Insecticide and fungicide seed treatment together for on-farm use

For more information visit
www.farmassist.com/crops/cereals
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CruiserMaxx® Cereals seed treatment insecticide/fungicide combines the power of three chemistries to provide cereal growers convenient protection against early-season insects and diseases. The performance of these proven chemistries helps wheat and barley get off to a vigorous start, preserving the yield potential of the variety.

Through CruiserMaxx Cereals, the powerful insect control of Cruiser® seed treatment insecticide is available for on-farm or on-site application. By combining Cruiser insecticide with two fungicides in one convenient formulation, growers can protect against pests without mixing several products together. The ability to self-treat gives growers the flexibility to make timely seed selection decisions that can help them capitalize on market opportunities.

The strength of CruiserMaxx Cereals lies in its performance. By stopping wireworm feeding, the crop is free from open wounds that serve as entry points for diseases. As a result, wheat and barley crops establish better stands, growing the potential for higher yields, better grain quality and increased test weights. Healthy cereal crops are also better able to withstand the stresses of the growing season, including moisture or heat. In the end, stronger roots, quicker emergence and healthier plants can deliver an improved return on investment.
Seed Treatments Prove Value from Start to Finish

Innovative seed treatment products can help protect against destructive early-season pests for the greatest potential return at the end of the season. Cereal growers treating their seed with CruiserMaxx Cereals are equipping their crops with a powerful tool that can deliver faster emergence, better stands, more vigorous plants and higher yield and quality potential.

In recent years, seed treatments have been proving their worth and are becoming standard. Not only can fungicide and insecticide seed treatments help prevent the spread of plant diseases and keep insects at bay, but they also offer added convenience, ease of handling, increased root mass, lower use rates and proven protection from day one.

In some areas, earlier planting dates have growers planting into cool, wet soils. While earlier planting helps increase yield potential, cool, wet soil conditions also expose cereal seedlings to early-season insects and diseases. To protect crops against destructive pests that can limit plant vigor and yields, growers have turned to seed treatments to defend their seed and seedlings. Under these conditions, a seed treatment applied before planting helps protect the seed the moment it is placed in the ground, helping improve germination and emergence for a strong, healthy crop.
Flexible Application Options

Formulated specifically for wheat and barley, CruiserMaxx Cereals is a ready-to-use water-based product available for application on-farm, on-site or through commercial seed treaters. This is the first time a product containing Cruiser seed treatment insecticide has been available for on-farm application, as an option for growers who prefer to treat seed themselves or who use saved seed.

CruiserMaxx Cereals can be easily applied at the simple rate of 5 oz/CWT through most conventional treatment technologies. Its cold-weather formulation can withstand sub-zero conditions, allowing for earlier treatment.

Apply as a water-based slurry using standard slurry seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of insect and disease protection. Continuous agitation or mixing of the slurry mixture is necessary to maintain suspension and ensure complete seed coverage. Allow seed to dry before bagging or adding to the planter.

Seed treated with CruiserMaxx Cereals must be visually identifiable from untreated seed by using an approved colorant or dye. CruiserMaxx Cereals contains an EPA-approved colorant/dye.

Protection against several pests can be enhanced with additional seed treatment.

Heavy Wireworm Populations+
CruiserMaxx Cereals provides suppression of wireworm activity. However, if wireworm pressure is high, additional protection may be required. Under these circumstances, mix CruiserMaxx Cereals at 5 oz/CWT with Cruiser 5FS at 0.25 oz/CWT.

Aphid and Hessian Fly+
For protection against aphids and Hessian fly, 0.48 to 1 oz/CWT of Cruiser 5FS must be mixed with 5 oz/CWT of CruiserMaxx Cereals.

Enhanced Pythium Protection+
For additional Pythium protection, add 0.0425 oz/CWT of Apron XL® LS.

*Consult each product label for registered use rates and follow all label use instructions. Read the label directions for each product and follow the most restrictive label precautions and limitations.
Cruiser seed treatment, the insecticide component in CruiserMaxx Cereals, helps cereal growers maximize yield potential by protecting against wireworms. Thiamethoxam, the active ingredient in Cruiser, is rapidly translocated throughout the plant, providing complete protection, and is active through both contact and ingestion. Insects that come in contact with seed or plants treated with Cruiser show some unique behavioral responses after exposure, and feeding is irreversibly stopped. Therefore, insect damage stops shortly after treatment.

Due to its water solubility, Cruiser requires less soil moisture for activation than other seed treatment insecticides, allowing the active ingredient to move quickly into roots and emerging seedlings to provide protection. In dry conditions, water solubility is critical. However, during wet conditions, it is important that the product remain in the root zone. Cruiser binds to soil particles surrounding the seed for uptake by the plant.

Years of research have proven that thiamethoxam can produce healthier, more vigorous plants under stressful conditions, even in the absence of insect pressure. This phenomenon, called the Thiamethoxam Vigor Effect, results in faster emergence, improved plant stands, increased root mass, thicker stems, earlier canopies, taller and greener plants, improved quality, and ultimately, higher yield potential.

How the Systemic Protection Grows With the Plant

Cruiser is on the seed as it is planted:
- Convenient delivery system to protect your wheat crop from pests.

Cruiser has the right water solubility to secure optimum uptake under diverse growing conditions.

Once dispersed into the root zone, Cruiser binds to soil particles to remain available for uptake.

Protection starts from day one. Seeds and young plants are protected.

As Cruiser is absorbed by the roots, it moves systemically throughout the growing plant.

Since Cruiser is absorbed into new plant tissue, it provides continuous protection so pests do not have a chance to damage young plants.
Systemic Protection for Wireworm Suppression

The increased popularity of reduced-tillage programs has created an opening for wireworms to thrive. The shiny yellow larvae of click beetles, wireworms prefer cool, moist soils in fields with high organic matter. They feed on roots and seedlings and can reduce stands up to 80 percent. Yields start to decline after a field reaches 20 percent stand loss.

Because wireworms live underground, attacking roots, seeds and stems, foliar sprays provide no control, but seed treatment can help. CruiserMaxx Cereals offers the most realistic, cost-effective and proven option for reducing wireworm damage. This gives plants a chance to develop root systems capable of taking up necessary nutrients and moisture, which allows them to better sustain any later attacks by wireworms. Although seed treatment insecticides are recognized as the best option for managing wireworm damage, they will only provide some level of suppression rather than complete control.

**Damage Caused by Wireworms:**
- Seed, root and stem feeding
- Reduction in plant stand
- Patches of dead plants

**Conditions Favored by Wireworms:**
- Cool, moist soils
- Fields just put into production after being in pasture or sod
- Long-term legume or grassy cropped fields
- Reduced-tillage fields because of their high organic matter and ample supply of plant roots and seeds
Mefenoxam, the active ingredient in Apron XL® seed treatment fungicide, provides protection against diseases caused by soil-borne *Pythium*, one of the most prevalent diseases in wheat fields. Damping-off, seedling blight and seed rots caused by *Pythium* species delay emergence, restrict nutrient uptake, stunt plant growth and steal yield. The technology of mefenoxam prevents spore production and inhibits the mycelial growth of *Pythium* species.

Difenoconazole, the proven active ingredient in Dividend® seed treatment fungicide, inhibits the development of subcuticular growth of mycelium and prevents the development of several diseases. This active ingredient acts as a barrier between the disease in the soil and the developing root system of the crop, reducing the chance of infection.

**Excellent Protection Against Pythium**

*Pythium* is one of the most prevalent disease pathogens attacking cereal crops. It is so common that it is often misdiagnosed as winter injury, poor soil fertility or toxicity from crop residue. *Pythium* feeds on the root system and results in spindly plants with shortened or distorted leaves, fewer tillers and smaller heads.

**Impact of Pythium:**
- Significant yield loss
- Delayed emergence
- Damping-off
- Restricted nutrient uptake due to disintegrated root tips
- Stunted plant growth
- Uneven plant development
- Thin plant stands

Research from Washington State University indicates that wheat seeds left unprotected are likely to become infected by *Pythium* within the first 24 to 48 hours after planting in moist soils. CruiserMaxx Cereals protects seeds and young seedlings from day one, while aiding the development of a strong, uniform stand and enhancing yield potential.
Guard Against Common Root Rot

Lingering in cereal fields, easily misidentified and often undiagnosed, common root rot can cause severe damage. Also known as *Cochliobolus sativus*, common root rot survives as spores in the soil or among infected debris from previous crops.

Symptoms include subtle, elongated brown spots or lesions. With severe infections, the entire crown, sub-crown internode and root system may turn dark brown and die. Prematurity blight can occur when severe infections are aggravated by spells of hot weather following a period of cool weather. With prematurity blight, heads appear nearly white with either shriveled seeds or no seeds at all.

CruiserMaxx Cereals protects the root system from common root rot, acting as a barrier between the disease in the soil and the developing root system — thereby lowering the disease risk and improving stand establishment.
CruiserMaxx Cereals Protects Against:

- Wireworms
- Common bunt (seed- and soil-borne)
- Covered loose smut
- Dwarf bunt (seed- and soil-borne)
- False loose smut
- *Fusarium* seed rot
- Loose smut (in wheat)
- *Penicillium* seed rot
- *Pythium* seed rot
- Seed- and soil-borne *Fusarium* (seedling blight, root rot, damping off)
- Soil-borne *Pythium*\(^\ast\) (seedling blight, root rot, damping off)

**Suppression\(^1\):**

- Aphids\(^\ast\)
- Common root rot
- *Fusarium* crown rot
- *Fusarium* foot rot
- Hessian fly\(^\ast\)

*CruiserMaxx Cereals:*

- Contains the power of three chemistries to help cereal growers deliver more
  - Combines the benefits of the insecticide *thiamethoxam* with fungicides *difenoconazole* and *mefenoxam* into one convenient product
- The *Thiamethoxam Vigor Effect* helps the crop develop a stronger root system, use inputs (water, nutrients, etc.) more efficiently, emerge more quickly and overwinter better
- All-in-one wireworm and disease protection for wheat and barley
  - Contains higher rates of fungicides and insecticide to raise the level of performance against *Pythium* and wireworms vs. the closest competitor
- Optimized formulation to ensure consistency in performance whether applied on-farm, on-site or through certified commercial treaters
- Enables cereal crops to get off to a healthier start, resulting in the potential for more bushels

\(^1\) Suppression means effective protection at a level that could provide commercial benefit.

\(^\ast\) See Application section for information about heightened control.
Pest Identification
Pest Identification

Wireworm

*Melanotus spp. or Agroites spp.*
*or Limonius spp.*

**Life Cycle:** Four stages of growth consisting of egg, larva, pupa and adult; most species require two or three years to complete development. Adults emerge in spring. Shortly after mating, female beetles lay up to 300 eggs in the soil, generally around the roots of grass plants. Larvae emerge from eggs. Depending on environmental conditions, some larvae require two to six years to reach full size of approximately 0.8”–1.5”, so numerous stages and sizes of larvae may be found at any one time. Pupal stage is also spent in the soil. Some species of wireworm can overwinter in any of the stages, but most do so in the larval and pupal stages.

**Description:**

**Egg:** Generally pearly white, round and difficult to see in the soil.

**Larvae:** Wireworm is the common name for the larval stage of several species of beetles. Newly hatched wireworms are white with dark jaws. After feeding and molting several times, these larvae become hard, slender, jointed and shiny; and generally orange, brown or yellow. They can be 0.4”–1.6” long; legs are present on the first three body segments behind the head.

**Pupae:** Generally white and soft-bodied.

**Adult:** Adults of some species are called “click” beetles because of their habit of snapping or clicking when placed on their backs. Adults are normally 0.06”–1.5” long; tapered toward both ends; brown to nearly black with loose, flexible joint just ahead of wings.

**Damage:** Wireworms can attack the crop as soon as the seed is planted into the soil. Injury includes boring into the seed and young seedlings. Usually, seedlings are not completely severed as with cutworm, but suffer severe scaring which weakens the plant. Open wounds also provide paths for other plant diseases. Larvae feed on roots and underground shoots of small grains, especially those planted on land previously in sod.

**Scouting/Control Measure:** Through crop rotation, tillage, soil-applied insecticides and seed treatment insecticides, wireworms can usually be managed. Infestations are most severe on land not previously in row crops, especially following sod. Wireworms are difficult to control, partially because they usually live and do their damage several inches deep in the soil. There are no known thresholds to estimate economic damage to plants. Sometimes baits can be used to determine population levels. If wireworm infestations are high, talk to your local advisers for recommendations in your area.

**Seed Treatment Product Recommendation:**

[Image of wireworm]

**Distribution:** Throughout the United States.
Common Bunt
*Tilletia spp.*

**AKA:** Covered bunt

**Principle Crops Affected:** Wheat

**Symptoms:** Heads affected by this fungal disease have a blue cast when they emerge from the boot. Heads are smaller, with spreading glumes. Infected kernels are transformed into smut balls — masses of foul-smelling, dark brown powder, which are the spores of the fungus. Smutted heads generally stand more erect than healthy heads because of being lighter weight.

**Disease Cycle:** Most commonly found on fall-sown wheat. Infection occurs from smut spores on seed and from spores in soil close to the seed. Soil-borne spores can last for decades. Spores germinate in cool conditions, attacking seedlings before emergence.

**Damage:** Loss in yield is directly related to the percentage of diseased tillers. There can be loss in quality with down-grading smutty grain.

**Scouting/Control Measures:** Appropriate seed treatment fungicides will provide good control. Also rotate crops and plant resistant varieties. Contact local advisers if infection occurs.

**Seed Treatment Product Recommendation:**

![CRUISER Maxx Cereals](image)

**Distribution:** Throughout the United States.

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Dwarf Bunt
*Tilletia controvers*

**Principle Crops Affected:** Winter wheat

**Symptoms:** Dwarf bunt looks like common bunt but affects only winter wheat, not spring wheat. Infected plants are shorter, with an increased number of tillers. Seed heads are full of greenish-brown “bunt balls” instead of kernels. Dwarf bunt has a strong, fishlike odor.

**Disease cycle:** Dwarf bunt can survive in soil for more than 10 years. At harvest, the bunt balls release black spores, which stay in the soil or on the seed. Spores on the seed are the most common source of inoculation. Spores germinate slowly at low temperatures under snow or frozen ground. Once a plant is infected, the fungus grows as the plant grows, filling the heads with bunt balls.

**Damage:** Yields are reduced because the bunt balls replace wheat kernels. As the spores are released, healthy grain can also be contaminated.

**Scouting/Control Measures:** Infected plants may be hard to find under a canopy of taller, healthy plants. Infection is most apparent later in the season as the bunt balls open to expose spores. Very early or very late fall planting and planting resistant varieties reduce yield losses caused by dwarf bunt, but these practices do not control the disease or prevent grain contamination. Fungicides and seed treatments that specify dwarf bunt control can be used.

**Seed Treatment Product Recommendation:**

![CRUISER Maxx Cereals](image)

**Distribution:** Mainly Pacific Northwest in areas with winter snow cover.
**Common Root Rot**  
*Coichiobolus Satiuus*  
*(Bipolaris sorokiniana)*

**Principle Crops Affected**: Wheat, barley, oat

**Symptoms**: First symptoms are stunting and sometimes wilting of infected wheat seedlings. Later these plants turn yellow and die. Brown lesions develop on subcrown internodes and primary roots. Roots of diseased seedlings are rotted, red-brown and may be covered with a mass of white, gray or pink mold. If only part of the root system is involved, the plant does not tiller and sends up only a single stem with a small seed head. Dead plants often have a bleached appearance.

**Disease Cycle**: This disease can be especially important in areas where wheat is planted following corn. Infection results from spores that are soil-borne or seed-borne, or from crop residues of corn or other cereal crops. These fungi are common in soil. Favorable conditions for this disease include dry, cool soils and drought stress during seed filling.

**Damage**: Main loss is due to a reduced number of heads per plant by kernel weight. The number of kernels per head are also reduced.

**Scouting/Control Measures**: Thoroughly plow or burn infected stubble, straw, corn stalks, grass weeds, etc. Rotate crops, and do not follow corn with wheat. Remove light and shriveled seeds from seed wheat. Plant resistant or tolerant varieties that are treated with appropriate seed treatment fungicides. Delay sowing until soil temperatures are 60°F or less. If this disease has been observed, contact local advisers for best control options.

**Seed Treatment Product Recommendation:**

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**Loose Smut**  
*Ustilago tritici*

**Principle Crops Affected**: Wheat

**Symptoms**: Easily recognized by characteristic dusty black appearance of diseased heads. Generally, glumes and grain are completely transformed to black powder spore masses which shatter off, leaving a bare, blackened spike at harvest. Infected plants are difficult to detect prior to heading.

**Disease Cycle**: Seed-borne fungal mycelium establishes itself in the embryo of the seed at flowering. As seed matures, mycelium becomes dormant. When infected seed germinates the following spring, mycelium begins to grow and penetrates the growing point.

**Damage**: Loss in yield is directly related to the percentage of diseased tillers. Also can be loss in quality with downgrading of smutty grain.

**Scouting/Control Measures**: Plant clean, certified seed from smut-free fields. Plant resistant varieties. Use appropriate systemic seed treatment fungicides. Rotate crops. Discuss control options with local advisers.

**Seed Treatment Product Recommendation:**

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**Distribution**: Throughout the United States.
**Pythium**

**Principle Crops Affected:** Wheat, many others

**Symptoms:** *Pythium* is one of the most common soil pathogens found in nature. *Pythium* infects the seed at or before germination, attacking the young seedling before or after emergence. Disease symptoms may include any of the following: seed decay; decay of the seedling before emergence; seedling root rot characterized by a soft, watery rot; root tips that are brown and dead in appearance; brown tissue on the outer portion of the root that easily pulls off and/or root cells containing fungus spores. Plants that do emerge are pale, stunted, become yellow and die within a few days. Surviving plants are less vigorous and competitive during early season growth development.

Early-season symptoms are commonly called damping-off. Compacted soils and water-soaked conditions cause anaerobic conditions that are favorable for the development of *Pythium*. Low soil oxygen levels cause plants to exudates oxygen forming sugars that *Pythium* thrive on and cause rapid increase in soil levels.

Cool conditions slow down plant development, increasing the exposure and time needed for infections to develop.

**Disease Cycle:** The fungus can be found in soil, sand, pond and stream water and their sediments, as well as dead roots of previous crops. *Pythium* is a particular problem in poorly drained soils. The fungus prefers wet and especially cool conditions for releasing spores. *Pythium* can develop most easily in seedlings, as plants become more resistant as they age. The plant’s root tips are attacked and killed first, causing root loss and poor growth. Several species of *Pythium* are known to infect wheat seed and seedlings.

**Damage:** *Pythium* root rot is difficult to control once rot has begun and rapid death of crops occur when infected. Economical impact can occur from stand loss, poor vigor, delayed emergence and poor plant development.

**Scouting/Control:** Most soils contain some level of *Pythium*, ensuring the potential for infections in fields if environmental conditions become favorable. Plant good quality seed, free from cracks and splits, in well-drained soils. Use seed treatment fungicides to prevent infection during the most susceptible early season development period.

**Seed Treatment Product Recommendation:**

**Distribution:** Throughout the United States.