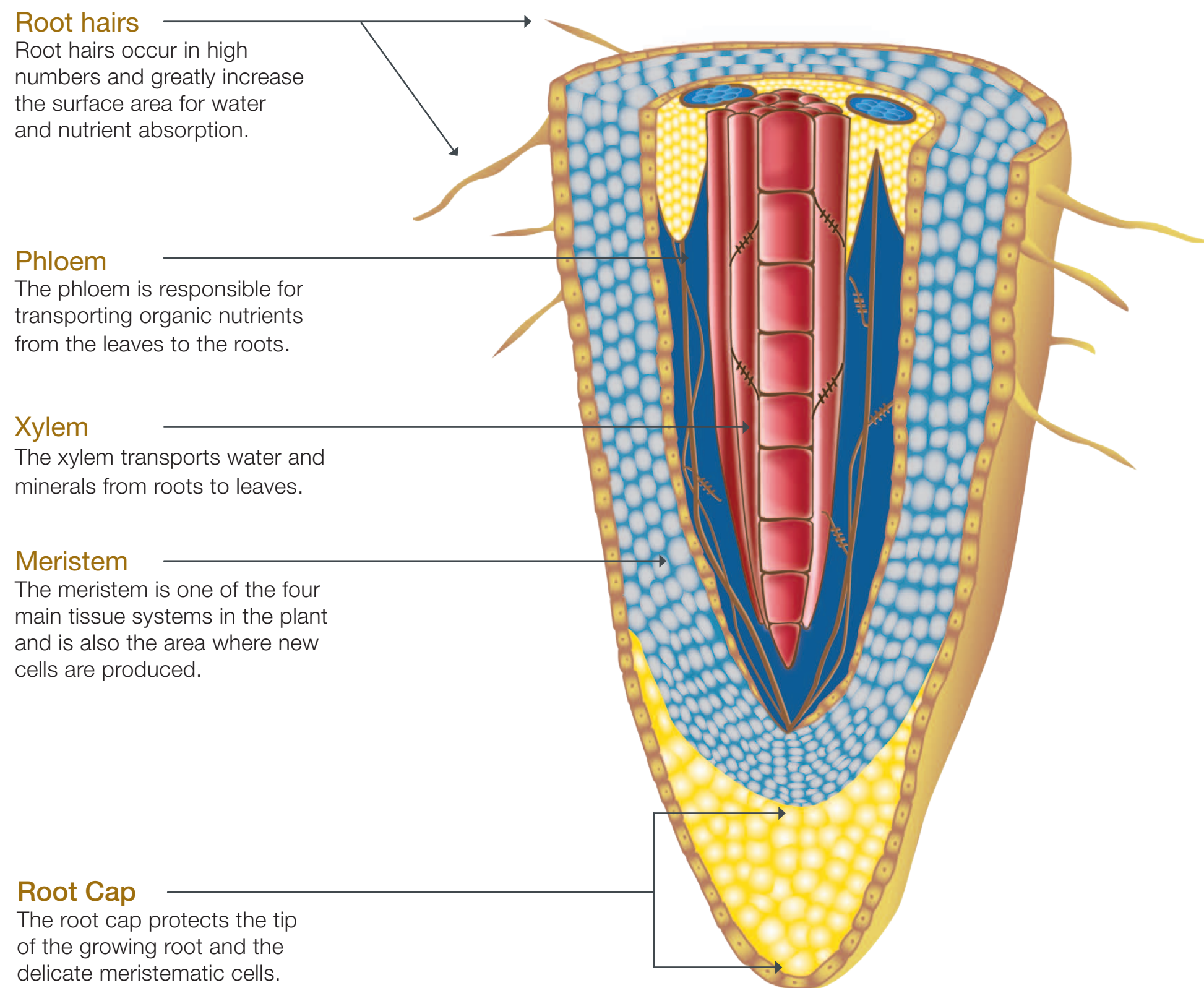


Strong, Healthy Root Systems Lead to Higher Productivity, Increased Profit Potential

More and more research is pointing to root health as the key to increasing crop productivity in the future. Why? Healthy roots lead to:

- Protection against yield-robbing insects and diseases below the soil surface
- The development of stronger stems and foliage that better withstand environmental stress
- More efficient water and nutrient uptake
- Protection of the crop's genetic potential

Roots are responsible for several important jobs, including anchoring and supporting the plant in the ground. They also hold soil in place, break up soil to create pathways for better water filtration, and absorb water and nutrients.



Root Health, According to the Experts

“Root health is a term that plant pathologists have used for many years to describe a plant root that has very little disease. Healthier, more robust root systems help plants better utilize available nutrients and moisture.”

—Wayne Pedersen, Ph.D.,
emeritus plant pathologist, University of Illinois

“Root health means that plants can live up to their full genetic potential, and can utilize water and nutrients in the most efficient way. Root health means that growers can get the best economic return on their inputs, and can use the most sustainable practices with the least environmental impacts.”

Tim Paulitz, Ph.D.,
research plant pathologist, USDA-ARS,
Washington State University



Syngenta Seed Treatments: Protectors from Pests, Builders of Strong Root Systems

As part of an ongoing commitment to root health and pest defense, Syngenta offers growers a strong portfolio of leading seed treatments and has taken the initiative to develop new active ingredients specifically as seed treatments designed to improve root health. In addition to our current cereals seed treatment products below, Syngenta is anticipating registration for a new seed treatment fungicide in 2012 that will help further maximize root health and yield potential.

DividendExtreme® Built-in Protection from More Than 16 Early-season Diseases for Better Cereals Stand Establishment

- Provides unsurpassed protection against more than 16 early-season seedborne, soilborne and fall foliar diseases to produce healthier root systems and stronger plants
- Offers healthier root systems and stronger plant stands to help winter wheat better prepare for dormancy and promote better spring crop vigor
- Delivers convenient protection of the seed's genetic potential to help maximize yield and quality
- Combining with ipconazole helps target certain *Fusarium* species to minimize disease pressure, enhance germination rates and protect yield potential
- Protects plants and promotes more vigorous root growth even under heavy infection of *Rhizoctonia* species

Cruiser® Convenient, Seed-delivered Insect Protection in Cereals for a Healthier, More Vigorous Start

- Provides convenient, seed-delivered protection against wireworms, aphids and early-season Hessian fly
- Helps produce healthier, more vigorous plants under certain conditions, even in the absence of insect pressure, to increase yield potential through the Thiamethoxam Vigor Effect
- Reduces the risk of the crop transmitting barley yellow dwarf virus by protecting against aphids that vector the disease
- Provides peace of mind by delivering consistent performance under a wide range of growing conditions
- Helps achieve stronger plant stands, increased root mass, thicker stems, and taller and greener plants

CruiserMaxx® Three Chemistries for Top-notch Cereals Pest Protection in One Convenient, On-farm Formulation

- Provides excellent protection against both insects and diseases in one convenient formulation, eliminating the need to mix products
- Delivers the power of three chemistries in one easy-to-use formulation effective at a single use rate
- Offers the option for on-farm or on-site application so growers can make timely seed selection decisions to help capitalize on market opportunities
- Provides early-season protection to promote healthier seedlings and stronger plant stands to reduce stresses throughout the season

Key Pests Impacting Root Health in Cereal Crops

Underground diseases and insects are the prominent threats to the development of a strong, healthy root system. Key pests to watch for in wheat and barley include:



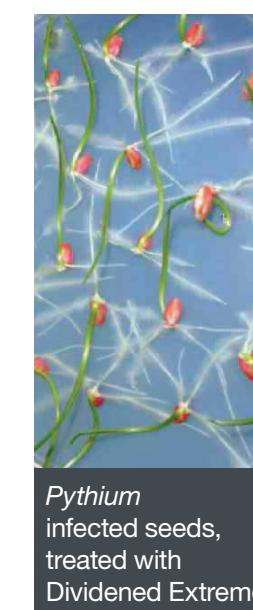
Rhizoctonia bare patch in wheat

Rhizoctonia infects the entire root system and is quickly establishing itself as one of the most prominent soilborne pathogens afflicting U.S. cereal growers. *Rhizoctonia* is capable of causing 20 to 40 percent yield loss. This fungus can cause preemergence or postemergence damping-off of seedlings, as well as plant wilting. Infected stems often break in the lesioned area, and roots may die from a firm, dry brown or red-brown decay.



Pythium infected seeds, untreated

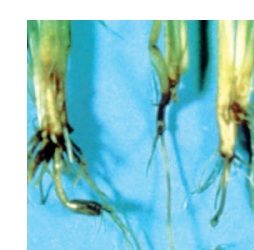
Pythium is one of the most prevalent disease pathogens attacking cereal crops and often misdiagnosed as winter injury, poor soil fertility or toxicity from crop residue. *Pythium* feeds on the root system and results in spindly plants with shortened and distorted leaves, fewer tillers and smaller heads. *Pythium* is difficult to control once rot has begun, and rapid death of crops occurs once infection occurs. Delayed emergence and poor plant development are common symptoms of *Pythium*.



Pythium infected seeds, treated with Dividene Extreme



Fusarium attacks the outside of the seed and the seed embryo in wheat and many other crops. These infection points act as inoculum for a new round of infection in the next crop when conditions are favorable. However, the immediate threat is to the seed. If infected, the seed may die, germinate poorly or encounter seedling blight as it germinates.



Common root rot causes stunting and sometimes wilting of infected wheat, barley and oat seedlings. Later, these plants turn yellow and die. Roots of diseased seedlings are rotted, red-brown in color and may be covered with a mass of white, gray or pink mold.



Wireworms are the shiny yellow larvae of click beetles and have the capability to reduce stands up to 80 percent. Wireworms feed on roots and underground shoots of small grains, especially those planted on land previously in sod. They attack as soon as the seed is planted in the soil, boring into seeds and young seedlings, which then suffer scarring, weakening the plant.

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