9%	Spray or fungigation	6.2-12.3 fl oz/A (7.7-12.3 fl oz/A, powdery mildew)	X	X	X	X		Resistance statement 5[5] Wheat and barley. Do not apply within 45 days of harvest. Application may be made from immediately after jointing (Feekes 6) up to late head emergence (Feekes 10.5). Do not harvest treated grain for forage. Do not harvest within 14 days for hay.
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-9 fl oz/A	X	X	X	X		Not registered for oats. Apply no later than 50% head emergence for barley and rye. A sec. 2 (ee) allows early application at 3 fl oz/A on wheat. Registered for up to full head emergence (Feekes 10.5) for wheat. No more than two applications per season. Apply prior to disease onset.
QoIs + Triazoles **Trifloxystrobin (11) + Propiconazole (3)** Stratego 11.4%:11.4%	Spray (barley) Spray or fungigation (wheat)	10 fl oz/A	X	X	X	X		Resistance statement 5[5] & 3[5] Stratego registered for wheat , barley and oats. A 2 (ee) label allows application of Stratego at 4-7 fl oz/A in barley and 4-10 fl oz/A in wheat for early season diseases. Do not apply Stratego after Feekes stage 8 (emergence of flag leaf ligule) in barley or 10.5 (full head emergence) in wheat. Do not apply Stratego within 32 days of harvest in wheat or 40 days of harvest in barley. Do not exceed 2 applications of Stratego or 20 fl oz/season.
Pyraclostrobin (11) + Metconazole (3) Twinline 12.0%:7.4%	Spray or fungigation	7-9 fl oz/A	X	X	X	X		Apply Twinline immediately after flag leaf emergence and before flowering. Apply prior to disease development to ensure maximum disease protection PHI = 30 days.
Azoxystrobin (11) + Propiconazole (3) Quilt 7.0%: 11.7%	Spray or fungigation	7-14 fl oz/A	X	X	X	X		Resistance statement 5[5] & 3[5]. For wheat, barley and triticale. Applications may be made no closer than a 14-day interval. Quilt may be tank mixed with Axial and Discover herbicides. If disease pressure is low, 10.5 fl oz/A may be applied. Quilt also can be applied at 7 fl oz/A for early season disease control. Quilt has a PHI of application through full head emergence (Feekes 10.5) for wheat and 45 days for barley and triticale.
Sulfur (M) Sulfur DF, 80%	Spray	6-15lb/A				X		Do not apply when temperatures are high (above 90 F). For powdery mildew only.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Leaf spots includes fungal leaf diseases such as tan spot, Septoria blotch and spot blotch on wheat, and spot blotch and net blot on barley.
[5]See fungicide resistance management statements on Pages 9-10.

Canola (Rapeseed)
SEED TREATMENT

Chemical	Application	Dosage[1]	Disease Control[2]		Remarks
			Seed-borne Blackleg	Seedling Diseases[3]	
Azoxystrobin Dynasty, 9.6%	Slurry	0.10-3.75 fl oz/cwt	X	X	Resistance statement 5. Seed-borne blackleg, seedling Rhizoctonia damping off, Alternaria seedling blight. Add Apron XL LS for Pythium spp.
Difenoconazole + Metalaxyl M + Fludioxonil + Thiamethoxam Helix Xtra 1.25%:0.38%: 0.13%:20.7%	RTA slurry	23 fl oz/cwt	X	X	Commercial use only. Contains both insecticide and fungicide. Contains higher concentration of insecticide - to be used for high flea beetle pressure.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	X	For seed-borne and soil-borne fungi.
Metalaxyl Acquire, 28.35% Allegiance FL, 28.35% Sebring 318 FS, 28.35%	Mist or slurry Mist or slurry	0.25-0.5 fl oz/cwt 0.25-0.5 fl. oz/cwt	X X	X X	For Pythium damping off **only**.
Thiram + Carboxin + Metalaxyl + Clothianidin Prosper 400 9.49%:4.43%: 0.316%:9.49%	Slurry	19.2-25.6 fl oz/cwt	X	X	Commercial use only. Contains both insecticide and fungicide.
Trifloxistrobin + Carboxin + Metalaxyl + Clothianidin Prosper FX 0.544%:3.81%:0.40 %:21.75%	Slurry	21.5 fl oz/cwt	X	X	Commercial use only. Contains both insecticide and fungicide.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.

Canola
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]			Remarks
			Alternaria Black Spot	Blackleg	Sclerotinia Stem Rot (white mold)	
Azoxystrobin (11) Quadris, 22.9%	Spray or fungigation	6.2-15.4 fl oz/A	X	X	X	Resistance statement 5[4] Alternaria Black Spot alone: 8.0 fl oz/A at pod stage (95% petal fall) Blackleg: 6.2 fl oz/A at 2- to 4-leaf stage Alternaria Black Spot or Sclerotinia Stem rot: 9.2-15.4 fl oz/A at 10-25% flowering (3-7 days after first flower).
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigation	2-6 qt/A			X	For suppression.
***Bacillus subtilis* strain QST 2808 (44)** BalladPLUS	Sprays or fungigation	1-4 qt/A			X	Begin applications when environmental conditions and plant stage are conducive to disease development.
Boscalid (7) Endura, 70%	Spray or fungigation	5-6 oz/A			X	Apply at 20-50% flowering prior to the onset of disease. Apply a second application if conditions continue to be favorable for disease development.
Metconazole (3) Quash WDG, 90%	Wettable Granule	2-4 oz/A			X	Apply at 20-50% bloom, 10-20 gpa by ground, 5 gpa by air. 35 day PHI. Do not make more than one application or apply more than 4 fl oz/A.
Prothioconazole (3) Proline 480 SC, 41%	Spray	4.3-5.7 fl oz/A			X	Apply at 20-50% flowering. Do not make more than two applications per year. For maximum disease control, apply in 15-20 gpa by ground or 5 gpa by air. Do not apply within 36 days of harvest.
Pyraclostrobin (11) Headline, 23.6%	Spray	6-12 fl oz/A	X	X		Resistance statement 5[4]. For blackleg control, apply at 2- to 4-leaf stage. For black spot control, apply at early pod development. A second application 7-10 days later may be made if disease persists or weather is favorable for disease.
Thiophanate Methyl (1) Topsin M WSB, T-Methyl 70 W WSB, 70%	Spray or fungigation	1-2 lb/a			X	Resistance statement 1[4] Apply 1-2 lb once at 20-50% flowering, or apply 1 lb twice with the first application at 20-30% flowering and the second application at 40-50% flowering. Do not apply more than 2 lbs product/acre/season.
Thiophanate Methyl, WDG 85%	Spray or fungigation	0.8-1.6 lb/A			X	Apply 0.8-1.6 lb once at 20-50% flowering, or apply 0.8 lb twice, with the first application at 20-30% flowering and the second application at 40-50% flowering. Do not apply more than 1.6 lbs product/acre/season.
T-Methyl E-AG 4.5F	Spray or fungigation	20-40 fl oz/A			X	See label for specific application timings. Do not apply more than 40 fl oz of T-Methyl E-AG per acre per season.

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[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Page 10.

Canola
SOIL APPLICATION

Organism	Application	Dosage[1]	Whitemold[2] *(Sclerotinia sclerotiorum)*	Remarks
Coniothyrium minitans Contans WG, 5.3%	Soil Incorporation	1-2 lb/A	X	Fungus attacks sclerotia of the fungus in the soil.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]See fungicide resistance management statements on Page 10.

Chickpea (Garbanzo Bean)
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Diseases[3]	Remarks
Azoxystrobin Dynasty 9.6%	Slurry	0.153-0.765 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Mefenoxam Apron XL-LS, 32.3%	Slurry or mist	0.32-0.64 fl oz/cwt	X	For Pythium damping off.
Mefonoxam + Fludioxonil + Thiamethoxam Cruiser Maxx, 1.7%:1.12%:22.61%	Slurry or mist	3 fl oz/cwt	X	For seed-borne and soil-borne fungi and insect.
Metalaxyl Allegiance, 28.35% Allegiance, FL 28.35% Sebring 318 FS, 28.35% Dyna-Shield, 28.35%	 Slurry or mist Slurry or mist Slurry	 0.75-1.0 fl oz/cwt 0.25-0.5 fl oz/cwt 0.75 fl oz/cwt	 X X X	For Pythium damping off.
Pyraclostrobin Stamina 18.4%	Slurry or mist	0.38-1.52 fl oz/cwt	X	For seed-borne and soil-borne fungi and for control of seed and seedling disease caused by Rhizoctonia solani.
Thiabendazole LSP, 30% Mertect 340-F, 42.3%	 Liquid, mist or slurry Slurry	 3.3 fl oz/cwt 2.04 fl oz/cwt	 X X	For seed-borne Ascochyta.
Trifloxystrobin Trilex, 22%	Slurry	0.32 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Trifloxystrobin + Metalaxyl Trilex 2000, 7.12%:5.69%	RTU or slurry or mist	1.0 fl oz/cwt	X	For seed-borne and soil-borne fungi.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Chickpea
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control Ascochyta[3]	Remarks
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigation	2-6 qt/A		Begin applications when environmental conditions and plant stage are conducive to disease development.
Boscalid (7) Endura, 70%	Spray or fungigation	6 oz/A	X	Labeled for control of Botrytis gray mold, Sclerotinia white mold and rust. Apply at the beginning of flowering, prior to the onset of disease. Make a second application at full blossom if conditions continue to be favorable for disease development.
Chlorothalonil (M5) Bravo Ultrex, or Equus DF 82.5%	Spray or fungigation	1.25-1.8 lb/A	X	State label allows application to begin at onset of disease, with maybe 2-4 weeks before flowering. Repeat at 7- to 10-day intervals. Do not make more than 4 applications per growing season. Do not apply within 14 days of harvest. Begin application during early bloom and repeat at 7- to 10-day intervals. Do not apply more than 11.1 lbs/A per season.
Bravo WeatherstickZN, 51%	Spray or fungigation	1.38-2 pt/A	X	
Bravo Weatherstick, 54%	Spray or fungigation	1.38-2 pt/A	X	
Echo 720, 54.0%	Spray or fungigation	1.38-2 pt/A	X	
Chlorothalonil 720, 54%	Spray or fungigation	1.38-2 pt/A	X	
Mancozeb (M3) Manex, 37%	Spray	1.2-1.6 qts/A	X	Maximum 9.6 quarts per season. Begin when blight first detected in field. Spray on a 5- to 7-day interval. Do not apply within 30 days of harvest. See label.
Prothioconazole (3) Proline 480 SC, 41%	Spray	5.0-5.7 fl oz/A	X	Apply at early flower or at the first sign or disease, whichever occurs first. Use the higher rate when conditions are favorable for severe disease pressure and/or when growing more disease-susceptible varieties. Do not make more than three applications per year. Repeat applications as needed on a 10- to 14-day interval. Do not apply within 7 days of cutting or swathing the crop for harvest.
QoIs **Azoxystrobin (11)** Quadris, 22.9%	Spray or fungigation	6.2-15.4 fl oz/A	X	Resistance statement 5[4]. Quadris Opti should not be tank mixed with COC, MS0 or silicon adjuvants.
Azoxystrobin (11) + Chlorothalonil Quadris Opti, 4.6% : 46%	Spray	1.6-2.4 pt/A	X	
Pyraclostrobin (11) Headline,23.6%	Spray or fungigation	6-9 fl oz/A	X	Maximum of 18 fl oz/A per season. 21-day PHI.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Page 10.

Corn (Field) and Sorghum
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Azoxystrobin Dynasty, 9.6%	Slurry	0.0688 fl oz/80,000 kernel count unit	X	Use only in combination with labeled rates of Maxim and Apron XL products.
Captan The following captan products are registered for seed treatment of corn and sorghum: Captan - Diazinon Seed Treater, 36.67% Methoxychlor, 70.9% Kernel Guard, 14.67% (corn only) Nu-Gro Captan 4000, 38.7% Sorghum Guard, 32.75%	See individual labels for rates of application, formulations, method of application and registered use	See individual labels for amounts of formulated product to apply	X	Captan - Diazinon Seed Treater contains 25% diazinon insecticide. Kernel Guard contains 15% diazinon and 25% lindane. Sorghum Guard contains 16.6% lindane insecticide.
Carboxin Vitavax 34, 34% Kernel Guard Supreme, 14%	Slurry Drill box	2-4 fl oz/cwt 1.5 oz/42lb	X X	Not registered for sorghum. May be used on seed previously treated with captan or thiram Kernel Guard contains 10.42% permethrin.
Fludioxonil +Mefenoxam Maxim XL, 21% : 8.4%	Water-based slurry	.071 fl oz/80,000 kernel count unit of seed	X	Controls seedling blights and fungi causing seed decay and damping off. For field corn.
Ipconazole Vortex, 40.7%	Water-based slurry	0.044 fl oz/cwt	X	For protection against soil-borne and seed-borne diseases.

[1]Dosages for corn apply to field corn. Dosages for sweet corn vary with some products and others are not registered for sweet corn, so consult the label for sweet corn information. Dosages are amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.

Corn (Field) and Sorghum (continued)
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Mancozeb				
Dithane DF Rainshield NT, 75%	Slurry	1.6-3.2 oz/bu field corn 1.6-2.7 oz/bu sorghum	X	Dithane DF, F-45 and M-45 registered for seed treatment of field corn and sorghum but not for seed treatment of sweet corn.
Dithane F-45, 37%	Drill box or slurry	2.4-4.8 fl oz/bu field corn, 2.4-4.0 fl oz/bu sorghum	X	
Dithane ST, 37%	Slurry or mist	2.4-4.8 fl oz/bu field corn 2.4-4.0 fl oz/bu sorghum	X	
Dithane M-45, 80% or Dithane WSP, 80%	Drill box or slurry	1.5-3.0 oz/bu field corn 1.5-2.5 oz/bu sorghum	X	
Grain Guard, 50%	Drill box	3 oz/bu	X	Grain Guard and Grain Guard Plus registered for sorghum only. Grain Guard Plus contains 18.75% lindane insecticide.
Grain Guard Plus, 50%	Drill box	3 oz/bu		
Manzate ProStick, 75%	Slurry	1.5-3 oz/bu corn 1.5-2.5 oz/bu sorghum	X	
Penncozeb 80 WP, 80%	Drill box or slurry	1.5-3.0 oz/bu field corn 1.5-2.5 oz/bu sorghum	X	Treated seed should be labeled "must not be used for food, feed or oil purposes."
Penncozeb 75 DF, 75%	Drill box or slurry	1.6-3.2 oz/bu field corn 1.6-2.7 oz/bu sorghum	X	
Maneb				
Manex, 37%	Liquid or slurry	2.4-4.8 bu	X	Not registered for sorghum.
Mefenoxam				
Apron XL LS, 32.3%	Liquid or slurry	0.32-0.64 fl oz/cwt	X	For control of Pythium damping off only.
Metalaxyl				
Allegiance FL, 28.35% or Sebring 318 FS, 28.35%	Mist or slurry	0.375-0.75 fl oz/cwt sorghum	X	For control of Pythium damping off only.
Dyna-Shield, 28.35%	Slurry	0.75 fl oz/cwt corn	X	
Acquire, 28.35%	Mist or slurry	0.75 fl oz/cwt corn	X	
Metalaxyl + PCNB + Carboxin				
Prevail, 3.12%:15%:15%	Drill box	3 oz/bu	X	Not registered for sorghum. Controls early season Pythium and Rhizoctonia.
Pyraclostrobin				
Stamina, 18.4%	Slurry or mist	0.38-0.76 fl oz/cwt	X	Not registered for sorghum. Controls seed and seedling disease caused by Rhizoctonia solani, seed-borne fungi causing seed decay and seedling blight.
Thiram				
42-S Thiram, 42% Signet 480 FS, 42%	Liquid or slurry	1.5 fl oz/bu field corn 5.0 fl oz/cwt sweet corn 2 fl oz/bu sorghum	X	
Trifloxystrobin				
Trilex, 22%	Slurry or mist	0.32-0.64 fl oz/cwt	X	

[1]Dosages for corn apply to field corn. Dosages for sweet corn vary with some products and others are not registered for sweet corn, so consult the label for sweet corn information. Dosages are amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.

Corn (Field)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks
			Rust	Leaf Spots[4]	
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigtion	2-6 qt/A	X	X	Begin applications when environmental conditions and plant stage are conducive to disease development.
***Bacillus subtilis* strain QST 2808 (44)** BalladPLUS	Sprays or fungigation	1-4 qt/A	X	X	Begin applications when environmental conditions and plant stage are conducive to disease development
Mancozeb (M3) Manzate ProStick, 75%	Slurry	1.5 lb/A	X	X	Do not feed treated forage to livestock. Do not apply more than 16 lb product per season. Do not apply within 40 days of harvest.
Penncozeb 75DF	Slurry	1-1.15 lb/A	X	X	
Propiconazole (3) Tilt, Propimax, or Bumper, Propiconazole E-AG	Spray or fungigtion	4 fl oz/A for rusts 2-4 fl oz/A for Helminthosporium leaf blights 4 fl oz/A for Gray leaf spot and eye spot	X	X	Resistance statement 3[5]. Do not apply to field corn and field corn grown for seed after silking. Do not apply more than 16oz/A per season. Do not apply to sweet corn within 14 days of harvest or field corn within 30 days of harvest. See label for restrictions on use for forage.
Tebuconazole (3) Folicur, 38.7% Orius, 38.7% Tebuzol 3.6F, Monsoon	Spray or fungigation	4-6 fl oz/A	X	X	See individual labels for spray schedule recommendations and preharvest intervals.
QoIs **Azoxystrobin (11)** Quadris, 22.9%	Spray or fungigation	6.2-9.2 fl oz/A rust 9.2-15.4 fl oz/A leaf spots	X	X	Resistance statement 5[5]. Do not apply more than two sequential applications and do not apply more than 3.75 quarts per acre per season. For field, pop and sweet corn.
Azoxystrobin (11) + Propiconazole (3) Quilt 7.0% : 11.7%	Spray or fungigation	7-14 fl oz/A	X	X	Resistance statement 3[5]. Field corn, popcorn and sweet corn. Alternate applications of Quilt with Tilt or another non-Group 11 fungicide. For best disease control, make applications after R1. PHI = 30 days.
Quilt Xcel 13.5%:11.7%	Spray or fungigation	10.5-14 fl oz/A	X	X	
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-12 fl oz/A	X	X	Apply prior to disease onset. Apply at VT stage for optimal disease control. PHI= seven days. Do not exceed 72 fl oz/A per season; maximum of 2 sequential applications.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Leaf spots include fungal leaf diseases such as the Helminthosporium leaf blights on corn.
[5]See fungicide resistance management statements on Pages 9-10.

Corn (Field) (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks
			Rust	Leaf Spots[4]	
Pyraclostrobin (11) + Metconazole (3) Headline AMP 13.64%:5.14%	Spray	10-14.4 fl oz/A	X	X	For optimal disease control, begin applications prior to disease development. Repeat application in 7-14 days if conditions for disease development persist. Do not exceed 57.6 fl oz/A/season. 20 day PHI.
QoIs + Triazole **Trifloxystrobin (11) + Propiconazole (3)** Stratego, 11:4%:11.4%	Spray or fungigation	10-12 fl oz/A	X	X	Resistance statement 3[5] and 5[5]. For optimum disease control, apply Stratego from VT to R2 stage of growth. Apply up to 30 days before harvest.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Leaf spots include fungal leaf diseases such as the Helminthosporium leaf blights on corn.
[5]See fungicide resistance management statements on Pages 9-10.

Crambe
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blight[3]	Remarks
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	For Rhizoctonia and Fusarium.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Dry Edible Bean
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Azoxystrobin Dynasty, 9.6%	Slurry	0.153-0.765 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Captan Captan 4000, 38.4%	See label for rates of application, formulations and registered use	See label for amounts of formulated product to apply	X	
Chloroneb **Chloroneb 65W, 65%**	Slurry	4 oz/cwt	X	May be used as a supplemental seed treatment for improved suppression of Rhizoctonia and Pythium.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	For seed-borne and soil-borne fungi. Registered for control of Rhizoctonia and Fusarium.
Fludioxonil + Mefenoxam Apron Maxx RFC 2.31%:3.46%	Slurry	1.5 fl oz/cwt	X	For Fusarium and Rhizoctonia control.
Mefenoxam Apron XL LS, 32.3%	Slurry or mist	0.32-0.64 fl oz/cwt	X	For Pythium control. For both commercial and on-farm use.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Dry Edible Bean (continued)
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Mefenoxam + Fludioxonil + Thiamethoxam Cruiser Maxx 1.7%:1.12%:22.61%	Slurry or mist	3 fl oz/cwt	X	
Metalaxyl Aquire, 28.35% Allegiance FL, 28.35% Sebring 318 FS, 28.35% Allegiance Dry Seed Protectant, 12.5% Dyna-Shield, 28.35%	Mist or slurry Mist or slurry Drill box Slurry	0.75 fl oz/cwt 0.75 fl oz/cwt 4 oz/cwt 0.75 fl oz/cwt	X X X X	Metalaxyl is only for Pythium damping control. For use only with commercial seed treatment equipment. Apron Dry Seed Protectant is for drill box application to seed not previously treated with Apron; thorough mixing of fungicide and seed is essential for good control.
Mefonaxam + Fludioxdnil + Thiamethoxan CruiserMaxx 1.7%:1.12%:22.6%	Slurry or mist	3 fl oz/cwt	X	For seed-borne and soil-borne fungi and insects,
Metalaxyl + PCNB + Carboxin Prevail, 3.12%:15%:15%	Drill box	6-8 oz/cwt	X	Controls early season Pythium and Rhizoctonia.
Pyraclostrobin Stamina, 18.4%	Slurry or mist	0.38-1.52 fl oz/cwt	X	
Streptomycin 62.6% Agri-Strep 500, AS-50, or Agricultural Streptomycin	Slurry (5%)	.83 oz/cwt		Controls bacterial surface contamination on dry beans.
	8 1/3 lb in 10 gal. water treats 16,000 lb. of seed. Do not use with Rhizobium inoculant. Triple treat process uses Fungicide + Insecticide + Streptomycin.			
Thiram 42-S Thiram, 42% Signet 480 FS, 42% Thiram 50WP Dyed, 50%	Liquid or slurry Drill box or slurry	2 fl oz/cwt 2 oz/cwt	X X	
Trifloxystrobin Trilex, 22%	Slurry	0.32 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Trifloxystrobin + Metalaxyl Trilex 2000, 7.12%:5.69%	Slurry or mist	1.0 fl oz/cwt	X	For seed-borne and soil-borne fungi.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Dry Edible Bean
BIOLOGICAL SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Organism *Bacillus subtilus* GB 03 Kodiak, 2.75%	Slurry	0.125 oz/cwt	X	
Bacillus pumilus GB 34 Yield Shield, 0.28%	Slurry	0.102/cwt	X	Suppression of root diseases caused by Rhizoctoria and fusarium.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Dry Bean
SOIL APPLICATION

Chemical (Fungicide Group)	Application	Dosage[1]	Control[2] of Rhizoctonia	Remarks
PCNB (14) Terraclor FL, 40%	In-furrow spray	2.2-3.3 fl oz/1,000 linear feet of row	X	Spray planting furrow and covering soil at planting. Do not apply to seed. Use lower rates on lighter soils.
Terraclor 75 WP, 75%	In-furrow spray	1.4-2.2 oz/1,000 linear feet of row	X	Apply as a directed spray in the seed furrow and to covering soil at planting.
Terraclor EC, 23.8%	In-furrow spray	4.4-6.6 fl oz/1,000 linear feet of row	X	Spray planting furrow and covering soil at planting. Do not apply directly to seed. Use lower rates on lighter soils.
PCNB 2 Spray, 24%	In-furrow spray	8.8 fl oz/1,000 linear feet of row	X	
Terraclor 10G, 10%	In-furrow granules	0.75-1 lb/1,000 linear feet of row	X	Apply in planting furrow and covering soil at planting.
PCNB (14) + Metalaxyl (4) Ridomil Gold PC GR 10%: 0.5%	In-furrow granules	0.75 lb/1,000 linear feet of row	X	Resistance statement 4[3]. Adjust application equipment so granules are mixed with soil surrounding seed. See label for planting restrictions within 12 months of application.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]See fungicide resistance management statements on Page 10.

Dry Edible Bean
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]				Remarks
			Anthracnose	Rust	Halo Blight	White Mold	
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigtion	2-6 qt/A		X		X	Begin applications when environmental conditions and plant stage are conducive to disease development.
Boscalid (7) Endura, 70%	Spray or fungigation	8-11 oz/A		X		X	Apply at the beginning of flowering, prior to disease onset. Use higher rate for extended protection. Make a second application at full bloom if conditions continue to be favorable for disease development. Do not apply within 21 days of harvest.
Chlorothalonil (M5) Bravo 500, 40.4%	Spray or fungigation	2-3 pt/A	X	X			Do not apply chlorothalonil within 14 days of harvest. See publication PP-576, "Dry Edible Bean Diseases." Carefully monitor fields for disease.
Bravo WeatherStik Echo, Echo 720, Chlorotholonil 720, 54%	Spray or fungigation	1 3/8-2 pt/A	X	X			
Bravo Ultrex DG, or Equus DF,82.5%	Spray or fungigation	1.25-1.8 lb/A	X	X			
Echo Zn, Bravo ZN or Terranil Zn, 38.5%	Spray or fungigation	2-3 pt/A	X	X			Bravo Zn, Bravo ZN, Echo Zn and Terranil Zn also contain zinc.
Echo 90 DF, 90%	Spray or fungigation	1.13-1.63 lb/A	X	X			
Copper (M) Basicop WP, 53%	Spray	2-4 lbs/A			X		
Champ DP, 57.6%	Spray or fungigation	0.66-2 lb/A			X		
Champ Formula 2 Flowable, 37.5%	Spray or fungigation	0.66-2 pt/A			X		
Cuprofix Ultra 40 Disprss 71.1%	Spray or fungigation	0.75-2 lbs/A			X		
Kocide 2000, 53.8%	Spray or fungigation	0.75-2.25 lb/A			X		
Kocide 3000, 46.1%	Spray or fungigation	0.5-1.25 lb/A			X		
Kocide 4.5 LF, 37.5%	Spray or fungigation	0.66-2 pt/A			X		

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Page 9.

Dry Edible Bean (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]				Remarks
			Anthracnose	Rust	Halo Blight	White Mold	
Cyprodinil (9)+ Fludioxonil (12) Switch 62.5 WG 37.5%:25.0%	Spray	11-14 oz/A				X	Make first application at 10-20% bloom. A 2 (ee) label allows Switch to be applied in tank mix with Thiophonate-methyl for improved white mold control.
Iprodione (2) Rovral 4F, 41.6%	Ground spray or fungigation	1.5-2.0 pt/A				X	Resistance statement 2[4]. Apply at first bloom (10% of plants with 1 open blossom) and again at peak bloom, if needed. Do not apply after full bloom. Use 50-100 psi and 3 nozzles, 1 over the row and one on each side. If pH of spray water exceeds 7.0, buffer it to pH 5.0-7.0.
Maneb (M3) Maneb 80, 80%	Spray or fungigation	1.5-2 lb/A	X	X	X		
Maneb 75 DF, 75%	Spray or fungigation	1.5-2 lb/A	X	X	X		
Manex, 37%	Spray or fungigation	1.2-1.6 qt/A	X	X	X		
Prothioconazole (3) Proline 480 SC, 41%	Spray	5.7 fl oz/A		X		X	Apply Proline prior to disease onset or at 15-25 % flowering when conditions are favorable for disease development. Do not make more than 3 applications per year. Repeat applications as needed on a 5-14 day interval. For maximum disease control, apply in 20 or more gpa by ground. Do not apply within 7 days of cutting or swathing for harvest.
Tebuconazole (3), 38.7% Folicur 3.6F Orius 3.6F Tebuzol 3.6F, Monsoon	Spray or fungigation	4-6 fl oz/A		X			See labels for information on spray scheduling, preharvest intervals and re-entry intervals. Do not apply more than 12 fl oz per year.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Page 9.

Dry Edible Bean (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]				Remarks
			Anthracnose	Rust	Halo Blight	White Mold	
QoIs **Azoxystrobin (11)** Quadris, 22.9%	Spray or fungigation	6.2 fl oz/A for rust 6.2-15.4 fl oz/A for other leaf diseases	X	X			Resistance statement 2[4].
Azoxystrobin (11) + Chlorothalonil (M5) Quadris Opti, 4.6% : 46%	Spray	1.6-2.4 pt/A	X	X			
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-9 fl oz/A	X	X			Apply prior to onset of disease. Maximum of 2 applications per season. 21-day PHI.
Sulfur (M) Microthiol Disperss, 80%	Spray	7 lb/A		X			
Thiophanate-methyl (1) Topsin M WSB, or T-methyl 70W WSB or T-Methyl WSB E-AG	Spray or fungigation	1.5-2 lb/A- 1 application or 1-1.5 lb/A - 2 applications	X			X	Resistance statement 2[4]. Apply 1.5-2 lb once when 70-100% of the plants have at least one open blossom. Or apply 1-1.5 lb twice, with the first application when 10-30% of the plants have at least one open blossom and the second application 4-7 days later. Complete coverage of all parts of plant is essential for control of white mold. Do not apply more than 4 lbs product/acre/season. Do not apply thiophanate-methyl within 14 days of harvest.
Topsin or T-Methyl E-AG, 46.2%	Spray or fungigation	30-40 fl oz/A 1 application or 20-30 fl oz/A if two applications	X			X	
Thiophanate Methyl 85 WDG, 85%	Spray or fungigation	0.8-1.6 lb/A	X			X	

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Page 9.

Flax
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blight[3]	Remarks
Captan Captan 400, 37.4%	Slurry	2-3.75 fl oz/cwt	X	
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	
Mancozeb Dithane DF Rainshield NT, 75%	Slurry	2.1-4.3 oz/bu	X	
Dithane F-45, 37%	Drill box or slurry	3.2-6.4 fl oz/bu	X	
Dithane WSP or Penncozeb 80 WP, 80%	Drill box or slurry	2-4 oz/bu	X	
Penncozeb 75 DF, 75%	Drill box or slurry	2.1-4.3 oz/bu	X	
Manzate 75 ProStick, 75%	Slurry	2-4 oz/bu	X	
Thiram 42-S Thiram, 42% Signet 480 FS, 42%	Liquid or slurry	3 fl oz/bu	X	

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.

Flax
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Pasmo *(Septoria linicola)* Control[3]	Remarks
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-12 fl oz/A	X	For optimal disease control, apply Headline before disease onset. Resistance statement 5[4]. Apply at midflowering (7-10 days after flower initiation). Make 2nd application if disease persists. Do not apply more than 24 fl oz/season. 21-day PHI.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Leaf spots includes fungal leaf diseases such as tan spot, Septoria blotch and spot blotch on wheat, and spot blotch and net blot on barley.
[5]See fungicide resistance management statements on Pages 9-10.

Grasses (Forage)
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Fludioxonil Maxim 4 FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Mefenoxam Apron XL LS, 32.3%	Slurry or mist	0.32-0.64 fl oz/cwt	X	Apron XL LS controls only Pythium. For both commercial and on-farm use.
Metalaxyl Acquire, 28.35% Allegiance Fl 28.35% Sebring 318 FS, 28.35% Allegiance Dry Seed Protectant, 12.5% Dyna-Shield, 28.35%	Mist or slurry Drill box Slurry	0.75 fl oz/cwt 3-4 oz/cwt 0.75 fl oz/cwt	X X X	Acquire and Allegiance controls only Pythium. Allegiance Dry Seed Protectant is for drill box application to seed not previously treated with Apron; thorough mixing of fungicide and seed is essential for good control.
Thiram 42-S Thiram, 42% Thiram 50WP Dyed, 50%	Liquid or slurry Drill box or slurry	8 fl oz/cwt 8 oz/cwt	X X	

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.

Lentils
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Azoxystrobin Dynasty 9.6%, Protege 9.6%	Slurry	0.153-0.765 fl oz/cwt	X	For seed-borne and soil-borne fungi. Not for Pythium if used alone.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Mefenoxam Apron XL LS, 32.3%	Slurry or mist	0.32-0.64 fl oz/cwt	X	Use 0.32-0.64 fl oz/cwt for Pythium damping off. For early season Phytophthora, use 0.64 fl oz/cwt.
Mefenoxam + Fludioxonil Apron Maxx RTU 1.1%:0.73%	Slurry	5 fl oz/cwt	X	Sec 24 (C) label for North Dakota for protection against damping-off and seed rots.
Mefenoxam + Fludioxonil + Thiamethoxam Cruiser Maxx 1.7%:1.12%:22.61%	Slurry or mist	3 fl oz/cwt	X	
Metalaxyl Aquire, 28.39%	Slurry or mist	0.75 fl oz/cwt	X	Metalaxyl controls only Pythium.
Allegiance FL, 28.35% Sebring 318 FS	Slurry or mist	0.75 fl oz/cwt	X	
Allegiance Dry Seed Protectant, 12.5%	Drill box	4 oz/cwt	X	
Dyna-Shield, 28.35%	Slurry	0.75 fl oz/cwt	X	
Pyraclostrobin Stamina, 18.4%	Slurry or mist	0.38-1.52 fl oz/cwt	X	
Thiabendazole Mertect 340-F, 42.3%	Slurry	1.05 fl oz/cwt	X	For seed-borne control of *Ascochyta rabiei*.
Trifloxystrobin Trilex, 22%	Slurry	0.32 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Trifloxystrobin + Metalaxyl Trilex 2000, 7.12%:5.69%	Slurry or mist	1.0 fl oz/cwt	X	

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Lentils
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Ascochyta Control[3]	Anthracnose Control[3]	Remarks
***Bascillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigation	2-6 qt/A			Begin applications when environmental conditions and plant stage are conducive to disease development.
Boscalid (7) Endura, 70%	Spray or fungigation	8-11oz/A	X		Begin applications prior to disease development and repeat on a 5- to 14-day interval. Do not make more than 2 applications per season (22 oz/A/season).
Prothioconazole (3) Proline 480 SC, 41%	Spray	5.0-5.7 fl oz/A	X		Apply at early flowering or at the first sign of disease. Use the higher rate when conditions are favorable for severe disease pressure and/or when growing more susceptible varieties. Do not make more than three applications per year. Repeat applications as needed on a 10- to 14-day interval. Do not apply within 7 days of cutting or swathing the crop for harvest.
QoIs					Resistance Statement 5[4].
Azoxystrobin (11) Quadris, 22.9%	Spray or fungigation	6.2-11oz/A	X	X	Begin applications prior to disease development and continue on a 7- to 14-day interval. Do not apply more than 2.88 qt/A/season for Quadris
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-9 fl oz/A	X	X	Begin applications prior to disease development and repeat on a 7- to 14-day interval if conditions are conducive for disease development.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Page 10.

Pea (Field)
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blight[3]	Remarks
Azoxystrobin Dynasty 9.6%	Slurry	0.153-0.765 fl oz/A	X	
Captan Captan 75%	See label for directions	1 oz/bu	X	Does not control seed-borne Ascochyta.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Fludioxonil + Mefenoxam Maxim XL 21% : 8.4%	Slurry	0.167-0.334 fl oz/cwt	X	For seed-borne and soil-borne fungi and Pythium and Phytopthora.
Mefenoxam Apron XL LS, 32.3%	Slurry or mist	0.32-0.64 fl oz/cwt	X	Use 0.32-0.64 fl oz/cwt for Pythium damping off. For early season Phytophthora, use 0.64 fl oz/cwt.
Mefenoxam + Fludioxonil Apron Maxx RTA 1.1%:0.73%	Slurry	5 fl oz/cwt	X	Sec 24 (C) for North Dakota; control of seed rots due to Pythium, Phytopthora, Fusarium, Rhizoctoria. Also suppresses seed-borne Sclerotinia and Phomopsis spp.
Mefenoxam + Fludioxonil + Thiamethoxam Cruiser Maxx 1.7%:1.12%:22.61%	Slurry or mist	1.5 fl oz/cwt	X	For seed-borne and soil-borne fungi and insects.
Metalaxyl Acquire, 28.35%	Mist or slurry	0.75 fl oz/cwt	X	For Pythium damping off. See labels for higher rates for systemic downy mildew. Apron Dry Seed Protectant for drill box application to seed not previously treated with Apron. Thorough mixing of fungicide and seed is essential for good control.
Allegiance Fl, 28.35% Sebring 318 FS, 28.35%	Mist or slurry	0.75 fl oz/cwt	X	
Allegiance Dry Seed Protectant 12.5%	Drill box	4 fl oz/cwt	X	
Dyna-Shield, 28.35%	Slurry	0.75 fl oz/cwt	X	
Pyraclostrobin Stamina, 18.4%	Slurry or mist	0.38-1.52 fl oz/cwt	X	
Thiabendazole Mertect 340-F, 42.3%	Slurry	1.05 fl oz/cwt	X	For seed-borne control of *Ascochyta rabiei.*
Trifloxystrobin Trilex, 22%	Slurry	0.32 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Trifloxystrobin + Metalaxyl Trilex 2000, 7.12%:5.69%	Slurry or mist	1.0 fl oz/cwt	X	For seed-borne and soil-borne fungi.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Pea (Field)
BIOLOGICAL SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Organism				
Bacillus subtilus GB 03 Kodiak, 2.75%	Slurry	0.125 oz/cwt	X	
Bacillus pumilus GB 34 Yield Shield, 0.28%	Slurry	0.102/cwt	X	Suppression of root diseases caused by Rhizoctonia and Fusarium.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Pea (Field)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Control[3] of Powdery Mildew	Control[3] of Ascochyta Blight	Remarks
***Bascillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigation	2-6 qt/A			Begin applications when environmental conditions and plant stage are conducive to disease development.
Prothioconazole (3) Proline 480 SC, 41%	Spray	5.0-5.7 fl oz/A		X	Apply at early flowering or at the first sign of disease. Use higher rate when conditions are favorable for severe disease pressure and/or when growing more susceptible varieties. Do not make more than three applications per year. Repeat applications as needed on a 5- to 14-day interval. Do not apply within 7 days of cutting or swathing the crop for harvest.
QoIs					Resistance statement 5[4].
Azoxystrobin (11) Quadris, 22.9%	Spray or fungigation	6.2-15.4 fl oz/A	X	X	
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-9 fl oz/A	X	X	
Sulfur (M)					Sulfur has been used in Wisconsin and the Prairie Provinces of Canada. Its economic return has not been determined for North Dakota.
Kumulus DF, 80%	Spray or fungigation	3-5 lb/A	X		
Liquid Sulfur Six, 52%	Spray or fungigation	3-4 pt/A	X		
Micro Sulf, 80%	Spray or fungigation	3-5 lb/A	X		
Microthiol Disperss, 80%	Spray or fungigation	7 lb/A	X		

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statement on Page 10.

Potato
SEED TREATMENT

Chemical	Application	Dosage[1]	Disease Control[2]		Remarks
			Fungi[3]	Bacteria[4]	
Azoxystrobin (11) Dynasty, 9.6%	Water-based slurry	0.10-3.75 fl oz/cwt	X		For suppression of black scurf and stem canker and seed-borne black dot, and for protection against silver scurf.
Fludioxonil Maxim 0.5% Maxim 4FS	Dust Liquid	8.0 oz/cwt 0.04-0.08 fl oz/cwt	X X		Maxim and Maxim MZ are formulated as dusts to be applied to cut or single-drop seed before planting. Maxim products effectively suppress Fusarium dry rot seed decay, stem cankers and tuber black scurf caused by seed-borne *Rhizoctonia solani* and seed-borne *Helminthosporium solani*, the causal agent of silver scurf disease. Half rates are recommended for processing (fries).
Fludioxonil + mancozeb Maxim MZ, 0.5%:9.6%	Dust	0.5 lb/cwt	X		
Fludioxonil + Thiamethoxam Cruiser Maxx Potato 7.0%:28%	Liquid	0.19-0.27 fl oz/cwt rate depends on seeding rate	X		To aid in control of certain insects and Fusarium dry rot and other fungal diseases.
Mancozeb + Imidacloprid Gaucho-MZ 1.2% : 1.25%	Dust	0.5-0.75 lb/cwt	X		To aid in control of certain insects and Fusarium dry rot.
Mancozeb PSP 6% PST Plus Bark 6%	 Dust Dust	 1 lb/cwt 1 lb/cwt	 X X		For suppression of Fusarium dry rot, Rhizoctonia, seed-borne common scab and silver scurf.
Mancozeb+ flutolanil Moncoat MZ, 6.0% : 1.5%	Dust	0.75 - 1lb/cwt	X		For suppression of Rhizoctonia and Fusarium dry rot seed decay. MZ added to suppress Fusarium dry rot seed decay.
Thiophanate-methyl+Mancozeb Tops MZ, 2.5%:6.0%	Dust	0.75-1lb/cwt	X		Effective against Rhizoctonia, Fusarium and *Helminthosporium solani*.
Thiophanate methyl + mancozeb + imidacloprid Tops MZ-Gaucho, 2.5%:6.0%:1.25%	Dust	0.75-1.0 lb/cwt	X		Effective against Rhizoctonia, Fusarium and *Helminthosporium solani.* Also aids in control of aphids and Colorado potato beetle.

[1] Dosage = Amount of formulated product to apply.
[2] X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3] Fusarium, *Rhizoctonia solani* and *Helminthosporium solani*. These fungi cause dry rot, Rhizoctonia stem canker and silver scurf.
[4] Includes Erwinia, cause of soft rot decay, and *Clavibacter*, cause of ring rot.

Potato
SOIL APPLICATION

Chemical (Fungicide Group)	Application	Dosage[1]	Control of Rhizoctonia[2]	Pythium Leak	Pink Rot	Remarks
***Bacillus subtilis* strain QST 713** Serenade ASO	In-furrow at planting	2.2-13.2 fl/oz/1,000 row feet	X			
Azoxystrobin (11) Quadris, 22.9%	In-furrow spray	0.4-0.6 fl oz/1,000 ft of row (5.8-8.7 fl oz/A with 36" rows)	X			Resistance statement 5[3]. For control of black scurf (*Rhizoctonia solani*) and Silver scurf (*Helminthosporium solani*). Also controls black dot caused by *Colletotrichum coccodes.* Apply as in-furrow spray in 5-15 gal of water at planting.
Pyraclostrobin (11) Headline, 23.6%	In-furrow spray	0.4-0.8 fl oz/1,000 ft of row	X			Maximum application rate is 0.73 fl oz/1,000 feet of row.
Azoxystrobin (11)+ Mefenoxam (4) Quadris Ridomil Gold SL	In-furrow spray	0.82 fl oz/1,000 ft of row	X	X	X	Maximum application rate of 1.5lb of azoxystrobin and 0.5 lb of mefenoxam products per acre per season.
PCNB (14) Blocker	Broadcast	180-250 lb/A	X			Incorporate 4-6 inches deep.
PCNB 10% Granules	In-furrow granules	100 lb/12,400 linear ft of a 36 inch row	X			
Flutolanil (7) Moncut, 70%	In-furrow	0.79-1.18 oz/1,000 ft row of a 36 in row	X			
Mefenoxam (4) Ridomil Gold EC or SL, 48%	6-8 inch band, in furrow or impregnated on dry fertilizer	0.42 fl oz /100 ft of row		X	X	Resistance statement 4[3]. For postharvest control of pythium leak and pink rot caused by *Phytophthora erythroseptica.*
Ultra Flourish, 25.1%		0.84 fl oz /100 ft of row		X	X	
Platinum Ridomil Gold, 9%		2.2 fl oz /1,000 ft row		X	X	Platinum Ridomil Gold contains 4.5% thiamethoxam for control of various potato insects.
Sodium (mono - and - dibasic) Potassium, and Ammonium Phosphites (33), Several products		check label			X	Apply in a band at planting directly over the seed pieces. For Pythium leak control, apply in combination with mefenoxam fungicide. Soil applications have not been shown to be efficacious with this fungicide. Foliar applications are recommended.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]See fungicide resistance management statement on Page 8.

Potato
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks[4]
			Late Blight	Early Blight	
Boscalid (7) Endura, 70%	Spray or fungigation	2.5-4.5 oz/a (EB) 5.5-10 oz/A (white mold)		X	10-day PHI. Also controls Sclerotinia white mold and Botrytis. For white mold control, apply prior to infection generally just prior to row closure. For early blight control, apply prior to disease onset. Do not exceed 20.5 oz/A per season.
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigation	2-6 qt/A	X	X	For suppression.
Chlorothalonil (M5)					
Bravo 500, Echo 500, 40.4%	Spray or fungigation	1.0-2.13 pt/A	X	X	Do not apply more than 11.25 lb ai of chlorothalonil per acre per season (23 pt of 40.4%, 16 pt of 54%, 14.5 lb of 82.5%, 13 lb of 90%). Do not apply within 7 days of harvest. A 24 (C) state label has been granted to Echo 720, Echo ZN to allow up to 16 lb ai per acre per season for late blight control.
Bravo 500 ZN	Spray or fungigation	1.0 pt/A 1st application. 1.4-2.1pt/A subsequent applications	X	X	
Bravo WeatherStik, Equus 720, Echo 720 or Chlorothalonil 720, 54%	Spray or fungigation	0.75 pt/ A 1st application. 1.0-1.5 pt/A subsequent applications	X	X	Do not apply more than 16 lb ai of Bravo Zn, Bravo Weatherstik or Bravo ZN per season (30.5 pt Bravo Zn, 21.5 pt of Bravo Weatherstik or Bravo Weatherstik Zn).
Bravo Ultrex DG, 82.5%	Spray or fungigation	0.7-1.4 lb/A	X	X	Bravo Ultrex has a maximum 10-day interval between applications for potato late blight control.
Bravo Zn, Echo Zn or Terranil Zn, 38.5%	Spray or fungigation	1.0-2.13 pt/A	X	X	
Equus DF, 82.5%	Spray or fungigation	0.7 lb/A 1st application. 0.9-1.36 lb/A subsequent applications	X	X	
Echo 90 DF, 90%	Spray or fungigation	0.63-1.25 lb/A	X	X	

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Check the NDSU blight hotline, (888) 482-7286, for information on infection potential of early blight and late blight. Whenever late blight is severe, vine killing is extremely important and should be done at least 2 weeks before harvest to prevent tuber infections. Hilling of soil around the vines should be done just before killing them.

Potato (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks[4]
			Late Blight	Early Blight	
Copper (M)					
Basicop WP, 53%	Spray	3-6 lbs/A	X	X	Do not apply Basicop through irrigation system.
Champ DP, 57.6%	Spray or fungigation	0.66-2.66 lb/A	X	X	Coppers are not effective under high disease pressure.
Champ WG, 77%	Spray or fungigation	1-1 ½ lbs/A	X	X	
Champ Formula 2 Flowable, 37.5%	Spray or fungigation	0.66-2.66 pt/A	X		Control will be improved by tank mixing with other compatible registered fungicides.
Cuprofix Ultra 40 Disperss 71.1%	Spray or fungigation	.75-3.0 lb/A	X	X	
Kocide 2000, 53.8%	Spray or fungigation	1.25-6lb/A	X	X	
Kocide 3000, 46.1%	Spray or fungigation	0.5-1.75 lb	X	X	
Kocide 4.5 LF, 37.5%	Spray or fungigation	0.66-2.66 pt/A	X	X	
Copper Sulfate (M1) Blue Viking Star Glow Powder **or** Triangle Brand Copper Sulfate Instant Powder	Spray	10 lb/A			For application with Diquat desiccant to enhance vine desiccation and suppress late blight.
Cymoxanil (27) Curzate 60 DF, 60%	Spray or fungigation	3 1/3 oz/A	X		Must be tank-mixed with a protectant fungicide. Do not apply within 14 days of harvest.
Dimethomorph (15) Forum, 43.1%	Spray or fungigation	4-6 oz/A	X		Do not exceed 30 oz/A per season. Do not apply Forum alone; must be tank-mixed with fungicides other than mefenoxam or metalaxyl registered for late blight control. 4-day PHI.
Fluazinam (29) Omega 500F, 40%	Spray or fungigation	5.5 fl oz/A for late blight 5.5-8 fl oz/A for white mold	X		Begin applications when conditions favor disease development. Repeat applications at 7-10 days. Do not apply more than 3.5 pts per acre per season. Do not apply within 14 days of harvest. Provides some tuber protection against late blight when used at the end of the season.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Check the NDSU blight hotline, (888) 482-7286, for information on infection potential of early blight and late blight. Whenever late blight is severe, vine killing is extremely important and should be done at least 2 weeks before harvest to prevent tuber infections. Hilling of soil around the vines should be done just before killing them.

Potato (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks[4]
			Late Blight	Early Blight	
Iprodione (2) Rovral 4F, 41.6%	Ground spray or fungigation	1-2 pt/A, early blight		X	Resistance statement 2[5]. Rovral also is labeled for control of white mold. Do not apply within 14 day of harvest. If pH of spray water is above 7.0, buffer it to pH 5.0-7.0.
Mancozeb (M3) Dithane DF Rainshield NT, 75%	Spray or fungigation	0.5-2 lb/A	X	X	Do not apply within 14 days of harvest. Vine kill should occur 14 days before harvest. Do not apply more than 11.2 lb ai/A per season of total EBDC (mancozeb, maneb or metiram). It is recommended that this product be used with an Integrated Pest Management Program.
Dithane F-45, 37%	Spray or fungigation	0.8-1.6 qt/A	X	X	
Dithane M-45, 80%	Spray or fungigation	1-2 lb/A	X	X	
Manex II, 37%	Spray or fungigation	0.8-1.6 qt/A	X	X	
Manzate ProStick, 75%	Spray or fungigation	1-2 lb/A	X	X	
Penncozeb, 80%	Spray or fungigation	1-2 lb/A	X	X	
Penncozeb DF, 75%	Spray or fungigation	1-2 lb/A	X	X	
Mancozeb (M3) + Copper (M) Cuprofix MZ Disperss, 30.4% + 22.1%	Spray or fungigation	1.5-4.75 lbs/A	X	X	Do not exceed 36.8 lbs product/acre/season. Do not apply within 14 days of harvest.
Mankocide, 15.0%:46.1%	Spray or fungigation	1.5-5.0 lbs/A	X	X	Do not use within 3 days of harvest.
Mancozeb (M3) + Zoxamide (22) Gavel, 66.7%:8.3%	Spray or fungigation	1.5-2 lb/A	X	X	Do not apply within 14 days of harvest. Do not make more than 6 applications or apply more than 12 lbs (8 lbs active mancozeb + 1 lb active zoxamide) per acre per season. Provides some tuber protection against late blight when used at the end of the season.
Mandipropamid (40) + Difenoconazole (3) Revus Top, 21.9%:21.9%	Spray or fungigation	5.5-7.0 fl oz/A	X	X	Begin applications before disease development and continue on 7- to 10-day intervals. Also controls black dot, brown spot, powdery mildew and septoria leaf spot. Do not make more than 2 applications before switching to a different mode of action. Do not apply within 14 days of harvest or apply more than 28 fl oz/season.
Maneb (M3) Maneb 80, 80%	Spray or fungigation	1.5-2 lb/A	X	X	Do not apply more than 11.2 lb ai/A per season of total EBDC (mancozeb, maneb or metiram). Do not apply within 14 days of harvest.
Maneb 75DF, 75%	Spray or fungigation	1.5-2 lb/A	X	X	
Manex, 37%	Spray or fungigation	0.8-1.6 qt/A	X	X	

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Check the NDSU blight hotline, (888) 482-7286, for information on infection potential of early blight and late blight. Whenever late blight is severe, vine killing is extremely important and should be done at least 2 weeks before harvest to prevent tuber infections. Hilling of soil around the vines should be done just before killing them.
[5]See fungicide resistance management statement on Page 9.

Potato (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks[4]
			Late Blight	Early Blight	
Mefenoxam (4) + Chlorothalonil (M5) Ridomil Gold/Bravo WP,4.5%:72% Ridomil Gold/Bravo Liquid	Spray or fungigation Spray or fungigation	2 lb/A 1 container/ 10 Acres	X[5]	X	Resistance statement 4[6]. Do not apply Ridomil Gold/Bravo, Ridomil Gold/Bravo Liquid or Ridomil Gold/Copper within 14 days of harvest. For late blight control, begin applications when conditions are favorable for late blight, but before infection, and continue at 14-day intervals until threat of disease is over. To minimize the potential for resistance, do not make more than 3 applications. The full rate of a protectant fungicide should be applied between Ridomil applications, regardless of the Ridomil formulation used. See label for rotation restrictions: waiting period to plant after application of Ridomil (all formulations) is 0 days for dry beans, soybeans, potatoes and sugar beets; 40 days for wheat, barley and oats; 9 months for corn; and 12 months for all other crops. A minimum of two applications at 2 lb/A (flowering and 14 days later) for all Ridomil formulations will control A1 late blight tuber rot, Pythium leak and *Phytophthora erythroseptica* pink rot. For aerial applications, a minimum of 5 gal/a spray volume is recommended.
Mefenoxam (4) + Copper Hydroxide (M1) Ridomil Gold/Copper WP, 5%:60%	Spray or fungigation	2.0 lb/A + 0.8 lb ai/A of maneb, mancozeb, metiram or chlorothalonil	X[5]	X	
Mefenoxam (4) + Mancozeb (M3) Ridomil Gold MZ, 4%:64%	Spray or fungigation	2.5 lb/A	X[5]	X	Resistance statement 4[6]. Do not apply Ridomil Gold MZ within 14 days of harvest. For late blight control, begin applications when conditions are favorable for late blight, but before infection, and continue at 14-day intervals until threat of disease is over. To minimize the potential for resistance, do not make more than 3 applications. The full rate of a protectant fungicide should be applied between Ridomil applications, regardless of the Ridomil formulation used. See label for rotation restrictions: waiting period to plant after Ridomil application (all formulations) is 0 days for dry beans, soybeans, potatoes and sugar beets; 40 days for wheat, barley and oats; 9 months for corn and sweet corn; and 12 months for all other crops. Two applications (flowering and 14 days later) at 2.5 lb rate will control A1 late blight tuber rot, Pythium leak and *Phytophthora erythroseptica* pink rot. For aerial applications, minimum of 5 gal/A spray is recommended.
Metiram (M3) Polyram 80 DF, 80%	Spray or fungigation	1.5-2 lb/A	X	X	Do not apply within 14 days of harvest. Vine kill should occur 14 days before harvest. Do not exceed 14 lbs/A per season. It is recommended that this product be used with an Integrated Pest Management Program. See label for further restrictions.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Check the NDSU blight hotline, (888) 482-7286, for information on infection potential of early blight and late blight. Whenever late blight is severe, vine killing is extremely important and should be done at least 2 weeks before harvest to prevent tuber infections. Hilling of soil around the vines should be done just before killing them.
[5]Mefenoxam provides average control of new mating types of the late blight fungus; it provides excellent control for mefenoxam-sensitive strains of the A1 mating type. Most late blight strains present since 1998 are resistant to mefenoxam.
[6]See fungicide resistance management statement on Page 10.

Potato (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks[4]
			Late Blight	Early Blight	
Propamocarb (28) Previcur, 66.5%	Spray or fungigation	0.7 pt/A low disease risk 0.9 pt/A medium disease risk 1.2 pt/A high disease risk	X		Do not apply more than 6 pints of Previcur/acre/season. Do not apply within 14 days of harvest. Use in a tank mix with 0.9 lb ai/acre of chlorothalonil (1.2 pt/acre of Bravo Weatherstik or equivalent) or 1 lb ai mancozeb (1.25 lb/acre of Dithane M-45 or equivalent).
Pyrimethanil (9) Scala, 54.6%	Spray or fungigation	7 fl oz/A		X	Also effective against Botrytis. Use only in tank mix with protectant such as mancozeb and chlorothalonil. Do not apply more than 35 fl oz/A per season. Do not make more than 2 consecutive applications of Scala. PHI= 7 days.
Sodium (mono - and dibasic -), Potassium, and Ammonium Phosphites (33) Several products	Spray or fungigation	check label	suppression		Also provides suppression of storage rot diseases such as pink rot.
Thiophanate methyl (1) Topsin M WSB, or T-Methyl E-AG 70 WSB, 70%	Spray or fungigation	1-1.5 lbs/A			Resistance statement 1[5]. Topsin M, Topsin 4.5 Fl acre and Thiophanate methyl WDG are labeled for white mold control in potatoes.
Topsin 4.5 FL, 45% or T-Methyl E-AG 4.5F	Spray or fungigation	20-30fl oz/A			
Thiophanate Methyl 85 WDG, 85%	Spray or fungigation	0.8-1.2 lb/A			

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Check the NDSU blight hotline, (888) 482-7286, for information on infection potential of early blight and late blight. Whenever late blight is severe, vine killing is extremely important and should be done at least 2 weeks before harvest to prevent tuber infections. Hilling of soil around the vines should be done just before killing them.
[5]See fungicide resistance management statement on Page 8.

Potato (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks[4]
			Late Blight	Early Blight	
QoIs					Resistance statement 5[5].
Azoxystrobin (11) Quadris, 22.9%	Spray or fungigation	6.2-15.4 fl oz/A	X	X	Early blight: 6.2 fl oz/A on a 7-day interval or 12.4 fl oz/A on a 14-day interval. Late blight: 6.2 fl oz/A on a 7-day interval as a preventive, 12.4-15.4 fl oz/A on a 5-day interval when late blight is present. Do not make more than 6 applications per acre per year. Do not apply within 14 days of harvest.
Azoxystrobin (11) + Chlorothalonil (M) Quadris Opti, 4.6% : 46%	Spray	1.6 pt/A	X	X	Also labeled for black dot control. See label for application instructions.
Famoxadone (11) + Cymoxanil (27) Tanos, 25% : 25%	Spray or fungigation	6-8 oz/A	X	X	Use 6 oz/A for early blight and 8 oz/A for late blight. Do not make more than 1 application of Tanos before alternating with a fungicide that has a different mode of action. Maximum of 72 oz/A/season.
Fenamidone (11) Reason, 44.4%	Spray	5.5-8.2 fl oz/A	X	X	A 2 (ee) allows application of Reason at 4 fl oz/A tank mixed with mancozeb, chlorothalonil for control of early and late blight. Tank mix with a different mode of action for resistance management. Applications should be on a 5- to 10-day interval and alternated with a fungicide with a different mode of action. Do not apply more than 24.6 oz/A of Reason per season. PHI= 14 days.
Fluoxastrobin (11) Evito, 40.3%	Spray or fungigation	3.8 fl oz/a	X	X	Do not apply within 7 days of harvest. Do not make more than 6 applications per season.
Pyraclostrobin (11) Headline, 23.6%	Spray	6-9 fl oz/A early Blight 6-12 fl oz/A late Blight	X	X	Use 6-9 fl oz/A for early blight and 6-12 fl oz/A for late blight. *****Do not apply within 3 days of harvest. Do not make more than 6 applications per season. See supplemental label for black dot control. Apply prior to disease onset.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Check the NDSU blight hotline, (888) 482-7286, for information on infection potential of early blight and late blight. Whenever late blight is severe, vine killing is extremely important and should be done at least 2 weeks before harvest to prevent tuber infections. Hilling of soil around the vines should be done just before killing them.
[5]See fungicide resistance management statements on Page 10.

Potato (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Late Blight Control[3]	Early Blight Control[3]	Remarks[4]
Trifloxystrobin (11) Gem 500 SC 42.6%	Spray	2.9-3.8oz/A early blight 3.8 oz/A late blight	X	X	For early blight, begin application preventively and continue as needed on a 7- to 10-day interval. For late blight, begin applications preventively. Alternate Gem with a protectant fungicide registered for late blight, on a 7- to 10-day schedule. Do not apply more than 23 oz. GEM 500SC per season. Do not apply within 7 days of harvest. Do not make more than 6 total applications per acre per season.
Cyazofamid (21) Ranman, 34.5%	Spray or fungigation	1.4-2.75 fl oz/A	X		Do not apply more than 10 sprays per season. Alternate sprays of Ranman with a fungicide from a different chemistry class.
Triphenyltin Hydroxide (TPTH)* RUP (30) Super Tin 80WP AgPak, 80% **or** Agri Tin, 80%	Spray or fungigation	2.5-3.75 oz/A	X	X	**RESTRICTED-USE PESTICIDE**. Do not apply within 7 days of harvest. Do not exceed 11.25 oz/A TPTH per season. May use 1.87 oz/A TPTH when used in combination with another fungicide. Ground application must be with closed cab. Do not enter treated area within 48 hours of treatment without proper PPE specified on label.
or					
Super Tin* 4L, or Agri Tin* 4L, 40%	Spray or fungigation	4-6 fl oz/A	X	X	Super Tin 4L label says “do not exceed 18 fl oz/a/season.”

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Check the NDSU blight hotline, (888) 482-7286, for information on infection potential of early blight and late blight. Whenever late blight is severe, vine killing is extremely important and should be done at least 2 weeks before harvest to prevent tuber infections. Hilling of soil around the vines should be done just before killing them.
[5]See fungicide resistance management statements on Page 10.
***Designates restricted-use pesticide.**

Safflower
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seed-borne Rust	Remarks
Carboxin Vitavax 34, 34%	Slurry	2 fl oz/cwt	X	
Carboxin + Thiram Vitavax 200, 17%:17%	Liquid or slurry	4 fl oz/cwt	X	State label granted 5/24/90.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt		
Mancozeb Dithane DF Rainshield NT, 75%	Slurry	2.1 oz/cwt	X	
Dithane F-45, 37%	Drill box or slurry	3.2 fl oz/cwt	X	
Dithane WSP, 80%	Drill box or slurry	2 oz/cwt	X	
Manzate ProStick, 75%	Slurry	2 oz/cwt	X	
Penncozeb 80 WP, 80%	Drill box or slurry	2 oz/cwt	X	
Penncozeb 75 DF, 75%	Drill box or slurry	2.1 oz/cwt	X	
Thiram 42-S Thiram, 42%	Liquid or slurry	2 fl oz/bu	X	
Thiram 50WP Dyed, 50%	Drill box or slurry	4 oz/cwt	X	

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.

Safflower
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Alternaria Leaf Spot Control	Remarks
Azoxystrobin (11) Quadris, 22.9%	Spray or fungigation	6.0-15.5 fl oz/A	X	Resistance statement 5[4].
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-12 fl oz/A	X	Also controls Septoria spp. Apply prior to disease development for optimum control

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.

Soybean
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Azoxystrobin Dynasty, 9.6%	Slurry	0.153-0.459 fl oz/cwt	X	For seed-borne and soil-borne fungi causing decay, damping off and seedling blight.
Captan Captan 4000, 38.4% Hi-Moly/Captan-D, 48.9% Hi-Moly Captan, 18.44%	See individual labels for rates of application, formulations and registered use	See individual labels for rates of application, formulations and registered use	X	Hi-Moly contains molybdenum.
Carboxin Vitavax-34, 34%	Slurry	3-4 fl oz/cwt	X	Vitavax 34 may be used on seed previously treated with captan or thiram.
Germate Plus, 14%	Drill box	1.5 oz/42 lb (2 oz/bu)	X	Germate Plus contains 15% diazinon and 25% lindane insecticide. Kernel Guard Supreme contains 10.42% permethrin.
Kernel Guard Supreme, 14%	Drill box	1.5 oz/50lb	X	
Carboxin + Captan Enhance, 20%:19%	Drill box	3 oz/bu	X	
Carboxin + Thiram RTU-Vitavax-Thiram, 10%:10%	Liquid or slurry or drill box	3.4 fl oz/bu (6.8 fl oz/cwt)	X	
Chloroneb Chloroneb 65W, 65%	Slurry	4 oz/cwt	X	May be used as a supplemental seed treatment for improved suppression of Rhizoctonia and Pythium.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X	For seed-borne and soil-borne fungi. Registered for control of Rhizoctonia and Fusarium.
Mefenoxam Apron XL LS, 32.3%	Slurry or mist	0.32-0.64 fl oz/cwt	X	For Pythium and early season Phytophthora control only. For both commercial and on-farm use.
Mefonoxam + Fludioxonil + Thiamethoxam Cruiser Maxx, 1.7%:1.12%:22.61%	Slurry or mist	3 fl oz/cwt	X	For seed-borne and soil-borne fungi and insects.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Soybean (continued)
SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Mefenoxam + Fludioxonil Apron Maxx RTA, 1.1%:0.73%	Slurry or mist (on-farm application) Slurry	5 fl oz/cwt	X	See labels for inoculant remarks.
Apron Maxx RFC, 3.46% : 2.31%	Slurry or mist	1.5 fl oz/cwt	X	
Maxim XL, 8.4% : 21%	Slurry or mist	0.167-0.334 fl oz/cwt	X	
Warden RTA 2.2%:0.72%		5 fl oz/cwt	X	
Metalaxyl Acquire, 28.35%	Mist or slurry	0.75 fl oz/cwt	see remarks	Metalaxyl is for Pythium damping off and early season Phytophthora control only. For use only with commercial seed treatment equipment.
Allegiance FL, 28.35%	Mist or slurry	0.75 fl oz/cwt		
Dyna-Shield, 28.35%	Slurry	0.75 fl oz/cwt		
Trifloxystrobin Trilex, 22%	Slurry	0.32 fl oz/cwt	X	For seed-borne and soil-borne fungi.
Trifloxystrobin + Metalaxyl Trilex 2000, 7.12%:5.96%	RTU or slurry or mist	1.0 fl oz/cwt	X	For seed-borne and soil-borne fungi.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Soybean
BIOLOGICAL SEED TREATMENT

Chemical	Application	Dosage[1]	Control[2] of Seedling Blights[3]	Remarks
Organism *Bacillus pumilus* GB 34 Yield Shield, 0.28, 2.75%	Slurry	0.1 oz/cwt	X	

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]Seedling blights due to various fungal infections of seed.
Note: Some seed treatments may affect Rhizobia inoculants; read inoculant label for specific information.

Soybean
SOIL APPLICATION

Chemical (Fungicide Group)	Application	Dosage[1]	Control[2] of Pythium, Phytophthora	Remarks
Mefenoxam (4)				
Ridomil Gold EC, 48%	In-furrow spray	0.08-0.28 fl oz/1,000 ft. of row	X	Resistance statement 4[3].
Ridomil Gold GR, 2.5%	In-furrow, 7" band or T-band	1.5-6 oz/1,000 ft. of row	X	Do not apply directly to seed but to soil that will be mixed in covering the seed. Use lower rates for early to midseason control; full rates for full-season control. See label for planting restrictions within 12 months of application.
Pyraclostrobin (11)				
Headline, 23.6%	In-furrow spray	0.4-0.8 fl oz/1,000 ft row		For suppression of Rhizoctonia. For 22" rows, use maximum of 0.5 fl oz/1,000 ft of row. For 30" rows, use maximum of 0.7 fl oz/1,000 ft of row.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]See fungicide resistance management statements on Pages 9-10.

Soybean
FOLIAR SPRAYS

Chemical (Fungicide Group)	**Application**[1]	**Dosage**[2]	**White Mold Control**[3]	**Remarks**
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	Spray or fungigation	2-6 qt/A	X	For suppression
***Bacillus subtilis* strain QST 2808** BalladPLUS	Spray or fungigation	0.5-4 qt/A	X	Use 0.5 to 4 qt/A in tank mix with labeled rates of strobilurins fungicides when conditions are conducive to disease development. Use 1 to 4 qt/A stand-alone.
QoIs **Azoxystrobin (11)** Quadris, 22.9%	Spray	6.2-15.4 fl oz/A		Resistance statement 5[4] Both products control pod and stem blight, soybean rust and brown spot**.**
Pyraclostrobin Headline, 23.6%	Spray or fungigation	6-12 fl oz/A		Apply prior to onset of disease. PHI= 21 days.
QoIs + Triazoles **Azoxystrobin (11) + Propiconazole (3)** Quilt, 7%:11.6%	Spray or fungigation	14-20.5 fl oz/A		Resistance statement 5[4] and 3[4]. Quilt controls several diseases in soybeans including soybean rust. Do not apply more than 42 fl oz/A. PHI: 21 days for seed; 0 for forage or hay.
Azoxystrobin (11) + Cyroconazole (2) Quadris Xtra, 18.2%:7.3%		5.0-6.8 fl oz/A		Quadris Xtra controls several diseases in soybeans, including soybean rust. Quadris Xtra is extremely phytotoxic to certain apple varieties, so don't spray when drift may reach apples. Do not apply more than 13.6 fl oz/A. Do not apply within 30 days of harvest.
Trifloxystrobin (11) + Propiconazole (3) Stratego 11.4%:11.4%	Spray or fungigation	10 fl oz/A		Stratego controls several diseases in soybeans, including soybean rust. Do not make more than 3 applications per season. Do not apply within 21 days of harvest.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Pages 9-10.

Soybean (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	**Application**[1]	**Dosage**[2]	**White Mold Control**[3]	**Remarks**
Chlorothalonil (M5) Bravo Ultrex, Equus DF, 82.5% Bravo WeatherStik, Echo 720 Equus 720, or Chlorothalonil 720, 54% Echo 90 DF, 90% Echo Zn, 38.5%	Spray or fungigation Spray or fungigation Spray or fungigation Spray or fungigation	See label See label See label See label		Chlorothalonil products control pod and stem blight and stem canker, and suppress soybean rust. Do not feed soybean hay or threshings from chlorothalonil-treated fields to livestock**.**
Cyproconazole Alto 100 SL, 8.9%	Spray	4.0-5.5 fl oz/A		For control of soybean rust and other leaf diseases. See label for specific rate recommendations. Do not apply more than 11 floz/season. Do not apply with 30 days of harvest.
Propiconazole (3) Tilt 3.6 EC, or Propiconazole E-AG, 41.80% Bumper 418 EC	Spray Spray	4-6 fl oz/A 4-6 fl oz/A		Resistance statement 3[4]. Propiconazole controls several diseases of soybeans, including soybean rust. Do not apply more than 12 fl oz/A. Apply up to R6.
Prothioconazole (3) Proline 480 SC, 41%	Spray	2.5-3 fl oz/A		For control of soybean rust and powdery mildew. Do not apply more than 9 fl oz/year. 21 days PHI.
Tebuconazole 38.7% (3) Folicur 3.6F Orius 3.6F Tebuzol 3.6F Monsoon	Spray	3-4 fl oz/A		For control of soybean rust and powdery mildew. Do not apply more than 12 fl oz/A per season. These products have a 21-day PHI.
Tetraconazole (3) Domark 230, 20.5%	Spray	4-5 fl oz/A		Resistance statement 3[4]. For several diseases of soybeans, including soybean rust. Do not apply after growth stage R5 (beginning seed). Do not apply more than twice a year or 10 fl oz/A per year.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Pages 9-10.

Soybean (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	**Application**[1]	**Dosage**[2]	**White Mold Control**[3]	**Remarks**
Thiophanate Methyl (1) Topsin M WSB 70WE, T-methyl WSB 70W, 70%	Spray or fungigation	0.751 lb/A	X	Thiophanate-methyl also controls pod and stem blight but is not labeled for control of soybean rust.
Topsin M 70WP, or T-Methyl E-AG 70 WSP, 70%	Spray or fungigation	0.75-1 lb/A	X	One application at early bloom (R1-R2) followed by a 2nd application 7-14 days later, if conditions favorable for continued disease pressure. 21-day PHI. 5 gal/A minimum by air.
Topsin 4.5 FL, 45% or T-Methyl E-AG 4.5 FL	Spray or fungigation	10-20 fl oz/A	X	
Thiophanate Methyl 85 WDG, 85%	Spray or fungigation	0.4-0.8 lb/A pod & stem blight 0.6-0.8 lb/A white mold	X	

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Pages 9-10.

Sugar Beet
SEED TREATMENT

Chemical	Application	Dosage[1]	Disease Control[2]				Remarks
			Aphanomyces	Pythium	Phoma	Rhizoctonia	
Chloroneb Chloroneb 65W, 65%	Liquid or slurry	6 fl oz/cwt		X		X	For control of Pythium and Rhizoctonia. For use as a supplement to another fungicide.
Fludioxonil Maxim 4 FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt			X	X	For control of seed-borne and soil-borne fungi.
Hymexazol Tachigaren, 70%	Pelleted seed	45-90 g/unit of 100,000 seed (approx. 1 kg)	X	X			For control of Pythium and Aphanomyces. Use of rates greater than 45 g may result in phytotoxicity. In fields with known heavy disease pressure, use of Tachigaren and a tolerant variety is suggested.
Mefenoxam Apron XL LS, 32.3% Sebring 318 FS, 32.3%	Slurry or mist	0.32-0.64 fl oz/cwt		X			For control of Pythium. May be combined with other fungicides if products are known to be compatible. For use only with commercial seed treatment equipment.
Metalaxyl Allegiance FL, 28.35% Dyna-Shield 28.35%	Mist or slurry Slurry	0.75 fl oz/cwt 0.75 fl oz/cwt		X X			For control of Pythium. May be combined with other fungicides if products are known to be compatible
Thiram Thiram 50 WP Dyed, 50% 42-S Thiram, 42% Signet 480 FS, 42%	Slurry or drill box Liquid or slurry	8 oz/cwt 8 fl oz/cwt		X X		X X	

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.

Sugar Beet
SOIL APPLICATION

Chemical (Fungicide Group)	Application	Dosage[1]	Control[2] of Pythium	Remarks
***Bacillus subtilis* strain QST 713 (44)** Serenade ASO	In-furrow at planting	2.2-13.2 fl/oz/1,000 row ft	X	
QoIs **Azoxystrobin (11)** Quadris, 22.9%	In-furrow spray	0.4-0.6 fl oz/1,000 ft of row (5.8-8.7 fl oz/A with 36" rows)	X	Resistance statement 5[3]. .
Pyraclostrobin (11) Headline, 23.6%	In-furrow spray	0.4 -0.8 fl oz/1,000 ft of row		For suppression of Rhizoctonia. For 22" row, use maximum of 0.5 fl oz/1,000 ft of row . For 30" row, use maximum of 0.7[2] fl[2] oz/1,000 ft of row.
Trifloxystrobin (11) Gem 500 SC, 42.6%	In-furrow spray	2.9-3.6 oz/A in band	X	Resistance statement 5[3]. For suppression of Rhizoctonia.
Mefenoxam (4) Ridomil Gold EC, 48%	7-inch band preplant incorporated	0.21-0.43 fl oz/1,000 ft. of row	X	Resistance statement 4[3]. See label for planting restrictions within 12 months of application.
Ridomil Gold GR, 2.5%	7-inch band preplant incorporated	4.3-8.6 oz/1,000 ft. of row	X	
Ultra Flourish, 25.1%	7-inch band preplant incorporated	0.43-0.86 fl oz/1,000 ft. of row	X	

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]See fungicide resistance management statements on Pages 9-10.

Sugar Beet
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks
			Cercospora Leaf Spot[4]	Powdery Mildew	
***Bacillus subtilis* strain QST 2808 (44)** BalladPLUS	Spray or fungigation	2-4 qt/A		X	Begin applications when environmental conditions and plant stage are conducive to disease development.
Copper (M) Basicop WP, 53%	Spray	4 lb/A	X		Do not provide adequate control of cercospora leafspot.
Champ DP, 57.6%	Spray or fungigation	1.33-3.33 lb/A	X		
Champ WG, 77%	Spray or fungigation	2-5 lb/A	X		
Champ Formula 2 Flowable, 35.5%	Spray or fungigation	1.33-3.33 pt/A	X		
Cuprofix Ultra 40 Disperss, 71.1%	Spray or fungigation	1.25-3.0 lb/A	X		
Kocide 2000, 53.8%	Spray or fungigation	1.5-3.75 lb/A	X		
Kocide 3000, 46.1%	Spray or fungigation	0.75-2.0 lb	X		
Kocide 4.5 LF, 37.5%	Spray or fungigation	1.33-2.66 pt/A	X		
Difenoconazole (3) + Propiconazole (3) 22.8%:22.8% Inspire XT, 23.2%	Spray or fungigation	7 fl oz/A	X	X	Resistance statement 3. Do not apply within 21 days of harvest. Do not apply more than 21 fl oz/A/season.
Fenbuconazole (3) Enable 2F, 23.5%	Spray	8 fl oz/A	X	X	Preharvest interval of 14 days. Resistance statement 3[7].
Mancozeb (M3) Dithane DF Rainshield NT, 75%	Spray or fungigation	1.5-2 lb/A	X		Do not apply mancozeb within 14 days of harvest. Do not exceed 11.2 lb ai/A per season of total EBDC (mancozeb and/or maneb), i.e,, do not exceed 14 lb/A of formulated WP or DF or 11.2 qt/A of formulated flowable product per season.
Dithane F-45, 37%	Spray or fungigation	1.2-1.6 qt/A	X		
Dithane M-45, 80%	Spray or fungigation	1.5-2 lb/A	X		
Manex II, 37%	Spray or fungigation	1.2-1.6 qt/A	X		
Manzate ProStick, 75%	Spray or fungigation	1.5-2 lb/A	X		
Penncozeb, 80%	Spray or fungigation	1.5-2 lb/A	X		
Penncozeb DF, 75%	Spray or fungigation	1.5-2 lb/A	X		

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Begin when disease is first observed in field. Higher rates are used when disease is severe on susceptible varieties. Use 5-10 gal. water with airplane or 20-40 gal. water and at least 100 psi with ground equipment. Repeat tin or copper at 10-14 days. Repeat maneb or mancozeb at 7-10 days.

Sugar Beet (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks[5]
			Cercospora Leaf Spot[4]	Powdery Mildew	
Mancozeb (M3) + Copper (M) ManKocide 15%: 46.1% Cuprofix MZ Disperss, 30.4% + 22.1%	Spray or fungigation Spray or fungigation	2.5-6.5 lbs/A 3.75-4.75 lbs/A	X X		Do not exceed 36.8 lbs product/acre/season Do not apply within 14 days of harvest.
Maneb (M3) Maneb 80, 80% or Maneb 75 DF, 75% Manex, 37%	Spray or fungigation Spray or fungigation	1.5-2 lb/A 1.2-1.6 qt/A	X X		Do not apply within 14 days of harvest. Do not exceed 11.2 lb ai/A/season of total EBDC (mancozeb and/or maneb).
Metconazole (3) Caramba, 8.6%	Spray or fungigation	9-14 fl oz/A		X	For optimal powdery mildew control, begin application prior to disease development.14-day PHI. Maximum of 34 fl oz/season.
Propiconazole (3) Tilt 3.6 E.C. 41.8% or Propiconazole E-AG 41.8% Bumper 41.8 EC, 41.8%	Spray	4-6 fl oz/A	X	X	Resistance statement 3.
Prothioconazole (3) Proline 480 SC, 41.0%	Spray	5.0-5.7 fl oz/A	X	X	Resistance statement 3. Proline at 5.7 fl oz/A in a 7" or less band at the 4-leaf stage also manages Rhizoctonia stem and crown canker. Do not apply more than 17.1 fl oz of Proline per year. Do not apply within 7 days of harvest.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Begin when disease is first observed in field. Higher rates are used when disease is severe on susceptible varieties. Use 5-10 gal. water with airplane or 20-40 gal. water and at least 100 psi with ground equipment. Repeat tin or copper at 10-14 days. Repeat maneb or mancozeb at 7-10 days.
[5]See **current** "**Sugar Beet Production Guide"** for management strategies.
[6]See fungicide resistance management statements on Pages 9-10.

Sugar Beet (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks
			Leaf Spot[4]	Powdery Mildew	
QoIs					Resistance statement 5[6].
Azoxystrobin (11) Quadris, 22.9%	Spray or fungigation	6.2-15.4 fl oz/A	X	X	2.88 qt Quadris/Acre/season maximum. May be applied the day of harvest. Band application at 4-leaf stage for management of Rhizoctonia stem and crown canker.
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	9-12 fl oz/A	X	X	48 fl oz Headline/Acre/season maximum. Has a 7-day PHI.
Trifloxystrobin (11) Gem 500 SC, 42.6%	Spray only	2.9-3.6oz/A	X	X	15.2 oz Gem/Acre/season maximum. Has a 21-day PHI.
Sulfur (M) Super Six, 52%	Spray or fungigation	8 pt/A		X	Apply sulfur fungicide if mildew appears prior to mid-September. One application gives protection for 4 weeks. Degree of control depends on amount of sulfur used (if less than 5 lb ai is used, only partial control may result).
Microthiol Disperss 80%	Spray or fungigation	5-10 lb/A		X	
Micro Sulf, 80%	Spray or fungigation	5-10 lb/A		X	
Tetraconazole (3) Eminent, 11.6%	Spray or fungigation	13 fl oz/A	X	X	Preharvest interval of 14 days. Resistance statement 3[7].

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Begin when disease is first observed in field. Higher rates are used when disease is severe on susceptible varieties. Use 5-10 gal. water with airplane or 20-40 gal. water and at least 100 psi with ground equipment. Repeat tin or copper at 10-14 days. Repeat maneb or mancozeb at 7-10 days.
[5]Because benzimidazole (Topsin M)-resistant strains of *Cercospora beticola* have developed in many sugar beet-growing areas, Topsin M should be used only once per season and only in combination with a nonbenzimidazole fingicide.
[6]See **current** "**Sugar Beet Production Guide"** for management strategies.
[7]See fungicide resistance management statements on Pages 9-10.
***Designates restricted-use pesticide.**

Sugar Beet (continued)
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Disease Control[3]		Remarks
			Leaf Spot[4]	Powdery Mildew	
Thiophanate methyl (1)					Resistance statement 1[7].
Thiophanate methyl 85 WDG, 85%	Spray	0.4 lbs/A	X[5]	X	Tank mix with tin for resistance management.
Topsin 4.5 FL, 45% or T-Methyl E-AG 4.5F	Spray or fungigation	10-20fl oz/A	X[5]	X	
Topsin M WSB, Topsin 70W, or T-methyl 70W WSB, 70% or T-Methyl E-AG 70WSB	Spray or fungigation	0.5-1.0 lb/A	X[5]	X	
Triphenyltin Hydroxide (TPTH) RUP* (30)					**RESTRICTED-USE PESTICIDE.** Do not exceed 15 oz/A of Super Tin 80WP per season. Do not feed treated tops to livestock. Do not enter treated areas within 48 hours of treatment without protective clothing specified on label. Ground application must be with closed cabs. A Sec 24 (c) state label allows treatment up to 7 days before harvest.
Super Tin 80WP AgPak, 80% or Agri Tin, 80%	Spray	2.5-5.0 oz/A	X[6]		
Super Tin 4L or Agri Tin 4L, 40%	Spray	4.0-8.0 fl oz/A	X[6]		Do not exceed 24 fl oz/A/season for Super Tin 4L.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]Begin when disease is first observed in field. Higher rates are used when disease is severe on susceptible varieties. Use 5-10 gal. water with airplane or 20-40 gal. water and at least 100 psi with ground equipment. Repeat tin or copper at 10-14 days. Repeat maneb or mancozeb at 7-10 days.
[5]See **current** "**Sugar Beet Production Guide"** for management strategies.
[6]See fungicide resistance management statements on Pages 9-10.

Sunflower
SEED TREATMENT

Chemical	Application	Dosage[1]	Disease Control[2]		Remarks
			Seedling Blights[3]	Downy Mildew	
Azoxystrobin Dynasty, 9.6%	Slurry	3.75-37.5 fl oz/cwt 0.025-0.25 mg/seed		X	Provides suppression against downy mildew.
Captan Captan 400, 37.4%	Slurry	2-4 fl oz/cwt	X		
Fenamidone Idol 500 SC, 44.4%	Slurry	5.8 fl oz/cwt		X	For downy mildew only.
Fludioxonil Maxim 4FS, 40.3%	Slurry	0.08-0.16 fl oz/cwt	X		For seed-borne and soil-borne fungi.
Fludioxonil + Mefenoxam Maxim XL, 21% : 8.4%	Slurry	0.167-0.334 fl oz/cwt	X		
Mefenoxam Apron XL LS, 32.34%	Slurry	1.28 fl oz/cwt			
Metalaxyl Allegiance FL, 28.35% Sebring 318 FS, 28.35%	Mist or slurry	1.5-3.0 fl oz/cwt			
Dyna-Shield, 28.35%	Slurry	1.5-3 fl oz/cwt			
Acquire, 28.35%	Mist or slurry	1.5-3.0 fl oz cwt			
Thiram 42-S Thiram, 42% Signet 480 FS, 42%	Liquid or slurry	2 fl oz/bu	X		

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[3]An increase in stand has been noted only once in moderately severe tests to date; under very severe conditions, some increase in stand might be expected.

Sunflower
FOLIAR SPRAYS

Chemical (Fungicide Group)	Application[1]	Dosage[2]	Rust Control[3]	Remarks
***Bacillus subtilis* strain QST 2808 (44)** BalladPLUS	Spray or fungigation	2-4 qt/A	X	Use as part of a program with other fungicides labeled for sunflower rust.
Azoxystrobin (11) Quadris, 22.9%	Spray or fungigation	6-15.5 fl oz/A	X	Resistance statement 5[4]. Apply prior to disease development. Also labeled for control of Alternaria leaf spot.
Pyraclostrobin (11) Headline, 23.6%	Spray or fungigation	6-12 fl oz/A	X	Resistance statement 5[4]. Apply prior to disease development. Also labeled for control of Alternaria leaf spot, powdery mildew, septoria leaf spot and white rust. Maximum of 2 applications per season. PHI = 21 days.
Tebuconazole (3) 38.7% Folicur 3.6F Orius 3.6F Tebuzol 3.6F Monsoon	Spray	4-6 fl oz/A	X	For maximum disease control, labels recommend using lowest rate of nonionic surfactant. Apply at earliest sign of infection. Do not apply more than 16 fl oz per season or within 50 days of harvest. See labels for further information or spray scheduling.

[1]Spray = ground or aerial; Fungigation = application through sprinkler irrigation system.
[2]Dosage = Amount of formulated product to apply.
[3]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.
[4]See fungicide resistance management statements on Pages 9-10.

SOIL-APPLIED BIOLOGICAL FUNGICIDES

Organism	Application	Dosage[1]	Sclerotinia Sclerotiorum (white mold) Control[2]	Remarks
Coniothyrium minitans Contans WG, 5.3%	Soil Incorporation	1-2 lb/A depending on crop	X	Fungus attacks sclerotia of the fungus.

[1]Dosage = Amount of formulated product to apply.
[2]X = Product labeled for crop and disease; Blank = product not labeled for specific disease.

Product	Company
Abound	Syngenta
Aquire	BASF
Agri Tin	NuFarm
Agri-Mycin 17	Merck
Agri-strep	Bayer CropScience
Agrox products	Wilbur Ellis
Allegiance	Bayer CropScience
Alto	Syngenta
Apron seed treatment products	Syngenta
Ballad	AgraQuest
Basicop	Nufarm
Big 6 Grain Protector	Seed Mate/Loveland
Blocker	AMVAC Chemical Co.
Blue Viking Star Glow	Nufarm
Bravo products	Syngenta
Bumper	Mana, Inc
Captan seed treatment products	Wilbur Ellis
	Bayer CropScience
	Helena
Caramba	BASF
Champ products	NuFarm
Charter, Charter PB	BASF
Chloroneb 65W	Wilbur Ellis
Chlorothalonil 720	Arysta
Contans	Prophyta (Advan)
Cruiser Maxx	Syngenta
Cuprofix Ultra 40 Disperss	United Phosphorus Inc
Curzate 60 DF	DuPont
Dithane products	DOW
Dividend seed treatment products	Syngenta
Domark	Valent
Dyna-Shield	Loveland
Dynasty	Syngenta
Echo 720	Sipcam Agro USA
Echo Zn	Sipcam Agro USA
Embrace	Winfield Solutions LLC
Eminent	Sipcam Agro USA
Enable	DOW
Endura	BASF
Equus	Nufarm
Evito	Arysta LifeScience
Folicur 3.6F	Bayer CropScience
Forum	BASF
Gavel	DOW
Gem 5C	Bayer CropScience
Grain Guard	Trace
Grain Guard plus	Trace
Granol N-M	Wilbur Ellis
Granol plus	Wilbur Ellis
Headline, Headline AMP	BASF
Helix lite	Syngenta
Helix xtra	Syngenta
HiMoly-Captan D	Trace
Idol	BayerCropScience
Inspire XT	Syngenta
Incentive	Winfield Solutions LLC
Kernal Guard	Trace
Kocide Products	Nufarm/DuPont
Kodiak	BayerCropScience
Kumulus Sulfur	Micro flo Co.
Liquid sulfur six	Helena Chemical Co.
LSP seed treatment	Bayer CropScience
Maneb	DuPont
Maneb 75 DF	United Phosphorous Inc.
Maneb 80 WP	United Phosphorous Inc.
Manex	DuPont
Mankocide	DuPont
Manzate ProStick, 4L	Dupont
Mertect 340-F	Merck
Mertect DG	Merck
Microthiol Disperss	United Phosphorus Inc
Micro Sulf	Nufarm
Moncoat MZ	Gowan
Moncut	Gowan

Product	Company
Monsoon	Loveland
NuFlow M	Wilbur Ellis
Nu-Grow Captan Carboxin	Wilbur Ellis
Nusan 30	Wilbur Ellis
NuZone 10ME	Wilbur Ellis
Omega	Syngenta
Onset	Winfield Solutions
Orius	MANA Inc.
PCNB Seed coat	Wilbur Ellis
Penncozeb products	United Phosphorous Inc.
Phostrol	NuFarm
Polyram 80DG	Loveland
Potato Seed piece fung. Dust	Wilbur Ellis
Prevail	Trace
Previcur	Bayer CropScience
Proceed	Bayer Crop Science
Proline	Bayer CropScience
Propiconazole E-AG	Etigra
Propimax EC	Dow
Prosaro	Bayer CropScience
Prosper	Bayer CropScience
Protector-L	Trace
PST 6% Plus Bark	Simplot
Quadris Xtra	Syngenta
Quadris, Quadris Opti	Syngenta
Quash	Valent
Quilt, Quilt Xcel	Syngenta
Raxil Seed Treatment Products	Bayer CropScience
Ranman	FMC
Reason	Bayer CropScience
Revus Top	Syngenta
Ridomil formulations	Syngenta
Rovral	Bayer CropScience
RTU-Vitavax-Thiram	Bayer CropScience
Sativa	NuFarm
Scala	Bayer CropScience
Sebring	NuFarm
Serenade	AgraQuest
Signet	NuFarm
Sorghum Guard	Trace
Stamina	BASF
Switch	Syngenta for 80 wp
Stratego	Bayer CropScience
Sulfur 6	Winfield Solutions LLC
Sulfur DF	Wilbur Ellis
Super Six	Simplot
SuperTin 80WP, 4L	United Phosphorous Inc.
Tachigaren 70WP	Bayer CropScience
Tanos	DuPont
T-Methyl	Micro Flo Co.
TebuStar	Albaugh
Tebuzol	United Phosphorous Inc.
Terraclor	Chemtura
Thiophanate Methyl 85 WDG	Mana, Inc
Thiram seed treatment products	Bayer CropScience
Tilt	Syngenta
T-Methyl E-AG	Etigra
Tops MZ	Bayer CropScience
Tops MZ Gaucho	Bayer CropScience
Topsin products	United Phosphorous Inc.
Triangle Brand Copper Sulfate	NuFarm
Trilex	Bayer CropScience
Trinox	Carlson Co.
Twinline	BASF
Ultra Flourish	NuFarm
Vitavax Seed Treetment Products	Bayer CropScience
Vortex	Bayer CropScience
Warden RTA	Winfield Solutions
Yield Shield	Bayer CropScience