Researchers around the globe are continuing to uncover evidence that points to roots as the key to increasing future crop productivity. Strong, healthy root systems help developing plants better utilize available nutrients and moisture, as well as produce stronger plants that are better able to withstand environmental stress.

Another key benefit of healthy root systems is the ability to better protect the developing crop from soilborne pathogens. *Rhizoctonia*, *Pythium* and *Fusarium* are becoming more widespread in cereal crops across the United States and have the potential to cause devastating yield loss. Fortunately, Syngenta holds a long-standing commitment to help cereal growers achieve healthy roots, stronger plants and top yields through unmatched service and a top-performing portfolio of seed treatment products.
Syngenta offers cereal growers strong fungicide seed treatment solutions that also boost Rooting Power and enhance disease protection.

Stopping damage caused by *Rhizoctonia*, *Pythium* and *Fusarium* is critical to helping ensure optimum root health and maximum yield potential in cereals. Not only do quality fungicide seed treatments help prevent the spread of these plant diseases, they also help increase root mass and offer added convenience, ease of handling, lower use rates and proven defense from day one.

The VIBRANCE family of cereals seed treatments features VIBRANCE Extreme seed treatment fungicide for application through commercial, on-site seed treaters and CruiserMaxx Vibrance Cereals seed treatment insecticide/fungicide, which can be applied on-farm and through commercial, on-site seed treater or seed company.

A member of the SDHI class of fungicides, sedaxane, found in VIBRANCE brand seed treatments, provides longer-lasting protection against damaging soilborne diseases. It aids in the development of stronger, healthier root systems that lead to increased crop productivity and consistently better yields.

Cereal growers treating their seed with VIBRANCE Extreme or CruiserMaxx Vibrance Cereals are equipping their crops with powerful tools that not only defend against pest-related yield damage, but also deliver faster germination and emergence, increased stand establishment and more vigorous plants.

The built-in Rooting Power™ of VIBRANCE brands helps develop robust root systems that more efficiently absorb and utilize water and nutrients. As a result, stems and foliage are healthier and can better withstand environmental stress, which leads to enhanced and consistent yield performance.
Disease Profile: *Rhizoctonia*

Capable of causing 20 to 40 percent yield loss, *Rhizoctonia* is quickly becoming one of the most prominent, yield-robbing, soilborne pathogens afflicting cereal crops in the United States. *Rhizoctonia* lives as a fungus in the soil, infecting seeds and young seedlings after water absorption.

**Symptoms**

*Rhizoctonia* can cause brown or red-brown lesions on larger seedlings and young plant stems down to the soil line and on the tap root.

**Damages/Impact**

Infected stems often break in the affected area, and roots often die from decay. Additionally, *Rhizoctonia* causes:

- Failure of seeds to germinate (seed decay)
- Failure of seedlings to emerge (pre-emergence damping-off)
- Stunted crops and uneven stands
- Bare patches in the field
- Reduced moisture and nutrient absorption
- Restricted crop growth, development and vigor
- Decreased yields and, in severe cases, destruction of an entire field

**Management Recommendations**

To manage *Rhizoctonia*, Dr. Tim Paulitz, Ph.D., research plant pathologist, USDA – ARS, Washington State University, stresses the importance of understanding field history, maintaining awareness of the disease and implementing both cultural and chemical management tactics. Specifically, he suggests growers:

- Apply starter fertilizer in the furrow at the time of planting to help the seedling pick up nutrients
- Plant fresh, clean and certified seed, as older seed is more susceptible to certain soilborne diseases
- Use seed treatments, as they are important in reducing *Rhizoctonia* and other soilborne diseases
Disease Profile: *Pythium*

*Pythium* is one of the most prevalent disease pathogens attacking cereal crops and is often misdiagnosed as winter injury, poor soil fertility or toxicity from crop residue. This pathogen thrives in wet, cool conditions. It develops most easily in seedlings, where it attacks root tips first.

**Symptoms**

Early-season symptoms are commonly called damping-off. Compacted soils and water soaked conditions cause anaerobic conditions favorable for the development of *Pythium*. Cool temperatures slow down plant development, increasing the exposure and time needed for infections to develop. Other symptoms include:

- Seed decay or decay of the seedling before emergence
- Seedling root rot characterized by a soft, watery root
- 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 fungal spores
- Emerging plants that are pale, stunted or become yellow and die within a few days
- Surviving plants that are less vigorous and competitive during early-season growth development

**Damages/Impact**

*Pythium* feeds on the root system and results in spindly plants with shortened or distorted leaves, fewer tillers and smaller heads. This pathogen is extremely difficult to control after rotting begins. Rapid death of crops occurs when infected, leading to an economic impact in some circumstances. The potential impacts of *Pythium* include:

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

**Management Recommendations**

Research from Washington State University indicates that unprotected wheat seeds are likely to become infected by *Pythium* within the first 24 to 48 hours after planting in moist soils. Since most soil contains some level of *Pythium*, the following cultural and chemical recommendations can help reduce the potential for infection.

- Planting certified seed
- Monitoring soil fertility levels
- Rotating to a non-host crop
- Planting into well-drained soils
- Delaying seeding in wet conditions
- Using a mefenoxam-containing fungicide seed treatment, such as VIBRANCE Extreme or CruiserMaxx® Vibrance Cereals
Disease Profile: *Fusarium*

Fusarium seed scab attacks the outside of the seed and the seed embryo. *Fusarium* can cause damage at multiple growth stages of the plant. According to the American Phytopathological Society, U.S. wheat and barley producers have lost more than $3 billion due to late-season infections of Fusarium head blight (FHB) since 1990.

**Symptoms**
Because the seed is threatened, it is important to be aware of the symptoms of this pathogen.

- Brown/tan lesions on primary and secondary roots
- Brown/red discoloration of crowns and lower stem tissue
- Poor tillering and yellowing of plants in spring

**Damage/Impact**
The immediate threat is to the seed of the plant, as *Fusarium* attacks the outside of the seed and the seed embryo. These infection points act as inoculum for a new round of infection in the next crop when conditions are favorable. *Fusarium* can affect the developing crop by:

- Lowering seed germination
- Attacking the germinating seedlings, causing them to die before becoming established
- Causing spotty or uneven stands

**Management Recommendations**
To minimize the effect this disease has on the seed portion of the disease life cycle, researchers point to several cultural options, and many recommend the use of seed treatment fungicides. In addition, other cultural recommendations include:

- Planting certified seed
- Selecting varieties with in-bred resistance
- Rotating with non-host crops
- Altering tillage practices – *Fusarium* infections seem to be more prevalent in reduced-tillage fields, so bury infected residue through tillage

![Wheat seed infected with Fusarium seed scab](image1)

![Untreated](image2)

![Treated with Dividend Extreme® + Ipconazole](image3)
Syngenta Solutions for Healthy Roots

Vibrance Extreme

With VIBRANCE Extreme, cereal growers can rest easy knowing their seeds are protected with top-notch chemistries that work together to promote vigorous roots and strong stands. VIBRANCE Extreme combines three proven fungicides to provide best-in-class Rhizoctonia activity and contains the proven protection behind Dividend® brands, which safeguard cereal crops from more diseases than any other product on the market. VIBRANCE Extreme:

- Stimulates quality root systems that deliver better emergence, stand, nutrient uptake and stress tolerance for enhanced Rooting Power
- Combines sedaxane with difenoconazole and mefenoxam to deliver extended protection against a broad spectrum of early-season seedborne and soilborne diseases
- Helps ensure a healthier start to deliver better yields under a wide range of environmental conditions
- Offers excellent seed safety for optimal seedling development and root growth
- Produces healthier, stronger stems and foliage that can better withstand stresses from weather, diseases and insects
- Contains the optimal combination of systemic action and soil mobility for excellent disease protection and root health

CruiserMaxx Vibrance Cereals

Custom formulated for on-farm application, CruiserMaxx Vibrance Cereals brings unrivaled disease and insect protection to the wheat and barley market. The heightened protection ensures the crop gets off to a vigorous start and delivers consistent yield performance and stability from year to year. For added convenience, CruiserMaxx Vibrance Cereals can also be applied through commercial, on-site seed treater or seed company. CruiserMaxx Vibrance Cereals:

- Provides unsurpassed protection against a wide range of insects and diseases, including best-in-class Rhizoctonia activity, to help boost Rooting Power
- Features sedaxane with thiamethoxam, mefenoxam and difenoconazole in a convenient formulation effective at a single use rate
- Offers consistent yield performance and stability under a wide range of growing conditions through an enhanced formulation
- Provides a resistance management tool as it adds another seed treatment mode of action from the SDHI class of fungicides to the Syngenta Seedcare portfolio
- Delivers the Cruiser Vigor Effect through the thiamethoxam component to help enhance germination, increase vigor, improve stand establishment and deliver better yield potential
- Contains higher rates of fungicides and insecticide to raise the level of performance against Pythium and wireworms vs. the closest competitor
- Offers ideal systemicity and soil mobility which creates a “halo of protection” around the seed and root system

For more information, visit www.farmassist.com/crops/cereals.