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DEPARTMENT OF AGRICULTURE

WESTERN AUSTRALIA

SUMMARY OF EXPERIMENTAL RESULTS 1984

Brown spot of lupins.

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Table 1: Fungicide treatment of lupin seed - 84WH34.

Treatment (Rovral, g/kg)	Germination (plants/m ²)	Disease (4-6 leaf stage)		Disease (12-14 leaf stage)		Yield (t/ha)
		Leaf $\sqrt{(\text{LN}^* + \frac{1}{2})}$	Cotyledon (% infected)	Leaf $\sqrt{(\text{LN} + \frac{1}{2})}$		
Nil	31	.844	28.2	1.145		1.29
1.25	33	.751	26.1	0.930		1.33
2.00	32	.758	33.3	1.041		1.42
2.50	30	.778	39.2	0.950		1.41
A.O.V.	NS	NS		NS†		NS

* lesion number

† t-test of treated vs untreated gives a significant response (p = 0.05)

Disease levels were not high enough to cause defoliation. Although treating seed with Rovral gave a statistically significant reduction in brown leaf spot, assessed at the 12-14 leaf stage, this was not reflected in a statistically significant yield response. However there was a trend toward higher yields with treated seed.

Table 2: Fungicide treatment of lupin seed - 84BA31.

Treatment (Rovral, g/kg)	Germination (plants/m ²)	Disease (4-6 leaf stage)		Disease (12-14 leaf stage)		Yield (t/ha)
		Leaf $\sqrt{(\text{LN} + \frac{1}{2})}$	Cotyledon (% infected)	Leaf $\sqrt{(\text{LN} + \frac{1}{2})}$		
Nil	31	0.714	3.9	.879		1.31
1.25	26	0.720	21.9	.826		1.04
2.00	29	0.718	34.9	.791		0.99
2.50	30	0.719	32.7	.825		1.32
A.O.V.	NS	NS		NS†		*
LSD (5%)						0.23

† t-test of treated vs untreated gave a significant response (p = 0.05).

Disease levels were too low to result in defoliation. Rovral seed treatment gave a slight (but significant) reduction in disease at the 12-14 leaf stage. An unexplained result was an apparent effect of Rovral in increasing the number of infected cotyledons. The yields of the two treatments with the lower rates of Rovral were lower than either the control or the high rate of Rovral treatment. The trial site was affected with cucumber mosaic virus which had a severity gradient diagonally across the block.

Obviously affected areas were avoided during brown spot disease ratings but may have resulted in yield variations, which in turn produced spurious treatment effects.

Table 3: Fungicide treatment of lupin seed - 84M37.

Treatment (Rovral, g/kg)	Germination (plants/m ²)	Disease (4-6 leaf stage)		Disease (12-14 leaf stage)		Yield (t/ha)
		Leaf $\sqrt{\left(LN^* + \frac{1}{2} \right)}$	Cotyledon (% infected)	Leaf $\sqrt{\left(LN + \frac{1}{2} \right)}$	Leaf area affected	
Nil	29	0.756	24.4	1.320	0.991	0.61
1.25	36	0.772	15.5	1.209	0.878	0.55
2.00	30	0.748	17.4	1.109	0.867	0.43
2.50	31	0.722	23.4	0.946	0.723	0.54
A.O.V.		NS		NS	NS	NS

* Lesion number

Again, there was only a low level of infection, insufficient to cause defoliation. There were trends for lower levels of leaf infection with higher levels of fungicide but the effects were not statistically significant.

Table 4: Effect of cereal stubble treatment on brown spot - 84WH27.

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TABLE 4: EFFECT OF CEREAL STUBBLE TREATMENT ON BROWN SPOT - 84WH27

TREATMENT	GERMINATION (PLANTS/M ²)	DISEASE (4-6 LEAF) LEAF DISEASE $\sqrt{LN+\frac{1}{2}}$	DISEASE (12-14 LEAF)		DISEASE		YIELD (t/ha)	
			LEAF $\sqrt{LN+\frac{1}{2}}$	LEAF AREA INFECTED (%)	DEFOLIATION $\sqrt{D+\frac{1}{2}}$	14-16 LEAF- DEFOLIATION $\sqrt{D+\frac{1}{2}}$		16-18 LEAF DEFOLIATION $\sqrt{D+\frac{1}{2}}$
Trash retained	29	1.500	1.473	1.048	1.62	1.73	2.20	1.03
raked	30	1.620	1.818	1.202	1.68	2.30	2.70	0.84
burnt	26	1.550	2.234	1.589	1.73	2.45	2.97	0.54
AOV	NS	NS	**	*	NS	NS ⁺	NS	NS
LSD (5%)			0.341	0.312				

+ A t-test between stubble retained and stubble treatment showed a significant difference (p = 0.05)

Thus either raking or burning of cereal stubble resulted in increased levels of leaf disease which became more marked at the 12-14 leaf stage. Although there was a trend for lower yields when cereal stubble was either raked or burnt, the differences between treatments were not statistically different because of high variation between replicates. Unfortunately, half the plots were lost due to the use of Illyarrie seed from Chapman which was later shown to have a very low germination.

Table 5: Effect of Rovral sprays on brown spot 84N056.

Treatment	Disease (4-6 leaf)	Disease (12-14 leaf stage)		Yield (t/ha)	
	lesion no. $\sqrt{\left(\frac{LN + \frac{1}{2}}{2}\right)}$	Lesion no. $\sqrt{\left(\frac{LN + \frac{1}{2}}{2}\right)}$	Leaf area infected (0-5)		Defoliation (leaves/plant)
Seed treatment (tt) only (T0)	1.581	1.732	0.9302	1.027	0.686
One spray (T1)	1.631	1.716	0.7966	0.952	0.528
Seed tt + 1 spray (T0 + T1)	1.572	1.602	0.7786	0.875	0.604
Two sprays (T1 + T2)	1.631	1.823	0.7590	0.956	0.426
Seed tt + 2 sprays (T0 + T1 + T2)	1.660	1.614	0.7538	0.926	0.486
Seed tt + 1 spray (T0 + T3)	1.603	1.696	0.9138	0.951	0.582
Seed tt + 3 sprays (T0 + T1 + T2 + T3)	1.720	1.677	0.7472	0.938	0.616
Unsprayed control	1.647	1.811	0.9960	1.046	0.540
A.O.V.	NS	NS	**	NS†	NS
LSD (5%)			0.0659		

† A t-test between control and Rovral treatment (either as a seed treatment or spray) indicates a significant treatment effect.

There were very low levels of disease. However the rating of leaf area infected appeared to be the most sensitive disease measurement, showing that with any treatment containing an early spray (T1) disease was significantly reduced.

Treatment effects on yields were not statistically significant presumably because disease levels were too low.

Table 6: Effect of Rovral sprays on brown spot - 84N057.

Treatment	Disease (4-6 leaf) lesion no. $\sqrt{(LN + \frac{1}{2})}$	Disease (12-14 leaf) lesion no. $\sqrt{(LN + \frac{1}{2})}$	Yield (t/ha)
Seed treatment (tt) only (T0)	1.144	1.154	0.867
One spray (T1)	1.035	1.281	0.748
Seed tt + 1 spray (T0 + T1)	1.050	1.005	0.895
Two sprays (T1 + T2)	1.035	1.215	0.698
Seed tt + 2 sprays (T0 + T1 + T2)	1.005	0.993	0.855
Seed tt = 1 spray (T0 + T3)	0.936	1.171	0.865
Seed tt + 3 sprays (T0 + T1 + T2 + T3)	0.832	0.903	0.938
Unsprayed control	1.240	1.310	0.753
A.O.V.	NS†	**	NS
LSD (5%)		0.198	

† A t-test on treated vs non-treated showed a significant reduction of disease with Rovral treatment.

Therefore the best control of disease (as assessed at the 12-14 leaf stage) was obtained with a combination of a seed treatment with at least one early spray. Observations indicated that disease was appearing earlier on this trial than the previous spray trial 84N056, thus offering an explanation for this treatment effect.

Table 7: Effect of sowing date and seed treatment - 84BA26.

Treatment*	Disease (4-6 leaf) Leaf area infected (0-5)	Disease (18+ leaf stage) Leaf area infected (0-5)	Defoliation (nos/plant)	Yield (t/ha)
<u>Sowing date</u> 1	1.195	1.1950	2.326	.660
2	1.108	1.1094	2.014	.845
3	1.121	1.1217	1.334	.723
A.O.V.		NS	***	NS
LSD (5%)		-	0.179	
<u>Fungicide*</u>				
Control	1.287	1.2878	2.198	.735
Rov 2.5g/kg S	1.152	1.1511	1.871	.754
SOLIN	1.149	1.1511	1.892	.796
Rov 25g/kg METH	1.026	1.0278	1.600	.741
Rov Ben 5g/kg METH	1.110	1.1100	1.863	.732
Rov Riz 5g/kg METH	1.125	1.1244	1.924	.698
A.O.V.		***	***	NS
LSD (5%)		0.0489	0.136	

Sowing date x fungicide **

* Rov = Rovral, Ben = Benlate, Riz = Rizolex, S = slurry, SOLIN = solvent infusion, METH = Methocel incorporated.

Time of sowing had an effect both on leaf area infected, and defoliation scores obtained at the second disease assessment. However only significant differences were obtained with the defoliation counts.

The results show that with early times of planting, disease was more severe, although only low levels were present. This effect of time of sowing probably resulted from frequent rainy days during May and early June providing suitable conditions for infection in earlier planted plots. Unfortunately, disease levels were not high enough to significantly influence yield. Fungicide seed treatments also gave small but significant reductions in disease, with the best treatment being the very high rate of Rovral incorporated in methocel. The standard treatment of 2.5 gm of Rovral applied as a slurry to 1 kg of seed was as effective as any of the other treatments. There was a significant sowing date x fungicide interaction with fungicide treatment being most effective with early times of planting.

Table 8: Effect of sowing date and seed treatment - 84WH28.

Treatment [†]	Disease (4-6 leaf) lesion no.	Disease (18+ leaf stage) Leaf area infected (0-5)	Defoliation (nos/plant)	Yield (t/ha)
<u>Sowing date</u> 1	1.824	1.301	1.811	1.143
2	1.946	1.329	1.492	1.273
3	1.586	0.989	0.774	0.545
A.O.V.	*	**	***	NS
LSD (5%)	0.244	0.140	0.245	
<u>Fungicide</u>				
Control	2.010	1.286	1.582	0.914
Rov 2.5g/kg S	1.790	1.206	1.308	1.051
SOLIN	1.848	1.248	1.409	1.034
Rov 25g/kg METH	1.700	1.070	1.120	0.990
Rov Ben 5g/kg METH	1.694	1.200	1.336	0.999
Rov Riz 5g/kg METH	1.670	1.228	1.398	0.934
A.O.V.	*	***	***	NS
LSD (5%)	0.196	0.089	0.130	

[†] Legend as for 84BA26.

Results were similar to those obtained in the identical trial, 84BA26, although disease levels were lower.

Again, brown spot was more severe with earlier sowing, and the most effective control was obtained with the very high rate of Rovral seed treatment. The standard treatment of 2.5 gm of Rovral applied as a slurry to 1 kg of seed was as effective as any of the other treatments.

Rovral treatment of farmers' paddocks.

Farmers' paddocks considered to have a high risk of brown spot in 1984 were selected throughout the lupin growing areas by District Office Advisers.

Sufficient Rovral to treat a central area of 1 ha at the standard rate of 2.5 gm/kg of seed was provided. Of 28 paddocks, only 5 were considered to have sufficient infection to warrant detailed disease assessments and yield measurements. The results are summarized in Table 9.

Table 9: The effect of Rovral seed treatment on brown spot on farmers' lupin crops.

Site	Plant density (nos/m ²)	Dry weight (gm/plant)	Disease (12-14 leaf)		Yield (t/ha)	
			Leaf area infected (0-3)	Defoliation (leaves/plant)		
Three Springs 1.						
Untreated	21.2	0.377	0.970	0.847	1.44	
Treated	27.4	0.638	0.053	0.037	2.16	
t-test						
(density, χ^2)	*	*	*	*	*	
2.						
Untreated				15.47†	0.77	
Treated				9.33†	1.09	
t-test						
(density, χ^2)				NS	NS	
† Disease rating done at flowering stage.						
Marchagee						
Untreated	48.7	0.946	1.957	5.03	1.50	
Treated	41.4	0.982	0.500	2.78	1.18	
t-test						
(density, χ^2)	*	NS	*	*	*	
North Gabin						
Untreated	36.4	0.719	1.610	4.07	1.31†	1.09
Treated	51.5	0.698	0.303	0.48	1.23†	0.85
t-test						
(density, χ^2)	*	NS	*	NS	NS	NS
E. Wannamal						
Untreated	47.1	0.242			0.67	
Treated	53.9	0.210			0.67	
t-test						
(density, χ^2)	*	NS			NS	

† yield figures obtained from quadrat sampling

The table shows that in all cases, where disease was measured, Rovral seed treatment had a marked effect in reducing levels of brown spot.

At three sites there was also an increase in plant density in treated areas, possibly because of control of hypocotyl and root rots. In one case, (Marchagee site) there was a depression of plant density which could have been partly or wholly responsible for the significant effect on yield. It is thought that failure of the treated seed to flow freely through the drill was responsible. At only one site (Three Springs 1) was a significant yield response obtained with the Rovral treatment. This probably resulted from a combination of higher plant density and lower levels of brown spot.

It is surprising that a yield response was not obtained at North Gabin in view of higher levels of brown spot being present and a marked effect of Rovral in controlling the disease. A lack of finishing rains is a possible reason for the lack of a yield response at this site.