1990

Rhizoctonia Bare Patch of Cereals and Lupins. Sterile red fungus (SRF) and control of take-all disease in wheat.

G. C. Macnish

TITLE: Rhizoctonia Bare Patch of Cereals and Lupins

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Western Australian Department of Agriculture
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EXPERIMENTAL SUMMARY 1990

Rhizoctonia Bare Patch of Cereals and Lupins

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Title: Rhizoctonia Strains and Paddock History

Experiment: 86E31

File: 4901EX

Location: EDRS (paddock C5)

Soil: Sandy gravel

History: Long term pasture site (? never cropped prior to 1986)

Aim: To determine the effects of pasture, cultivation and cropping on Rhizoctonia root rot, Rhizoctonia patch and distribution of patch and non-patch strains of R. spp.

Treatments:

	1986	1987	1988	1989
1.	P (undist.)	P (undist.)	B (cult.)	B (cult.)
2.	P (undist.)	P (undist.)	B (min. till.)	B (min. till.)
3.	P (cult.)	P (cult.)	B (cult.)	B (cult.)
4.	P (cult.)	P (cult.)	B (min. till.)	B (min. till.)
5.	W (min. till.)	B (min. till.)	B (cult.)	B (cult.)
6.	W (min. till.)	B (min. till.)	B (min. till.)	B (min. till.)
7.	W (cult.)	B (cult.)	B (cult.)	B (cult.)
8.	W (cult.)	B (cult.)	B (min. till.)	B (min. till.)
9.	P (undist.)	P (undist.)	P (undist.)	B (cult.)
10.	P (undist.)	P (undist.)	P (undist.)	B (min. till.)

P = Pasture; W = Wheat; B = Barley; cult = cultivated; min. till = minimum tillage.

1991

Treatments 1, 3, 5, 7 and 9	(Rep 1)	Lupins cultivated
Treatments 2, 4, 6, 8 and 10	(Rep 1)	Lupins minimum tillage
Treatments 1 to 10	(Rep 2)	Ungrazed pasture
Treatments 1, 3, 5, 7 and 9	(Rep 3)	Barley cultivated
Treatments 2, 4, 6, 8 and 10	(Rep 3)	Barley minimum tillage
Treatments 1 to 10	(Rep 4)	Grazed pasture

Methods:

Site preparation: 8/6/90 Roundup, 18/6/90 Sprayseed @ 2.0 L/ha
20/6/90 cultivated plots cultivated twice

Experimental design: Originally, randomized complete block with split plot. Four replications.

Plot size: 40 x 1.7 m

Sown: 20/6/90

Sampled - date: No samples taken - area used for mapping experiments with removal of cores at regular intervals.

Results:

Two sampling experiments conducted in 1989-90. Thirty-two sets of samples were removed at intervals over a 12 month period. These indicated that the recovery of patch forming strains of R. solani was not affected by the summer dry period. However the amount of damage the surviving pathogen could do to the host was gradually reduced during the summer months. A return to wet conditions after the break-of-season saw a rapid recovery of the amount of damage the fungus could inflict.

Results from similar experiments conducted in 1990-91 are not available.

Title:	Rhizoctonia Patch Mini-plot Establishment Area
Experiment:	88E39
File:	5782EX
Location:	EDRS (paddock N1B)
Soil:	Sandy soil with gravel
History:	Pasture in 1986, crop 1987
Aim:	To examine the effects of cultivation and minimum tillage in patches in lupins and to provide sites for mini-plot experiment.
Treatments:	1. Lupins sown with cultivation - plots 1 to 8 and plots 23 to 30. 2. Lupins sown with minimum tillage - plots 9 to 22.

Methods:

Site preparation:	23/5/90 Sprayseed @ 1.5 L/ha + Simazine @ 2.0 L/ha 12/6/90 Sprayseed @ 2.0 L/ha
Experimental design:	Not applicable
Plot size:	1.7 m x 40 m
Sown:	15/6/90 Gungurru @ 90 kg/ha, Super Mn @ 195 kg/ha
Sampled - date:	No samples taken - area used for mapping experiments with removal of cores at regular intervals.
Results:	Similar to those for 86E31.

Title: Rhizoctonia Bare Patch Establishment Area

Experiment: 88KO15

File: 5782EX

Location: Kojaneerup annex

Soil: Sandy with some gravel

History: Pasture in 1987

Aim: To establish an area (with a known history) for future research.

Treatments:

	1988	1989	1990
1.	Pasture	Pasture	Pasture
2.	Barley cult.*	Barley cult.	Lupin cult.
3.	Barley min. till.*	Barley min. till.	Lupin min. till.

* Cult. = Cultivated; min. till. = minimum tillage

Methods:

Site preparation: April raked and burnt stubble, 1/5/90 300 sheep for 1 day

Experimental design: Three treatments randomized - no replications

Plot size: 200 x 60 m

Sown: 24/5/90 Gungurru @ 90 kg/ha with super at 20 kg/ha

Sampled - date: 22/11/90

Method: Cores removed from 22 patches

Assessed: Mapped bare patches

Results: Patches were observed for the first time in part of treatment 3 (minimum tillage). All 45 district patches were mapped. The patches tended to be in clusters and elongated in the direction of sowing. Cores were removed from 22 patches and all yielded the patch forming strain ZG2. No patches were observed in the cultivated or pasture plots.

Comments: The establishment of rhizoctonia bare patch at this site should provide interesting information on the spread of this disease.

Title: Rhizoctonia Bare Patch and the Influence of Pasture Growth

Experiment: 89E12

File: 4126EX

Location: EDRS (paddock W11)

Soil: Flemming gravelly sand

History: 1986 - cereals; 1987 - clover pasture, 1988 - clover pasture

Aim: To test the hypothesis that build up in grassy pasture leads to increased rhizoctonia bare patch

Treatments:

	1989	1990
1.	Rank grass pasture ungrazed	Barley
2.	Grass pasture grazed	Barley
3.	Broadleaf pasture grazed	Barley
4.	Bare chemical fallow	Barley
5.	Rank pasture ungrazed	Barley

Methods:

Site preparation: 18/5/90 Sprayseed @ 1.5 L/ha, 7/6/90 Dicamba @ 0.7 L/ha 12/6/90 Sprayseed @ 1.0 L/ha

Experimental design: Randomized complete block with grazed pasture covariates on either side of each plot

Plot size: 5 x 5 m

Sown: 13/6/90 Windich @ 87.5 kg/ha using triple-disc undercarriage. Super 109 kg/ha

Sampled - date: 18/9/90

Method: Scored each plot for patch density and severity by placing a 10 x 10 grid (100 quadrats each 0.5 x 0.5 m square) over the plot

Assessed: Rhizoctonia bare patch (number of quadrats positive and severity score for each quadrat (0 = no patch, 1 = moderate and 2 = severe))

Results:

Table 1. Mean quadrats positive, patch score and yield results (89E12). Mean of 10 plots except yield (7 plots)

Treatments	Quadrats positive patch per plot (max. 100)	Patch score per plot†	Yield[S] kg/ha
Mixed pasture ungrazed	10[A]	13	2,634[A]
Pure grass ungrazed	17[A]	23	2,025[BC]
Grass free pasture grazed	17[A]	22	2,197[AB]
Pure grass grazed	24[AB]	31	1,610[CD]
Chemical fallow	35[B]	47	1,533[D]
Significance	*	NS	***
S.E.M.	6	8	168
Mixed pasture grazed‡	16	19	2,047
S.E.M.	4	5	55

† Each of 100 quadrats per plot scored; 0 - no patch (plant height 40 cm), 1 - moderate (22 cm) and 2 - severe (12 cm).

‡ Mean of 50 plots.

S From 7 reps only.

Relationship between bare patch and yield (50 untreated covariant plots only).

Quadrats positive per plot $y = 2,407 - 22.7x$, $r^2 = 0.70$
Patch score per plot $y = 2,364 - 16.4x$, $r^2 = 0.67$
where y = yield (kg/ha).

Comments: The hypothesis was not supported. There was a trend towards the opposite position with the chemical fallow having the most patch.

Title:	Rhizoctonia Bare Patch and Seed Size, Depth of Sowing Interaction
Experiment:	90E54
File:	4126EX
Location:	EDRS (paddock W7)
Soil:	Gibson sandy over clay
History:	Oats 1988, Lupin 1989
Aim:	This experiment aims to test the hypothesis that small seed planted deep will be weaker and more prone to attack by R. solani than large seed planted shallow.
Treatments:	1. Small seed - sown at 2 cm - scarified twice to 10 cm. 2. Small seed - sown at 2 cm - no cultivation. 3. Small seed - sown at 4 cm - scarified twice to 10 cm. 4. Small seed - sown at 4 cm - no cultivation. 5-8. Large seed - as above.
Methods:	
Site preparation:	21/3/90 Glysophate @ 0.5 L/ha 12/4/90 raked 8/5/90 Sprayseed @ 1.5 L/ha 22/5/90 Sprayseed @ 1.0 L/ha
Experimental design:	Randomized complete block. Five replications.
Plot size:	40 x 1.42 m
Sown:	14/6/90 Gutha with 105 kg/ha of super. Small seed 56 kg/ha and large seed 72 kg/ha sown with minimum tillage.
Sampled - date:	5/7/90 and 20/7/90 for plant density.

Results:

Table 2. Mean plant density (plants/m^2) at 21 and 36 days and yield at Esperance Downs Research Station (90E54) (data analysed as a factorial)

Treatments	Plant density 21 days	Plant density 36 days	Yield kg/ha
Seed size			
Small	102	97	4,438
Large	110	107	4,726
Significance	**	**	***
SEM	2	2	46
Depth of sowing			
2 cm	105	100	4,581
4 cm	108	105	4,584
Significance	NS	NS	NS
SEM	2	2	46
Cultivation			
Scarified	104	101	4,584
Nil	109	104	4,581
Significance	NS	NS	NS
SEM	2	2	46

Comments: There were no rhizoctonia bare patches at this site. Large seed increased plant density and yield.

Title:	Rhizoctonia Bare Patch and Seed Size, Depth of Sowing Interaction
Experiment:	90E55
File:	4126EX
Location:	EDRS (paddock W11)
Soil:	Flemming gravelly sand
History:	1986 - cereals, 1987 - clover, 1988 - clover, 1989 manipulated pasture
Aim:	This experiment aims to test the hypothesis that small seed planted deep will be weaker and more prone to attach by R. solani than large seed planted shallow.
Treatments:	1. Small seed - sown at 2 cm - scarified twice to 10 cm. 2. Small seed - sown at 2 cm - no cultivation. 3. Small seed - sown at 4 cm - scarified twice to 10 cm. 4. Small seed - sown at 4 cm - no cultivation. 5-8. Large seed - as above.
Methods:	
Site preparation:	18/5/90 Sprayseed @ 1.5 L/ha 7/6/90 Dicamba @ 0.7 L/ha 12/6/90 Sprayseed @ 1.0 L/ha
Experimental design:	Randomized complete block. Five replications.
Plot size:	1.42 x 40 m
Sown:	14/6/90 Gutha with 105 kg/ha super. Small seed 56 kg/ha and large seed 72 kg/ha sown with minimum tillage.
Sampled - date:	5/7/90 and 20/7/90 for plant density. Mapped for bare patch 24/10/90.

Results:

Table 3. Mean plant density (plants/m^2) at 21 and 36 days, rhizoctonia bare patch score and yield for wheat grown at Esperance Downs Research Station (90E55) (data analysed as a factorial)

Treatments	Plant density 21 days	Plant density 36 days[A]	Bare patch score (max. 240)	Yield kg/ha
Seed size				
Small	92	90	5.9	2,547
Large	100	100	5.0	2,622
Significance	**	**	NS	NS
SEM	2	2	1.4	36
Depth of sowing				
2 cm	99	96	5.9	2,582
4 cm	93	94	5.0	2,588
Significance	*	NS	NS	NS
SEM	2	2	1.4	36
Cultivation				
Scarified	87	89	0.3	2,739
Nil	103	101	10.5	2,430
Significance	***	**	***	***
SEM	2	2	1.4	36

[A] At 36 days there was a significant (P = 0.049) interaction between seed size and depth, small 2 cm - 141, small 4 cm - 130, large 2 cm - 147, large 4 cm - 153.

Comments: The level of bare patch was low. The hypothesis was not supported with seed size and depth having no effect on rhizoctonia bare patch. Scarification reduced plant density and rhizoctonia bare patch but increased yield. This increase in yield is probably due in part to reductions in bare patch following cultivation.

Title: Rhizoctonia Bare Patch and Seed Size Interaction

Experiment: 90SG61

File: 4126EX

Location: R. Graham lease block (paddock T1)

Soil: Circle Valley sand

History: Medic pasture 1988 and 1989

Aim: This experiment aims to test the hypothesis that plants grown from small seed will be weaker and more prone to attack by R. solani than plants from large seed.

Treatments:
1. Small seed - sown at 2 cm - scarified twice to 10 cm.
2. Small seed - sown at 2 cm - no cultivation.
3. Large seed - sown at 2 cm - scarified twice to 10 cm.
4. Large seed - sown at 2 cm - no cultivation.

Methods:

Site preparation: 28/4/90 Roundup 0.6 L/ha
14/6/90 Sprayseed 2.0 L/ha

Experimental design: Randomized complete block. Ten replications.

Plot size: 1.42 x 40 m

Sown: 18/6/90 Gutha with 104 kg/ha super. Small seed 56 kg/ha and large seed 72 kg/ha sown with minimum tillage.

Sampled - date: 13/7/90 and 6/8/90 for density. Mapped for bare patch 14/11/90.

Results:

Table 4. Mean plant density (plants/m^2) at 25 and 42 days, rhizoctonia bare patch score and yield for wheat grown at Circle Valley (90SG61) (data analysed as a factorial)

Treatments	Plant density 25 days	Plant density 42 days	Bare patch score (max. 240)	Yield kg/ha
Seed size				
Small	80	84	15.1	622
Large	86	89	15.7	668
Significance	NS	NS	NS	*
SEM	2	2	2.8	12
Cultivation				
Scarified	90	96	10.9	687
Nil	76	78	19.9	603
	***	***	*	***
	2	2	2.8	12

Comments: The hypothesis was not supported with seed size having no effect on rhizoctonia bare patch. Large seed size increased yield. Scarification significantly increased plant density and yield, but reduced rhizoctonia bare patch. Some of the increase in yield is probably due to reductions in bare patch following cultivation.