1982

Pasture Research at Esperance.

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SUMMARY OF EXPERIMENTAL RESULTS 1982

Pasture Research at Esperance

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A. (i) SERRADELLA SPECIES AND STRAIN EVALUATION TRIALS

AIM

There are only two strains of serradella available commercially in Australia, Ornithopus compressus, Pitman and Uniserra. There have been approximately 400 strains of the different serradella species collected by Australian scientists and their European colleagues in the Mediterranean region. The aim of these experiments was to screen a selection from this collection in an attempt to broaden the genetic diversity of serradella available commercially.

There were originally only very small amounts of seed of each new serradella strain. Thus these field experiments aimed at bulking up the seed in order to do more meaningful experiments. In the process, maturity (appearance of first flowers), seed yield measurements, and measurement of hardseededness, were done. The results of these latter measurements are now summarized.

None of the trials were defoliated or grazed.

RESULTS

(1) Flowering time (FT) and seed yield (SY) data from Serradella seed yield (bulk up) experiments at Esperance.

	1980				1981			
	Experiment 1		Experiment 2		Experiment 1		Experiment 2	
	FT (days)	SY (gm^{-2})	FT (days)	SY (gm^{-2})	FT (days)	SY (gm^{-2})	FT (days)	SY (gm^{-2})
O. compressus								
Pitman			111	24.0	116	19.1	113	15.1
Uniserra			104	24.0	108	6.9	99	9.7
GM 016	108	4.3			106	15.2	101	11.7
GM 043.2	118	6.5			120	20.4	106	12.3
GM 057.1	109	2.4			108	4.0	100	6.5
GM 065.1	109	0.7			108	5.2	102	7.6
GM 065.2	107	17.0			106	8.9	99	11.6
GM 065.3	109	5.5			106	11.3	101	5.6
GM 107	108	0.5			106	14.9	100	27.7
GT 046	100	9.5			99	25.1	99	10.7
GT 047.1	112	6.5			113	6.9	106	1.2
CPI 47250	118	11.0			108	12.4	106	17.6
CPI 47251	125	0.6			128	4.0	123	6.6
CPI 50484	125	2.6			128	23.1	122	20.6
CPI 50774	117	17.0			120	22.0	120	20.7
GS 046.1	113	4.5			109	19.4	108	10.3
GS 046.2	125	5.0			128	12.9	108	37.0
M 34	98	2.5			99	19.2	95	6.2
M 115	104	6.6			103	14.1	101	7.2
M 133	104	3.3			106	7.4	99	9.5
M 167	107	6.2			106	7.7	99	8.1
DP 3			90	8.0	90	17.3		
DP 4			98	7.0	99	13.0	93	37.5
DP 5			88	5.5	90	20.4		
DP 6			88	23.0	90	16.6	90	25.7

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	1980				1981			
	Experiment 1		Experiment 2		Experiment 1		Experiment 2	
	FT (days)	SY (gm^{-2})	FT (days)	SY (gm^{-2})	FT (days)	SY (gm^{-2})	FT (days)	SY (gm^{-2})
(cont.)								
O. isthmocarpus								
GM 017	120	2.6			120	11.8	121	21.0
GM 030.1	114	2.4			116	9.9	110	15.2
O. perpusillus								
GM 034	108	14.5			108	12.6	106	9.7
O. species (?)								
GM 113.2	116	14.0			128	13.8	108	16.4
O. pinnatus								
GM 134.1	117	5.1			116	15.9	106	15.9
GT 045	125	24.5			128	12.3	120	10.6
O. sativus								
CPI 16006	124	3.4			129	4.7	120	20.3
CPI 47656	126	5.0			132	4.1	123	6.5

Details

(i) 1980 (a) Experiment 1: one replicate. Sited on newly cleared soil-sand (40-80 cm) over gravel on property of J. Royle, Condingup.

Fertilizer: At sowing 400 kg ha^{-1} Super No. 1 (Cu,Zn,Mo)
100 ka ha^{-1} Potassium chloride
In spring 200 kg ha^{-1} ordinary Super
100 kg ha^{-1} Potassium chloride

Seeding rate: 2.5 kg ha^{-1}

(b) Experiment 2: one replicate. Sited on newly cleared soil-sand (40cm) over gravel on property of J. Royle, Condingup.

Fertilizer: At sowing 400 kg ha^{-1} Super No. 1 (Cu,Zn,Mo)
100 kg ha^{-1} Potassium chloride

Seeding rate: 20 kg ha^{-1}

(ii) 1981 (a) Experiment 1: Sited on newly cleared soil-sand (40-80 cm) over gravel on property of J. Royle, Condingup.

(b) Experiment 2: Sited on newly cleared soil-sand (40-80 cm) over gravel on property of M. Quinlivan, Mt. Ney.

For both (a) and (b), trial design was a completely randomized block of 3 replicates.

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(ii) 1981 (b) Experiment 2: (cont.)

Fertilizer:	At sowing	450 kg ha^{-1}	Super No. 1 (Cu,Zn,Mo)
		450 kg ha^{-1}	ordinary Super
		100 kg ha^{-1}	Potassium chloride
	In spring	50 kg ha^{-1}	ordinary Super
		25 kg ha^{-1}	Potassium chloride
Seeding rate:	2.5 kg ha^{-1}		

In both 1980 and 1981 the seed was inoculated (Group G commercial inoculum) and lime pelleted just prior to sowing.

Sprayed trial just after sowing and at commencement of flowering with 2 l ha^{-1} DDT to control RLEM and native budworm respectively.

(2) Levels of imbibed and germinated seed measured in the strains of serradella species collected from the 1981 seed yield experiment at Mt. Ney (1981 Experiment 2 in above table).

Species and Strain	% imbibed and germinated seed Days mature seed in fluctuating oven (15/58°C in 24 hr) 7	33	61	90	160	205	244	279	315
O. compressus									
Pitman	27	49	58	70	66	86	79	93	81
Uniserra	33	42	39	32	67	65	62	76	81
GM 016	3	4	2	2	5	12	12	19	21
GM 043.2	8	8	4	3	12	14	14	31	29
GM 057.1	4	3	2	3	18	26	22	47	49
GM 065.1	8	6	5	5	9	19	22	30	26
GM 065.2	4	7	4	5	2	11	8	11	47
GM 065.3	12	11	9	7	12	20	22	26	41
GM 107	6	7	4	8	10	11	11	29	25
GT 046	7	11	4	4	18	18	26	23	43
GT 047.1	5	14	16	20	34	40	51	76	78
CPI 47250	7	13	6	7	15	17	15	18	21
CPI 47251	12	16	13	13	23	24	28	24	50
CPI 50484	7	25	24	20	19	32	30	33	29
CPI 50774	9	12	9	8	21	20	17	29	43
GS 046.1	2	4	6	14	29	50	73	69	72
GS 046.2	4	6	6	9	24	25	44	44	54
M 34	11	26	12	14	42	40	39	52	43
M 115	36	51	47	66	74	91	85	86	88
M 133	10	33	36	33	72	65	94	90	90
M 167	28	65	80	77	72	88	90	89	88
DP 4	0	10	6	5	19	23	43	59	64
DP 6	6	11	10	12	19	21	23	39	28
O. isthmocarpus									
GM 017	6	13	8	13	11	24	22	46	33
GM 030.1	13	16	18	15	18	25	40	39	61

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Species and Strain	% imbibed and germinated seed Days mature seed in fluctuating oven (15/58°C in 24 hr) 7	33	61	90	160	205	244	279	315
(cont.)									
O. perpusillus									
GM 034	10	10	11	12	9	10	9	11	24
O. species (?)									
GM 113.2	1	1	0	1	1	3	0	1	3
O. pinnatus									
GM 134.1	5	18	7	13	14	9	30	38	33
GT 045	14	20	14	18	13	15	16	33	34
O. sativus									
CPI 16006	100	100	100	100	100	100	100	100	100
CPI 47656	100	100	100	100	100	100	100	100	100

Details

Samples of seed were collected at random from each plot and stored in an oven in which temperature fluctuated between 15 to 58°C in 24 hours in a roughly sigmoidal fashion. Subsamples of 100 segments were collected periodically and the seed placed on moist filter paper in petri dishes in a germination cabinet in which the temperature was a constant 15°C. Ten days later, the number of germinated and imbibed seed found within the podded serradella seed segment were counted.

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A. (ii) SERRADELLA GERMINATION TRIAL

AIM

To measure per cent germination in selected strains of serradella species, with ± pods.

METHOD

The seed was inoculated and lime pelleted just prior to sowing, and hand sown (mixed with fertilizer) at 10 kg ha^{-1} for O. pinnatus, and 20 kg ha^{-1} for all other strains. Fertilizer used at sowing was 400 kg ha^{-1} Superphosphate No. 1 (Cu,Zn,Mo) and 100 kg ha^{-1} Potassium chloride.

The trial was sown 6/5/81.

When mature, random seed samples were collected from plots for the laboratory tests. Two methods were used:-

(a) Seed in pods - used method of Quinlivan (1961). Seed placed in fluctuating oven (15/58°C in 24 hr) and subsamples removed periodically for a germination test (soaked on moist filter paper in petri dish at 15°C in a germination cabinet for 10 days before counting germinated and imbibed seed).

(b) Seed only - seed carefully removed from pod, and then measured for hardseededness using a method similar to that of Taylor (Taylor and Palmer, 1979; Taylor, 1981). In this method 200 seeds of each line were placed in ice cube trays and soaked in water for 48 hours in an incubation cabinet (15°C). The water was removed, and the imbibed seed counted and removed. The remaining seed was placed in a fluctuating oven (15/58°C in 24 hr) and periodically removed, soaked in water for 48 hr. etc.

SOIL TYPE

Newly cleared sandplain soil - 40 cm sand over gravel over clay.
Sited on the property of J. Royle, Condingup.

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RESULTS

(a) Seed in pod (method of Quinlivan, 1961)

Species and Strain	% imbibed and germinated seed Days seed in fluctuating oven (15/58°C in 24 hr) 0	25	53	81	149	193	231	261	292
O. compressus									
Pitman	19	28	57	64	58	76	84	87	98
CPI 47250	4	2	3	3	3	7	11	32	92
O. sativus									
CPI 47656	100	100	100	100	100	100	100	100	100
O. isthmocarpus									
GM 017	29	24	36	36	43	73	44	55	80
O. perpusillus									
GM 034	11	6	9	9	19	19	23	27	92
O. pinnatus									
GM 134.1	9	9	8	9	13	17	15	36	52

(b) Seed only (method of Taylor - modified from Taylor, 1981)

Species and Strain	% imbibed seed (after 48 hr soaking) Days seed in fluctuating oven (15/58°C in 24 hr) 2	33	39	92	146	190	224	258	286	313
O. compressus										
Pitman	37	63	73	89	96	97	97	98	98	98
CPI 47250	9	17	18	18	23	34	36	37	38	44
O. sativus										
CPI 47656	100									
O. isthmocarpus										
GM 017	29	37	39	42	47	60	62	62	65	65
O. perpusillus										
GM 034	11	16	16	17	17	18	21	22	23	24
O. pinnatus										
GM 134.1	19	25	30	34	36	56	62	62	68	79

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(c) Field tests - podded serradella seed were collected from the plots at various intervals, and germination tests done on this seed. The results are listed below.

Species and Strain	% Soft Seed				
	5/1/82	2/3/82	1/4/82	7/5/82	28/5/82
O. compressus					
Pitman	9	19	17	28	35
CPI 47250	5	4	3	3	22
O. sativus					
CPI 47656	100	100	100	100	100
O. isthmocarpus					
GM 017	47	22	3	9	9
O. perpusillus					
GM 034	13	9	7	14	41
O. pinnatus					
GM 134.1	24	3	4	5	2

There are two trends probably occurring with time in the field data:-

(i) the loss of soft seeds due to false breaks, and thus the increase in the proportion of hardseeds measured.

(ii) the increase in the number of soft seeds in time due to the breakdown of hardseededness.

The results in Table (c) above is the net effect of both these trends with time.

B. TRIFOLIUM BRACHYCALYCINUM HARDSEED EXPERIMENT
Results of 1981 sown experiment (1982 not yet completed)

AIM

To measure the level of hardseededness in a range of T. brachycalycinum strains on alkaline mallee soil at Esperance, using strains of annual Medicago species and T. subterraneum for comparisons.

METHOD

The trial design was a completely randomised block of three replicates. Single strain species swards were sown, using inoculated lime pelleted seed hand sown (mixed with fertilizer) at 50 kg ha^{-1}. The fertilizer used was 400 kg ha^{-1} Superphosphate No. 1 (Cu,Zn,Mo) and 50 kg ha^{-1} Potassium chloride. When mature, random seed samples were collected from each plot.

The method used to measure the hardseed was similar to that used by Taylor and Palmer (1979) and Taylor (1981). In this method, 200 seeds of each line are removed from the mature burrs and placed in ice cube trays and then placed in a fluctuating (15/58°C in 24 hr) oven for 7 days. The seeds were then soaked in water for 48 hours in a germination cabinet (48 hours). At the end of the period, the water was removed, and the imbibed seed removed and counted. The remaining seed was returned to the fluctuating oven, and the above procedure repeated once every month.

SOIL TYPE

The plots were grown on newly cleared shallow (2 cm) sand over alkaline clay.

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RESULTS

(1) Level of imbibed and germinated seed measured in strains of T. brachycalycinum, T. subterraneum and annual Medicago sp.

Species and Strain	% imbibed seed Days mature seed in fluctuating oven (15/58°C) 7	39	67	101	129	163	207	241	275	303	330	389
M. truncatula												
Cyprus	3	3	3	6	12	27						
Jemalong	3	3	4	8	10	17	35	42	49	53	55	56
M. littoralis												
Harbinger	5	5	6	7	8	14	26	38	42	50	53	54
T. subterraneum												
Nungarin	15	18	24	42	53	73	75	85	86	87	88	89
Daliak	24	28	35	47	61	72	82	82	83	84	84	85
T. brachycalycinum												
CPI 24417	16	19	21	36	40	40						
CPI 25308B	24	29	42	54	62	75	83	85	91	93	93	93
CPI 28096	18	22	27	36	45	58	64	68	71	72	74	75
CPI 28102	17	21	29	47	56	67	74	79	84	85	86	86
CPI 33245	12	14	18	34	38							
CPI 33248	11	19	27	45	55	61						
CPI 56894D	23	25	28	48	65	77	86	88	89	90	90	90
CPI 56911	45	53	60	72	85	93						
CPI 69972	46	38	42	66	71	97	95	97	98	100		
CPI 69973A	22	32	39	66	81	90	90	97	99	100		
CPI 69976	30	35	46	65								
CPI 70100	15	17	23	39								
CPI 70124B	11	18	25	49	63	81	90	92	97	97	98	98
Clare	49	61	68	89	92	95	98	98	100			

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(2) Field Test: seed was collected at random from each plot on several occasions, and a germination test done on the seed. The results are as follows:

Species and Strain	% soft seed				
	15/1/82	20/2/82	29/3/82	3/5/82	28/5/82
M. truncatula					
Cyprus	9	6	3	1	0
Jemalong	4	11	4	0	0
M. littoralis					
Harbinger	6	9	5	3	-
T. subterraneum					
Nungarin	9	44	20	8	6
Daliak	24	62	21	16	12
T. brachycalycinum					
CPI 24417	16	23	11	16	8
CPI 25308B	16	35	13	16	23
CPI 28096	12	21	18	14	17
CPI 28102	10	31	22	13	14
CPI 33245	9	15	9	9	26
CPI 33248	5	22	26	26	12
CPI 56894D	23	39	11	31	-
CPI 56911	35	69	36	0	1
CPI 69972	22	37	28	9	13
CPI 69973A	24	44	19	13	23
CPI 69976	22	49	28	23	17
CPI 70100	12	42	25	14	2
CPI 70124B	7	57	33	6	7
Clare	36	73	41	30	2

The results are the net loss of soft seeds during false breaks and the production of soft seeds through time.

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C. SUBTERRANEAN CLOVER HARDSEED TRIAL
(with W.J. Collins)

AIM

To attempt to follow the fate of some strains of Trifolium subterraneum over a 3 year period when no further seed is produced after the first year.

SOIL TYPE

Newly cleared sand (20-40 cm) over gravel over clay.

METHOD

The trial design is a completely randomised block of 5 replicates, which is also replicated through time (3 years). The results presented are for the first year (1981).

Seed was sown using a 12 row disc drill at 100 kg ha^{-1}, with the discs in the soil at 1 cm and with light harrows trailing behind the drill to cover the seed.

Fertilizer used was:
400 kg ha^{-1} Superphosphate No. 1
400 kg ha^{-1} ordinary Superphosphate
100 kg ha^{-1} Muriate of potash.

All seed was inoculated and lime pelleted just prior to sowing.

Assessments made were plant counts, seed yield, and levels of hardseededness. This later data is presented here.

Hardseededness was measured using the method of Taylor (Taylor and Palmer, 1979; Taylor, 1981), except that the seed was soaked in water for 48 hrs instead of 24 hrs. The oven temperature fluctuated between 15 and 58°C in a roughly sigmoidal fashion.

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RESULTS

(i) % imbibed seed measured on samples of seed of strains of T. subterraneum. The burrs were collected after the burrs had matured.

Strain	% imbibed seed Days seed in fluctuating oven (15/58°C in 24 hr)										
	7	15	49	78	113	139	173	217	251	285	313
Woogenellup	10	18	49	66	92	99	100				
Esperance	2	4	22	38	61	90	18	100			
Daliak	4	5	8	14	43	59	68	84	95	95	96
Seaton Park	3	5	16	33	58	76	88	93	99	99	100
Trikkala	19	25	53	72	99	100					

(ii) Field test: % soft seed measured from seed samples gathered periodically from the plots, using a standard germination test.

Strain	% soft seed			
	30/12/81	22/2/82	22/3/82	29/4/82
Woogenellup	22	66	49	14
Esperance	3	36	45	5
Daliak	3	19	27	4
Seaton Park	3	55	39	6
Trikkala	21	52	35	16

The latter date is the net result of loss of soft seed during false breaks and the production of soft seeds through time.

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