

1981

Legume seed inoculation

D. L. Chatel

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DEPARTMENT OF AGRICULTURE

WESTERN AUSTRALIA

SUMMARY OF EXPERIMENTAL RESULTS

LEGUME SEED INOCULATION

D.L. CHATEL

MEDIC INOCULATION EXPERIMENTS

Inoculation trials were conducted at Holleton (81 ME 6) and Canna (81 GE 5).
The major objectives were:-

1. To test the field effectiveness of new strains of Rhizobium meliloti and to compare them with standard strains.
2. To initiate trials aimed at examining the performance of R. meliloti as long term colonisers of mildly acid soils. These trials are the first in a programme aimed at looking at the feasibility of developing acid tolerant strains for large areas of acid soil which are not suitable for growing subterranean clover. The 1981 trials will provide a basis for comparison with newer strains isolated from well nodulated medics found on acid soils. The major field index of 'acid tolerance' will be second year nodulation.

The strains used included:-

Strain	Origin
U45	Isolated from <u>M. sativa</u> , Uruguay, 1956 approximately. This is the strain used in Australian inoculants.
SU47	Isolated from <u>M. sativa</u> , Bathurst, New South Wales, Australia 1939. This strain was used as a commercial strain in Australia and is a useful standard.
WSM 244	Isolated from <u>M. polymorpha</u> at Perth from plant collected at Tel Afer, Iraq, 1979.
WSM 248	Isolated from <u>M. polymorpha</u> at Perth from plant collected at Ajanardine, Iraq, 1980.
CC 169*	Isolated from <u>M. rugosa</u> cv. <u>paragosa</u> collected Stockyard Creek, South Australia.

* Supplied by J. Brockwell, CSIRO Canberra.

WSM 244 and WSM 248, particularly the former, performed well on a range of hosts in glasshouse tests (Perth) and field tests (Iraq). The CSIRO strain, CC 169, is considered by Mr J. Brockwell to be a useful candidate strain for inclusion in Australian commercial inoculants. It is effective on a wide range of medics.

The host medics used were:-

Medicago truncatula cv. Cyprus
Medicago littoralis cv. Harbinger
Medicago polymorpha cv. Serena
Medicago tornata cv. Swani
Medicago tornata cv. Tornafield (Canna only).

TRIAL 1

81 ME 6/2995 EX

The response of medics to inoculation by a range of Rhizobium meliloti.

Location: Holleton (via Merredin) Mr I. Quinn.

Soil: Deep yellow sand, acacia, mallee, tamma with occasional native pines. Soil pH 5.8.

History: Cleared 1976, fallow 1977, wheat '78, '79, '80.
Fertiliser: 1978, 100 kg ha⁻¹ No. 1 mix super;
1979, 70 kg ha⁻¹ plain super; 1980, 60 kg ha⁻¹ plain super.

Sowing: Sown into moist soil with disc drill 26 May. Inoculated, lime pelleted seed sown at 14 kg ha⁻¹ mixed with plain super sown at 170 kg ha⁻¹.

1. Nodulation (percent) August 19, 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	23	96	96	99	98	98	99
Harbinger	12	98	91	95	91	97	77
Swani	17	99	95	96	91	99	90
Serena	1	0	-	99	69	100	100

2. Nodulation (tap root percent) August 19, 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	26	68	91	98	90	92	93
Harbinger	5	89	82	83	77	84	56
Swani	6	89	77	83	70	73	53
Serena	0	0	-	97	61	98	98

3. Yield (mg/plant DW) August 19, 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	14	32	78	78	66	61	71
Harbinger	15	68	33	50	45	40	19
Swani	16	48	56	52	43	41	34
Serena	8	10	-	86	36	72	74

4. Yield (kg ha⁻¹) October 1, 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	133	830	847	1153	1037	1017	942
Harbinger	82	1033	767	977	988	933	490
Swani	20	847	908	905	717	757	517
Serena	18	18	-	805	218	875	742

5. Seed Yield (kg ha⁻¹) November 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	5	62	77	113	88	75	98
Harbinger	3	62	27	56	66	59	12
Swani	4	141	92	113	85	105	50
Serena	4	0	-	152	19	124	93

Comments:

1. The nodulation of the non-inoculated treatments was poor, however, it was higher than expected for medics on an acid soil. The possibility of experimental error cannot be excluded.
2. There was a good relationship between nodulation and yield (both of tops and seed).
3. The poor performance of strain CC169 on Harbinger is disturbing because this strain is likely to replace all other commercial strains for use on all medic species sown in Australia. Further work with this strain is required on both acid and "non problem" more alkaline soils.
4. Strain WSM 244, which has proved so useful in Iraq shows considerable promise on the medics tested.
5. Unfortunately an error at seeding means that it was not possible to compare NA 2290 and WSM 244 on Serena.

TRIAL 2 81 GE5/2995 EX

The response of medics to inoculation by a range of Rhizobium meliloti.

Location: Canna (Mr P. Fabling).

Soil: Loamy sand to 3 metres. Tamma, wodgil, tee tree and mallee.
Soil pH 6.0.

History: Cleared twenty years. Initial application 100 kg Copper, Zinc
superphosphate. Approximately 10 crops, each with 90 kg plain
superphosphate. Total super 1,000 kg ha⁻¹.

Sowing: Sown into moist seed bed on June 3, 1981. Inoculated and lime
pelleted seed sown at 15 kg ha⁻¹ mixed with plain super at 140
kg ha⁻¹.

1. Nodulation (percent) July 22, 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	0	95	90	94	85	86	87
Harbinger	0	86	71	74	73	69	62
Swani	0	81	46	71	38	56	35
Serena	0	10	90	92	96	91	91
Torrafield	0	95	87	87	83	77	85

2. Nodulation (tap root percent) July 22, 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	0	69	71	65	60	53	65
Harbinger	0	63	51	49	54	47	43
Swani	0	43	23	35	21	36	18
Serena	0	5	79	80	83	76	81
Torrafield	0	75	65	66	69	48	63

3. Yield (mg/plant) July 22, 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	21	29	20	26	21	21	22
Harbinger	12	16	14	16	13	12	13
Swani	15	24	19	20	17	20	16
Serena	14	14	24	20	23	17	19
Torrafield	24	29	26	27	29	23	25

4. Growth Ratings, September 24 (1 = poorest, 10 = best)

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	3.3	9.0	8.0	6.3	7.3	7.6	5.3
Harbinger	2.6	8.3	8.0	4.0	7.0	7.0	5.3
Swani	3.3	9.6	6.3	7.0	7.0	9.0	6.0
Serena	3.3	2.0	8.6	9.0	8.3	7.6	8.0
Torrafield	2.3	8.6	8.3	8.0	8.6	7.0	7.3

5. Seed Yield (kg ha⁻¹) November 1981

Host	Nil	U45	NA2290	WSM 244	WSM 248	CC 2117	CC 169
Cyprus	19	68	53	67	41	54	41
Harbinger	3	32	13	16	21	40	10
Swani	14	74	53	54	42	47	32
Serena	14	6	181	151	196	124	155
Torrafield	6	65	85	62	93	58	61

Comments:

1. There was no background (non-inoculated control) nodulation.
2. Harbinger did not perform well. It was particularly poor with strain CC 169. The poor performance of that strain on Swani is also cause for concern.
3. The plots were very weedy (grasses, capeweed and turnip/radish) which no doubt contributed to the considerable variation found.
4. A severe drought in spring caused premature haying off and it was not possible to do pasture cuts for yield. Plots were rated as a compromise. It is important to note that nodulation, yields and rating can only be compared within a host group since ratings were done separately in each host.