

## Small Grains XII

### Small Grains

## Rhizoctonia Root Rot / Bare Patch

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**Cause:** *Rhizoctonia solani* (the teliomorph is *Thanatephorus cucumeris*) a soil-inhabiting fungus

**Hosts:** Wheat and other members of the grass family (Poaceae). Oats are less susceptible to pathogen when compared with wheat, barley, and rye.

**Occurrence:** *Rhizoctonia solani* persists in the soil or on the soil surface for long periods of time, and is widespread.

### Key Symptoms:

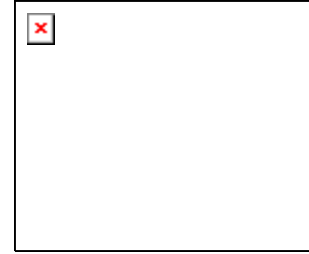
Early-season infection:

- Localized circular areas in wheat field with stunted, dull grayish-blue or dead wheat plants.
- Infected roots typically have abnormally pointed, and sometimes discolored tips (“spear-points”).

Later-season infection:

- Close examination of plants infected later in the growing season reveals characteristic oval- to lens-shaped lesions with dark brown borders and pale, “straw-colored” centers on the lower portions of wheat stems (culm) near the base of the plant, The ends of the lesions are typically pointed and stems may be girdled.
- Plants appear stunted, discolored, and may produce a "white head" of underdeveloped kernels OR exhibit delayed maturity.
- Affected wheat plants may lodge or fall over, typically at the 2<sup>nd</sup> or 3<sup>rd</sup> internode from the soil surface.
- Mycelium beneath lesions on maturing stems is often abundant and ashy-white in color.
- Leaf sheath tissue rots, leaving a characteristic, diagnostic hole rather than a fibrous net (as with Foot Rot).
- Small black sclerotia (compact masses of hardened mycelium), may develop in the space between the stem and leaf sheath.

### Look-Alike Symptoms:



*Rhizoctonia solani* girdles individual roots and rootlets, causing symptoms similar to take-all root rot, Pythium root rot, drought or nutrient deficiency.

#### **Favorable Conditions:**

- Environmental conditions, particularly cool, wet weather, significantly increase disease severity.
- Planting immediately following a glyphosate application. Glyphosate inhibits the defense system of the plant (volunteer wheat or grassy weeds), allowing it to build to large populations in the roots.
- Reduced tillage (including “no-till”) favors disease development by the increased retention of host debris and lack of soil disturbance to break hyphal networks.
- *Rhizoctonia* root rot is more likely to develop on plants growing in periphery of wet spots and in areas where there was standing water over the winter.

#### **Diagnosis:**

Species of *Rhizoctonia* are characterized by:

- Lack of spore production.
- Hyphae that branch at right and acute angles to the main hypha, with a slight constriction at the branch origin, and a septum near the branch origin.
- Specialized hyphae composed of dark-colored, compact cells called “monilioid cells”.
- Monilioid cells fuse together to produce “sclerotia”.
- Sclerotia are resistant to environmental extremes, allowing the fungus to survive adverse conditions.
- Sclerotia of *Rhizoctonia* species lack distinct medulla or “rind”, unlike the ergot sclerotia of *Claviceps purpurea*.

Although *Rhizoctonia solani* produces no spores, it produces hyphae characterized by:

- Under low magnification, infected root tips appear reddish-brown and taper to a fine point.
- Lesions on roots are generally small (2.0-3.0 mm in length).
- Septate hyaline multi-nucleate hyphae, having several nuclei in each cell (similar to *Rhizoctonia zea* and *R. oryzae*).
- The 4-15  $\mu$ m wide hyphae tend to branch at right angles (90 degrees).
- *Rhizoctonia solani* can be differentiated from *R. cerealis*, in that the latter has only two nuclei in each cell.
- In culture when grown on potato dextrose agar, *Rhizoctonia solani* produces white to dark brown mycelium, along with irregularly-shaped, light-tan to black sclerotia approximately 1 mm (0.04 inch) in diameter.
- *Thanatephorus cucumeris*, the sexual state or teleomorph, is a basidiomycete that forms club-shaped basidia and 4 apical sterigmata on which oval, hyaline basidiospores are produced.
- *Thanatephorus cucumeris* is produced in nature, but rarely in association with wheat.

When grown on potato dextrose agar (PDA), colonies of *Rhizoctonia solani* are characterized as follows:

- White-to dark brown (buff to black) mycelium composed of hyphae 4-15  $\mu\text{m}$  wide that tends to branch at right angles (90 degrees).
- Optimum temperature for growth ranges from 18°C (64.4°F) to 28°C (82.4°F), with optimal growth occurring at 23°C (73.4°F).
- Irregularly-shaped, light tan to black sclerotia ( $\geq 1$  mm in width) are produced on the surface of 4- to 6-week old cultures.
- Older cultures produce abundant brownish black, irregularly-shaped sclerotia (**larger** than those produced by *Rhizoctonia cerealis*).
- *Rhizoctonia solani* is divided into 11 anastomosis groups (AGs).

**Problem:**

- Rhizoctonia root rot can cause large yield losses of wheat, including stand reductions up to 100%.
- Pathogen persists in the soil, and is widespread. Primary inoculum originates from soil-borne sclerotia or from mycelium in host debris, volunteer plants or weeds.
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- Severe infections cause premature ripening and lodging of wheat plants.
- Root infections can occur at any time during the growing season, given favorable conditions.
- Pathogen populations are increased by applications of glyphosate on volunteer wheat or grassy weeds.

**Management Approaches:**

- Pay attention to the “green bridge” - the plants of volunteer cereals and grassy weeds harbor the pathogen, and assist movement of the pathogen.
- Wait 2-3 weeks to plant cereal crops after tillage or an herbicide (especially glyphosate) application to control volunteer cereals and grassy weeds to allow the plant material to decay.
- *Rhizoctonia solani* is active in the top 10-15 cm of soil, thus soil tillage helps to breakup pathogen mycelium and helps to promote the breakdown of infected crop residue.
- Management practices which favor good, vigorous growth of the wheat plant generally limit damage due to Rhizoctonia root rot.
- Avoid planting in wet soils or in areas where the soil will be kept overly moist during seed germination and seedling development.
- Late autumn shallow seeding of wheat tends to suppress disease development.
- Rotate wheat with legumes or other non-host crops.
- Maintain a balanced soil fertility program; research indicates that zinc helps to reduce the incidence of Rhizoctonia root rot in wheat.
- Infected winter wheat plants may be able to outgrow Rhizoctonia root rot by production of new roots.

- Effective and economical chemical controls currently do not exist for control of Rhizoctonia root rot of wheat, but some seed treatments may be partially effective.
- Resistant wheat cultivars are currently not available.

**Agrichemicals Registered for Control of Rhizoctonia Root Rot / Bare Patch:**

<b>Agrichemical</b>	<b>Time and Method of Application</b>	<b>Application Rate</b>	<b>Comments</b>
Mono- and dipotassium salts of Phosphorous Acid	Apply as a seed treatment		
Carboxin + Thiram	Apply as a seed treatment		
Baytan			
Charter			
Charter PB			
Dividend Extreme		2 to 4 fl oz/100 lb seed	Do not graze, cut for green chop silage or hay or otherwise utilize straw until 55 days after planting
Dividend XL RTA			
Raxil Thiram		3.5 to 4.6 fl oz/100 lb seed	Use the low rate on dryland or if rain is low. For best results, plant no deeper than 1.5 to 2 inches. Do not graze livestock in treated areas for 31 days.
Raxil XT & MD		Raxil XT at 0.16 oz/100 lb seed Raxil MD at 5 to 6.5 fl oz/100 lb seed	
Vitavax RTU		5 to 6.8 fl oz/100 lb seed	Do not graze livestock in treated areas for 6 weeks after planting
Vitavax Extra			

Note: Baytan, Dividend alone, and Vitavax are ineffective unless supplemented by other products.

Sources:

United States Environmental Protection Agency ~

[http://www.epa.gov/pesticides/biopesticides/product\\_lists/bppd\\_products\\_by\\_AI.pdf](http://www.epa.gov/pesticides/biopesticides/product_lists/bppd_products_by_AI.pdf)

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[ext/factsheets/wheat/wheat%20Seed%20Treatments.asp](http://www.oznet.ksu.edu/path-ext/factsheets/wheat/wheat%20Seed%20Treatments.asp)

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**Categories:** Small grains, Diseases, Rhizoctonia root rot

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