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# Lupin and Serradella Inoculation Experiments

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PLANT RESEARCH DIVISION

1969 RESULTS OF FIELD EXPERIMENTS

D.L. Chatel - Research Officer

1969 Trials

"LUPIN AND SERRADELLA INOCULATION EXPERIMENTS"

## LUPIN AND SERRADELLA INOCULATION EXPERIMENTS

BACKGROUND:

During 1967 there were a number of reports of poor establishment of Weiko and Uniwhite lupins.

Because of the possibility of either delayed nodulation or insufficient nitrogen fixation being involved, an experiment was conducted during 1968 to examine a range of lupin rhizobia isolates in the field (a summary of this experiment was circulated during 1969). In this experiment two strains, WU425 and WU43, showed sufficient promise to warrant additional testing in 1969.

A series of experiments were laid down in 1969 in which the two new strains of Rhizobium lupini were compared with strain W72 (commercial strain) and an uninoculated control.

LOCATION AND DESIGN:

There were three sites:-

- (1) Lancelin 69M015, 16.  
On coarse yellow sand of pH 6.2, with limestone floaters - 2.0 per cent clay at surface. Lancelin sandplain scrub (Banksia, Christmas tree). Cleared and burnt summer 1967, ploughed winter 1967 and autumn 1968. Sown to wheat in 1968 with 180 lb superphosphate, 1.5 lb ZnO, 10 lb CuSO<sub>4</sub> and 60 lb urea.
- (2) Eneabba 69TS22, 23.  
On grey sand overlying gravel at 9 - 15 inches. Burnt and ploughed 1968. Not root raked. Eneabba sandplain scrub.
- (3) Esperance Forestry block 69 E27, 28.  
On grey sand overlying clay at 16 - 24 inches. Chained, ploughed and raked from early 1969.

The experiments were laid out as randomised blocks. In the lupin experiments (69M015, 69TS22 and 69E27) there were 4 inoculant treatments and 4 replications. Each of the 16 plots was split with respect to host plant. There were 5 replications in the serradella experiments (69M016, 69TS23 and 69E28).

TREATMENTS:

Host plants - Lupinus cosentini (W.A. Blue)  
- L. luteus (Weiko)  
- L. angustifolius (Uniwhite)  
- Ornithopus compressus (W.A. Serradella)

Rhizobia\* - 0, W72, WU425, WU43.

Two by 25 link rows (2 links apart) of each host were sown in each plot. Seed was sown with 3 - 4 in. spacings.

Seed was inoculated with laboratory prepared peats

(WU425 and WU43) and commercial peat (W72) the day before sowing. The inoculum was applied with Methofas sticker.

FERTILISER:

Lancelin : 300 lb superphosphate, 2.0 oz MoO<sub>3</sub>,  
8.0 oz CoSO<sub>4</sub> per acre.

Eneabba : 300 lb Cu, Zn (A mix) superphosphate  
per acre.

Esperance : 360 lb Cu, Zn (A mix) superphosphate  
per acre.

RESULTS:

Fresh weights are presented in Tables 1 and 2. Treatment WU43 was disappointing. It is considered that this was primarily due to the poor quality of the "home made" peat inoculants (they were grossly contaminated).

Poor recovery of WU425 from the nodules of the WU425 inoculated plants for the second Lancelin sowing indicated an inoculant failure - probably for the same reason as outlined above for WU43.

The nodulation data is presented in Tables 3 and 4. It can be seen that in most cases the WU43 inoculated plants gave similar nodulation patterns to the uninoculated controls. As was the case with the top yields, the WU425 was quite inferior for the second Lancelin sowing.

The prompt nodulation of W.A. Blue at Esperance was not reflected in the top yields. This highlights the inadequacy of the wild-type rhizobia to form an effective symbiosis, in this situation. The wild-type rhizobia were much more effective at Eneabba.

CONCLUSION:

Overall WU425 seems no worse than W72; in fact, there is a tendency for it to be superior. Some counts of the rhizobia in the peats used for inoculation indicated that the WU425 population was lower than that of W72. It is possible that WU425 would have performed better if higher inoculum densities were used.

W72 was quite inferior to WU425 in tests conducted by U-DALS in N.S.W.

Although no problems with either lupins or serradella can be directly related to the use of W72 in the commercial inoculants, it has been recommended that the culture be changed for the 1970 season.

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\* WU425 - isolated by C.A. Parker from O. compressus.  
WU43 - isolated by R.T. Lange from L. luteus.  
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Post Script: The commercial peats available for lupins and serradella for the coming season contain WU425 in place of W72.

TABLE 1

Fresh Weight Lupins (Gm/20 Plants)

Site	Date Sown	Date Harvested	Host	Treatment				Significance +
				Nil	W72	WU43	WU425	
Lancelin 1	6/5	17/9	W.A. Blue	3073	3365	2859	3199	425 = 72 > 43, Nil 72 > Rest 425 = 72 > Nil
			Uniwhite	1957	2912	2176	2179	
			Weiko	1759	2317	1745	2369	
Lancelin 2*	5/6	17/10	W.A. Blue	275	1166	697	424	72 > Rest 72 > Rest N.S.
			Uniwhite	271	465	278	297	
			Weiko	481	538	386	466	
Lancelin 3	4/7	23/10	W.A. Blue	768	913	1364	1342	425 > 72 = Nil N.S. 425 = 72 > Nil
			Uniwhite	423	688	648	702	
			Weiko	503	1204	986	1149	
Eneabba	23/4	4/9	W.A. Blue	1021	1313	1464	1303	N.S. N.S. N.S.
			Uniwhite	891	729	1042	1053	
			Weiko	1762	2243	1778	1974	
Esperance	14/5	24/9	W.A. Blue	377	1684	534	2147	425 > 72 > Nil 425 = 72 > Nil 425 = 72 > Nil
			Uniwhite	570	2399	936	2112	
			Weiko	271	2377	855	2016	

\* Dry Weights

+ Based on L.S.D's - WU43 not considered.

TABLE 2

Dry Weight Serradella (Gm/20 Plants)

Site	Date Sown	Date Harvested	Treatment				Significance
			Nil	W72	WU43	WU425	
Lancelin 1	6/5	17/9	15.6	25.0	20.4	17.8	N.S.
Lancelin 2	5/6	17/10	9.1	22.0	17.6	8.7	72 > 425, Nil
Lancelin 3	4/7	17/10	Drought Affected				
Eneabba	23/4	4/9	16.6	20.0	16.4	21.4	N.S.
Esperance	14/5	24/9	42.0	136.0	76.0	230.0	425 > 72

TABLE 3

## Nodulation Lupins (Per Cent.)\*

Site	Date Sown	Date Harvested	Host	Nil			W72			WU43			WU425		
				E	L	N	E	L	N	E	L	N	E	L	N
Lancelin 1	6/5	17/9	W.A. Blue	80	17	3	90	10	0	76	23	1	71	28	1
			Uniwhite	24	74	2	74	26	0	27	70	3	41	59	0
			Weiko	45	27	28	96	4	0	42	43	15	89	7	4
Lancelin 2	5/6	17/10	W.A. Blue	83	10	7	100	0	0	94	6	0	80	20	0
			Uniwhite	28	66	6	94	6	0	69	31	0	24	72	4
			Weiko	66	16	18	100	0	0	91	5	4	49	35	16
Lancelin 3	4/7	23/10	W.A. Blue	75	11	14	86	9	5	90	9	1	100	0	0
			Uniwhite	55	35	10	99	1	0	95	5	0	94	6	0
			Weiko	53	11	36	100	0	0	100	0	0	100	0	0
Eneabba	23/4	4/9	W.A. Blue	59	34	7	91	8	1	51	43	6	81	16	3
			Uniwhite	14	84	2	77	23	0	15	75	10	54	46	0
			Weiko	34	41	25	89	7	4	41	49	10	92	8	0
Esperance	14/5	24/9	W.A. Blue	96	3	1	96	4	0	99	1	0	100	0	0
			Uniwhite	16	68	16	90	9	1	26	69	5	96	4	0
			Weiko	23	15	62	97	3	0	75	18	7	100	0	0

\* E (Early) = Early nodulation (nodules on upper tap-root, within 4 inches of ground surface).

L (Late) = Nodulated, but not on upper tap-root.

N (Nil) = No nodules.



TABLE 4

## Nodulation Serradella (W.A.) (Per Cent)\*

Site	Date Sown	Date Harvested	Nil			W72			WU43			WU425		
			E	L	N	E	L	N	E	L	N	E	L	N
Lancelin 1	6/5	17/9	12	79	9	78	18	4	16	79	5	9	80	11
Lancelin 2	5/6	17/10	11	55	34	98	2	0	91	9	0	12	44	44
Lancelin 3	4/7	17/10	22	27	51	99	1	0	100	0	0	100	0	0
Eneabba	23/4	4/9	12	75	13	82	17	1	18	77	5	59	40	1
Esperance	14/5	24/9	19	65	16	73	24	3	48	46	6	69	19	12

\* E (Early) : Early nodulation (nodules on upper tap-root within 2.0 inches of ground surface).

L (Late) : Nodulated, but not on upper tap-root.

N (Nil) : No nodules.