Rhizoctonia (Rhizoctonia solani)

Rhizoctonia is a cereal root disease caused by the soil borne fungus *Rhizoctonia solani*. Various strains affect all commonly grown crop and pasture species (Figure 1). Yield losses from Rhizoctonia are proportional to the total area of the patches and can average up to 50% (Wallwork 2000). Rhizoctonia in southern Australia is estimated to cost $77 million each year in lost production (Roget 2006). Rhizoctonia cannot be eliminated but can be suppressed to a level that doesn't cause economic loss.

**KEY POINTS**

- Rhizoctonia may be more widespread and severe in 2007 due to the drought in 2006
- Tillage remains the most effective method of Rhizoctonia suppression
- Assess the risk in each paddock and monitor crops from 4 weeks after sowing

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**BIOLOGY AND ECOLOGY**

Rhizoctonia is an opportunistic disease, favoured by slow growing plants. It can survive in the absence of a host and under extreme circumstances.

Rhizoctonia is first noticeable 4-8 weeks after sowing. Symptoms include small bare patches up to several metres in diameter with defined edges in the growing crop (Figure 2). Surviving plants within the patch are severely stunted, spindly, have stiff, narrow, rolled leaves, are discoloured (yellow-red) and have few tillers. In the early stages of infection, sections of the root may appear thin due to rotting however it eventually rots through leaving brown 'spear tips' (Figure 3). Affected plants remain stunted until maturity or die prematurely. Some plants may appear to recover slightly in spring but they will yield poorly as they have lost most of their root system. The edge of the affected patch becomes less distinct as the crop matures. Symptons of Rhizoctonia in pastures and grain legumes are not as obvious as in cereal crops.

There are also ‘non-patch’ strains of Rhizoctonia which cause root rot but not bare patch on cereals.

To correctly identify Rhizoctonia and other root and crown diseases you need to:

1. Monitor the crop closely (and compare with other crops) looking specifically for poor patches within the crop
2. Dig up affected plants, keeping the root system intact, and wash the roots in water to remove soil
3. Place the roots against a white background, observe and compare with those from healthy plants.

The Rhizoctonia fungus survives as hyphae (fine fungal threads) or sclerotia (thick walled hyphae) in organic matter between crops and grows onto young seedlings following germination. The fungus is spread via crop residue, seed, burrs, machinery, animals and wind-borne material. It is most active between 10 and
15°C in the top 10-15cm of the soil (Hollaway 2007; Wiese 1987). The disease can be more severe in seasons with high rainfall however recovery is also most significant in these years.

Figure 3. Roots of a Rhizoctonia affected plant.

Rhizoctonia is more severe:

- When weeds are not controlled prior to sowing
- When there is no soil disturbance
- When soil fertility (especially P, N and Zn) and organic matter are low
- Following the use of sulfonylurea herbicides
- In sandy soils
- When soil is very wet or dry following sowing
- Following a late break (farmers tend to go forego cultivation in order to get the crop in as soon as possible and the soil is cold and dry), and
- Following a drought.

Farmers need to be aware of the high Rhizoctonia risk in 2007. Rhizoctonia is often more severe following drought due to:

- Limited breakdown of plant residues thus more inoculum in the soil
- A decline in microbes antagonistic to the disease (Rhizoctonia can recover and grow faster than the beneficial bacteria), and
- Poor control of volunteer plants that act as hosts for disease.

**MANAGEMENT**

Rhizoctonia cannot be eradicated completely but good management can minimise losses. Assess your paddocks for disease risk and confirm with available soil tests such as PreDicta® B. Crops should be monitored from 4 weeks after sowing and any disease symptoms should be correctly identified. Where possible, prevent the fungus from multiplying in the year prior to sowing by controlling weeds and preventing their seed set.

To reduce Rhizoctonia levels, cultivate no more than 2 weeks prior to sowing, ensure adequate nutrition, control grass weeds prior to sowing, avoid using sulfonylurea herbicides and consider using a seed treatment (Murray et al 2006).

**Chemical Options**

Dividend® is the only registered seed treatment available for the suppression of Rhizoctonia in wheat and barley. Visit www.syngenta.com.au to view the product label or contact your local adviser.

**Cultural Options**

**Tillage**

Tillage below sowing depth (5cm below seedling depth for loam soils and 10cm below sowing depth for sandy soils) within 2 weeks before sowing remains the best option for Rhizoctonia control. It breaks up the fungal hyphae network allowing the plants to mature before the fungus can build up and cause significant damage. Alternatively use modified (narrow) sowing points that disturb the soil below seeding depth at sowing. Cultivation should be done while the soil is moist and the fungus is actively growing. The effectiveness of tillage decreases as the severity of the disease increases.

The adoption of zero-till in Australia has increased the incidence and severity of Rhizoctonia. In these systems there is no cultivation to break up the fungal hyphae network which is why Rhizoctonia often increases in the early stages of zero-till adoption. However after many years of reduced tillage with stubble retention, carbon inputs increase which can lead to disease suppressive soil (see **Biological Options**).

**Fertility and Seed Quality**

Adequate nutrition allows plants to grow away from the Rhizoctonia fungus more effectively. Plants emerging from good quality, high vigour seed have a healthier root system, are more able to access soil moisture and nutrients and are less susceptible to disease.
Hygiene

A volunteer pasture present before sowing significantly increases the severity of Rhizoctonia in the following crop. A chemical fallow sprayed 3-4 weeks (weeds must be dead for 2-3 weeks) prior to sowing greatly reduces damage to wheat and can increase grain yield from 1.2t/ha to 2.2t/ha (Roget, Venn & Rovira 1987). However do not delay sowing if the break is late. This is particularly relevant for direct drilled systems where the volunteer pasture usually remains present until immediately prior to sowing.

Follow strict hygiene practices when moving machinery between paddocks and remove all traces of soil from machinery before moving it from infected areas to non-infected areas.

Burning

Burning can decrease the level of suppressive activity in the soil. The removal of carbon inputs affects the composition and activity of the beneficial microbes in the soil (see Biological Options).

Crop Species, Cultivar and Density

The strain of Rhizoctonia affecting cereal crops also affects legumes and weed species therefore crop rotation is not a management option. Barley is the most susceptible cereal followed by wheat and then oats (Wallwork 2000). There are no significant varietal differences however varieties which better tolerate low fertility soils appear less susceptible.

PreDicta B®

PreDicta B® is a soil test that detects the presence and level of disease in your soil. For more information visit www.c-qentec.com or phone (08) 83377888.

Biological Options

All soils have a natural level of disease suppression which can be influenced through management. Rhizoctonia suppression is due to a combination of beneficial organisms including Pantoea, Exiguobacterium and Micribacterium (known as PEC) (Barnett & Anstis 2007). Two of these organisms promote root growth and one reduces root infection. Soils with a high level of suppression can completely control the disease.

Disease suppression can be increased by full stubble retention, limited grazing, high nutrient input, intensive cropping, no cultivation and above average yields (high water use efficiency). These management practices increase biologically available carbon which increases the activity of the disease suppressive microbial population.

The level of microbial suppression is strongly influenced by the level of soil mineral N over summer and autumn. Disease suppression is not fully expressed in the presence of high mineral N so as the level of mineral N increases, the level of disease suppression decreases. Any management factors which increase the mineral N (eg. legume pastures and green manuring) will decrease disease suppression however poor crop nutrition (especially, N, P, Zn) during the seedling stage of crop growth is equally damaging. Soil nitrogen will build-up if carbon inputs are removed such as from stubble burning. Matching N supply to demand by the crop will balance carbon and nitrogen inputs and increase suppression.

Disease suppression develops after about 10 years of these management practices. However inoculating soils with the beneficial organisms PEC and Trichoderma can reduce Rhizoctonia levels in a single season (Leonard 2006). Different crop species and varieties have varying abilities to host the beneficial organisms with medic species particularly reducing the benefit of the organisms (Leonard 2006).

Tillage will break suppression, therefore suppression is rarely achieved in southern dryland cropping systems where tillage remains an important component.

References


Hollaway, G 2007,’Cereal Root Diseases’, Agriculture Notes (AG0562), Department of Primary Industries, Victoria.

Leonard, E 2006, ‘Beneficial soil organisms need numbers to win’, Ground Cover magazine, GRDC.


Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (2008). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries/Murrumbidgee Catchment Management Authority or the user’s independent adviser.

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This project has been funded through the Australian and NSW Governments’ National Action Plan for Salinity and Water Quality.