MANAGEMENT OF RHIZOCTONIA ROOT ROT: KINNABULLA FIELD TRIALS 1993

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Introduction

Rhizoctonia root rot is skimming the profits off cereal yields and current management practices are not providing effective control. Research over the last three years has indicated that rhizoctonia root rot is reducing cereal yields by up to 50% in the Mallee, with an average annual yield loss of 10%.

In 1993, the most effective control strategy at the Kinnabulla trial site was to sow with the moisture seeking point. This treatment had the highest grain yield (2.54 t/ha) and the lowest rhizoctonia severity (severity score 1.2).

BEST OPTIONS TO CONTROL RHIZOCTONIA ROOT ROT

Traditionally, cultivated fallows have been used to control rhizoctonia. However, the results of a crop disease survey suggest that growers are not achieving effective control of rhizoctonia with cultivation.

Results from Western Australian and South Australian research show that sowing with long narrow points or a depth modified combine can improve crop establishment. Both sowing implements cultivate 5-10 cm below the depth of sowing. The action of sowing disrupts the fungus in the soil and retards its growth; the deeper cultivation, under the seedbed, permits rapid penetration by the seedling roots, away from the main concentration of rhizoctonia. (See Table 1 for a description of different sowing systems).

UNDERSTANDING RHIZOCTONIA

The rhizoctonia root rot fungus survives in the top 10 cm of soil. It lives in the roots of previously infected plants and in plant debris in the soil. After the autumn rains the fungus grows out of this material and spreads rapidly through the soil infecting the roots of germinating plants.

Rhizoctonia has a wide host range and crop rotations are not effective in controlling the disease. All crop, pasture and weed species grown in rotation are susceptible.

Rhizoctonia is sensitive to soil disturbance when the fungus is active. Cultivation breaks up the fungus in the soil and this severely retards its growth. Cultivation also controls weeds which host the disease.

FIELD TRIALS TO CONTROL RHIZOCTONIA

In 1993, field trials were undertaken to find more reliable methods to control rhizoctonia. The aim of this work was to compare the effectiveness of summer/autumn chemical and mechanical fallows in combination with different sowing systems, to control rhizoctonia root rot (Table 1).

Sites were selected at Kinnabulla, Charlton, Sea Lake and Meringur so control methods could be compared on different soil types. A preliminary report of the 1993 results is published in the March 1993 edition of the Mallee Farmer Newsletter.

KINNABULLA FIELD TRIAL

The Kinnabulla trial was established to examine and demonstrate different methods to control rhizoctonia root rot (see Table 1).

KINNABULLA FIELD TRIAL 1993: MANAGEMENT DETAILS	
Soil fertility:	Soil fertility was moderate at the Kinnabulla site (Table 2)
Plot design:	Plots were 40 m long * 2 m wide. Treatments were replicated five times.
Tillage:	Cultivated treatments worked on 20 April, 28 May and 23 June.
Seeder:	Plots sown with a modified Shearer Culti-Drill with Janke coulters, tynes, points and press wheels.
Sowing:	Plots sown on 23 June with Schooner barley @ 60 kg/ha.
Pre-sowing herbicide:	Roundup on 24 June @ 1 L/ha
Post-sowing herbicides:	Ally on 3 September @ 4 g/ha, Hoegrass on 27 October @ 1.4 L/ha
Assessments:	Root samples were assessed for rhizoctonia severity at early tillering (8 weeks after sowing) and at flowering.

Table 1. Treatments used to control rhizoctonia root rot in the 1993 field trials

Fallow treatments	Sowing treatments
• **Mechanical fallow** (Summer/Autumn) Worked up after first rain, worked after weeds germinated.	**Conventional:** seed sown after multiple cultivations, fertiliser placed with seed OR Deep banding: fertiliser banded 10 cm under the seed.
• **Chemical fallow** (Summer/Autumn) Weeds sprayed out after germination and kept weed free until sowing.	**Direct drill:** seed sown directly, no cultivation before sowing OR **Cultivate in the week prior to sowing** (Alternative to cultivating deep, sowing shallow) OR **Long narrow point:** spear point (with a deflector plate) which disrupted the soil 5 cm under the seedbed while sowing at the correct depth OR **Depth modified combine:** cultivating tynes set directly in line with sowing tynes, but work 5 cm deeper OR **Moisture seeking point:** points push the top 10 cm of soil away allowing seed to be sown into a moist seedbed OR **Deep banding:** fertiliser placed 10 cm under the seed.
• **No fallow** - Knock down herbicide Plots sprayed with Roundup in the week prior to sowing.	"As for chemical fallow"

Table 2: Results of soil tests for Kinnabulla trial site 1993

Soil type	Olsen P ppm	EDTA Zn ppm	Total N %	Organic Carbon %	Organic Matter %	pH (H_2O)
Sandy clay	10.6	2.1	0.13	1.6	3.1	8.1
	Moderate	Moderate	Normal	Low	Moderate	

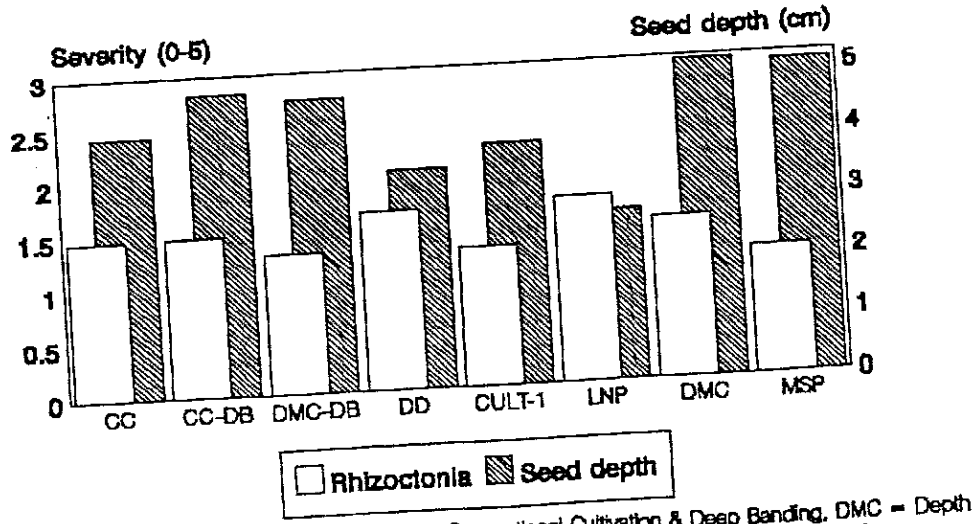
WHAT WERE THE BEST TREATMENTS AT KINNABULLA IN 1993?

The effects of different sowing systems on seed depth, rhizoctonia severity and grain yield are summarised in Figures 1 and 2. Severity is a measure of root damage caused by the rhizoctonia fungus.

SOWING SYSTEMS

Seed depth:

Different sowing systems placed seed at different depths. Deeper sowing decreased root damage, but did not affect grain yield (Figures 1 and 2).



Legend: CC = Conventional Cultivation, CC-DB = Conventional Cultivation & Deep Banding, DMC = Depth Modified Combine & Deep Banding, DD = Direct Drill, CULT-1 = Cultivation in week before sowing, LNP = Long Narrow Point, DMC = Depth Modified Combine, MSP = Moisture seeking point

Figure 1. Effect of sowing system on seed depth and rhizoctonia severity: Kinnabulla 1993

Rhizoctonia severity:

Root damage was greatest when plants were established by direct drilling or long narrow points. Plants established after sowing with the moisture seeking point had the least root damage (Figure 1).

Deep banded with the depth modified combine, cultivation in the week prior to sowing and the use of moisture seeking points reduced rhizoctonia severity, compared to the conventionally cultivated treatments (Figure 1).

Yield:

The highest yielding treatment was the moisture seeking point (2.54 t/ha). Yields for the conventionally cultivated treatment (2.12 t/ha) and the conventionally cultivated-deep banded treatment (2.12 t/ha) were significantly lower than all other treatments (Figure 2).

RESULTS FROM CHARLTON, SEA LAKE AND MERINGUR: 1993

Soil disturbance at sowing:

Rhizoctonia severity was low at the Charlton, Sea Lake and Meringur trial sites. The long narrow point, depth modified combine, cultivation within a week of sowing and moisture seeking point treatments all disturbed the soil at, or just prior to, sowing. This resulted in a reduction of rhizoctonia severity and increased yield.

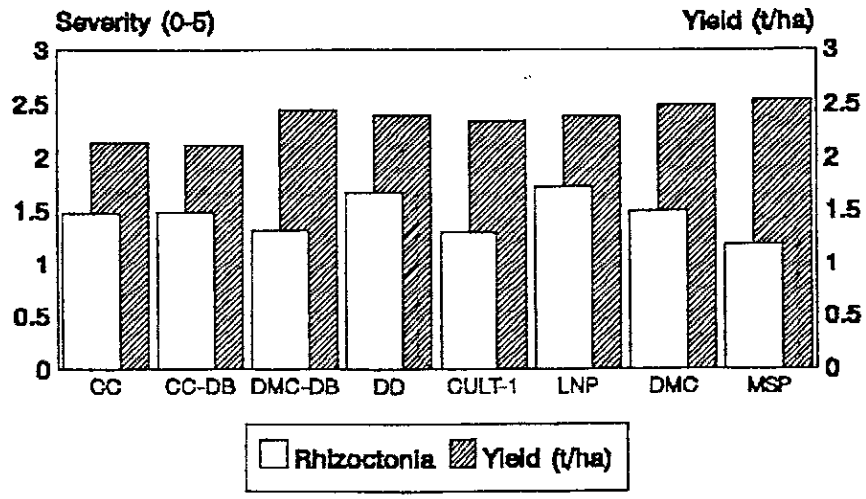


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Figure 2. Effect of sowing system on rhizoctonia severity and barley yield: Kinnabulla 1993

Deep banding

At Charlton, Sea Lake and Meringur deep banding fertiliser resulted in low rhizoctonia severity and high yields, compared to other treatments. The response was related to fertiliser placement rather then soil disturbance. In other treatments which included soil disturbance, but not fertiliser applications, a higher rhizoctonia severity resulted. Soil fertility was low at the Charlton, Sea Lake and Meringur sites compared to the Kinnabulla site.

CONCLUSIONS FROM 1993:

Rhizoctonia Severity Was Low

Rhizoctonia root rot was not severe during 1993 and did not cause large yield losses. There was no weed growth in the autumn due to lack of rain and the fungus did not get the opportunity to multiply on weed roots before sowing. In years with an early autumn break chemical fallowing is an important management strategy to control rhizoctonia.

Dry Cultivation did not reduce Rhizoctonia

There was no significant difference in root damage between the direct drilled and conventionally cultivated treatments. This indicates that cultivating, when the soil is dry, will have little impact on the severity of rhizoctonia.

Cultivation Reduced Yield

At Kinnabulla, yields of the conventionally cultivated and the conventionally cultivated-deep banded treatments were significantly lower than other treatments.

This was a very dry autumn in 1993 and the conventional cultivated treatments were scarified three times prior to sowing. This extra tillage may be dried out the soil profile in the conventional treatments compared to the untilled treatments. The reduction in the amount of soil moisture, available at sowing, may have led to lower yields.

Sowing Depth Was Critical

At the Kinnabulla site the direct drilled and long narrow point treatments placed seed at 2.5 - 3.5 cm. This results in more root damage compared to treatments that placed seed at 5 cm.

This is consistent with Western Australia research which has shown that plants grown from seed placed at 2-3 cm are more vulnerable to rhizoctonia attack than plants established from deeper sown seed (5 cm).

The reason for this is plant debris, containing rhizoctonia, is concentrated in the top 5 cm of soil. Therefore, when seed is sown deeper the seedling roots tend to escape the main concentration of the fungus.

Moisture Seeking Point Decreased Rhizoctonia And Increased Yield

The moisture seeking point was the most effective treatment in 1993. It increased yield by 0.42 t/ha and decreased the rhizoctonia severity score by 0.7, compared to the conventional treatments.

The success of this point was probably due to the dry autumn. the point pushes away the top 10 cm of soil and allows seed to be sown into a moist seed bed. Deeper sowing also means that seed is placed under the main concentration of rhizoctonia. However, this type of point is not suitable for all soil types.

Horses For Courses

Results from trials undertaken at Kinnabulla and other sites during 1993 indicate that the effect of different treatments was dependant on soil type, soil fertility and soil moisture. Management practices, to control rhizoctonia, may be different for each soil type.

FUTURE PLANS - 1994

In addition to the treatments outlined in Table 1 the 1994 field trials will also incorporate long chemical and cultivated fallows to determine if they are necessary to control rhizoctonia.

SUMMARY OF 1993 TRIAL RESULTS:

- Rhizoctonia severity was low in 1993.
- Cultivation of dry soil did not reduce the impact of the rhizoctonia.
- Shallow sowing (2.5 cm) may predispose plant roots to rhizoctonia.
- At Kinnabulla the moisture seeking point as the best treatment. it reduced rhizoctonia severity and increased yield.
- At Charlton, Sea Lake and Meringur soil disturbance at, or just prior to, sowing was important to reduced the severity of rhizoctonia.
- Deep banding fertiliser increased yield and decreased rhizoctonia severity at all sites except for Kinnabulla.
- The best management practices, to control rhizoctonia, may be different for each soil types.

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REMEMBER: BCDS Field Day - 14 September