1983

1. Clover scorch screening, 2. Bluegreen aphid screening, 3. Root rot screening, 4. Medicago murex, 5. Clover establishment techniques, 6. Salinity effects on irrigation pastures, 7. Moisture usage and seed production in subterranean clover.

D. J. Gillespie

EXPERIMENTAL SUMMARY 1983

D.J. GILLESPIE

PLANT RESEARCH DIVISION

1. Clover scorch screening
2. Bluegreen aphid screening
3. Root rot screening
4. Medicago murex
5. Clover establishment techniques
6. Salinity effects on irrigation pastures
7. Moisture usage and seed production in subterranean clover

1. CLOVER SCORCH SCREENING

During 1982 some 983 clover introductions and crossbreds were screened for resistance to clover scorch. Approximately 7,500 sub clovers have now been screened since testing commenced in 1972, and the techniques used have successfully identified over 300 introductions possessing resistance to clover scorch.

Screening results for 1982 were jeopardised by accidental heavy grazing with cattle immediately prior to the final assessment. However, it was still possible to identify most of the plots with high disease levels and some of the plots with moderate disease levels (see Table 1). Over 60% of the 380 introductions were identified as susceptible to clover scorch and 25% of the 600 crossbreds. The remaining 600 plots are either tolerant of clover scorch or could not be assessed due to severe grazing. These must be re-tested in 1983.

Table 1. Clover scorch screening - Denmark 1982

Summary (October 6 - final assessment) 1 = no effect
10 = plot completely dead

Collection	No. tested	Score* 6 or more	Score* (5)	% of lines scoring 5 or more
Portuguese	117	43	2	38%
Greek	49	32	7	80%
East Aust.	106	72	15	82%
Re-test	91	9	37	51%
Dwalg. replac.	18	18	-	100%
Total	381	174	61	62%
Crossbreds	602	74	76	25%
Total	983	248	137	39%

* Ratings of 6.0 or greater indicate definite clover scorch damage and variety susceptibility. Ratings of 5.0 indicate presence of clover scorch and possible susceptibility. Plots scoring less than 5.0 are either tolerant or could not be rated due to severe defoliation.

Winter vigour ratings, two clover scorch assessments, and ratings of damage due to Cercospora zebrina, are available for all 983 test lines and control varieties but are not included in this summary.

Cercospora zebrina caused moderate to severe damage on some plots this year. It may also have changed some varieties' reaction to clover scorch. In 1983 the test area will be moved to a new site and steps will be taken to minimise Cercospora infection.

2. BLUEGREEN APHID SCREENING

Approximately 200 clover selections were tested for BGA resistance during 1982 including about half the sub species yanninicum lines in the collection.

During the year the method of assessment of BGA susceptibility was changed somewhat from that used in previous years. Initial trials had compared the damage between varieties under heavy aphid attack without reference to the performance of the same varieties unstressed by aphids.

Current screening trials now include control boxes so that a comparison of dry matter yield with and without aphid damage can also be made. Table 2 summarises the results obtained using this method.

Table 2. Productivity loss through BGA attack in 156 sub clover breeding lines

Percentage reduction in dry matter yield (mean of 120 plants for each line)	Number of lines (ssp. yanninicum)	(ssp. subterraneum)
0	1	1
1 - 10%	2	0
11 - 20%	4	4
21 - 30%	9	8
31 - 40%	16	12
41 - 50%	17	24
51 - 60%	4	20
61 - 70%	3	20
71 - 80%	0	9

It is clear from these results that the vast majority of lines tested during 1982 show a significant reduction in dry matter yield under aphid attack. Only a few lines have been identified which show negligible yield reductions in the presence of aphids. Even these lines are not truly resistant in the sense that they still support breeding aphid populations. However, they can be classified as highly tolerant.

These trials involve seedling sub clovers under controlled conditions and are designed to identify breeding lines with a genetic basis for aphid resistance. The performance of these lines under field conditions is complicated by an enormous range of environmental and behavioural influences which might modify their response to aphid attack. Field testing of the more promising lines will be a lengthy and complex procedure.

Attempts over the last two years to measure the effect of BGA on dry matter yield and seed production for a range of commercial cultivars in field conditions have failed, largely due to the unpredictable and erratic occurence of the aphid.

3. ROOT ROT SCREENING

High levels of root rot occurred at both the screening sites in 1982 and considerable mortality resulted among susceptible lines. 135 selections were tested for disease reaction at two sites with four replications at each site.

This year for the first time the whole of the root rot screening programme was incorporated into an "Info" programme on the Prime computer. Functions including label printing, calculations of germination data, and storage and calculation of disease index have been carried out using this programme. Direct recording of disease ratings onto floppy discs and subsequent transfer to the "Prime" computer has considerably speeded up the tedious task of rating some 20,000 plants.

Results of disease susceptibility and survival for the 135 test lines are still being processed but will be available shortly.

The failure to identify any fully resistant clovers so far using field testing, the large variation in root rot incidence from site to site and year to year, and the apparent reduction in the severity of root rot problems in south coastal pastures, suggests that the input into screening should be reduced somewhat in future.

In 1982 it is planned to restrict the number of clovers to less than 100 lines and, in future years, possibly only selected lines showing definite promise as potential cultivars will be tested. If the importance of root rot disease increases again, as it did during the 1970s, then the programme can be quickly expanded.

4. MEDICAGO MUREX

Further evaluation of Medicago murex was undertaken during 1982 in order to determine the potential of this mid season medic as an alternative legume to sub clover for parts of the agricultural area. Further small plot trials were established at Augusta and Manjimup, rhizobial trials and some production assessments were made at Katanning and Merredin, and seed increase and row evaluation of the whole M. murex collection was undertaken at South Perth.

(a) Small plot trials

Twenty-one M. murex selections were sown in a replicated small plot trial at Augusta and 12 of these were also sown in a similar trial at Manjimup. Results of winter and spring yield assessments and end of season seed yield are summarised in Table 3.

Table 3. Summary of M. murex field assessment.

Yields kg/ha	AUGUSTA			MANJIMUP		
Variety	Winter yield mid. Aug.	Spring yield Oct.20	Seed yield Dec.	Winter yield mid. Aug.	Spring yield Oct.20	Seed yield Dec.
C.D.33.1	2500	2790	17	1350	2420	42
.11	1950	3573	84			
.13	2200	3693	102	1900	2565	176
.14	1650	4279	265	1400	2710	174
50.3	1350	3285	113	1450	3344	247
.5	1800	4697	215	1550	3313	260
53.1	2050	4213	310	1800	4676	358
.4B	2000	2667	121			
.5	1850	4386	270	1600	3981	411
64.7	1400	3737	179			
71.3	2600	4109	244	1750	3737	282
.9	1350	3396	53			
73.1	1350	3144	207			
79.1	1850	2806	108			
.4	1800	3571	191			
.9	2150	3423	48			
80.3	2300	3807	89	1900	3470	263
134.2	1950	3489	109	1150	3684	109
141.4	2550	3403	117			
146.2	2150	2690	58	1550	2985	199
157.4	2000	3950	103	1700	2706	128
Circle Valley	1750	2104	87	950	1805	90
Jemalong	1500	3478	57	1050	2801	164
70124B	1300	2728	77	950	1889	288
Trikkala	1550	3000	406	800	2036	284
Woogenellup	800	3134	256	900	2474	702
Meteora	950	3860	75	500	2061	375

Winter yield is total yield to that time.
Spring yield is 6 weeks' regrowth after hard grazing in Aug/early Sept.
Very dry spring at both sites has reduced seed yield.

Springs conditions were extemely dry at both sites and seed yield of all species obviously suffered. Yields at Augusta were on average about half those recorded in 1981 - a year with good spring rains.

Both winter and spring yields were significantly higher than the sub yields for many of the M. murex selections. The best selections nearly doubled the sub yields in both winter and spring (e.g. C.D.53.1).

At Manjimup the plots were grazed with sheep prior to closing up for a spring assessment and extremely hard grazing pressure was applied. Only small leafless rosettes remained in the case of all the M. murex plots. In spite of this, total production in the next six weeks was up to 4,680 kg/ha on the best selection, while the best sub variety, Woogenellup, produced only 2,470 kg/ha.

Further assessments of hard seed breakdown, regeneration density and second year production will be made during 1983.

(b) Merredin and Katanning experiments

The performance of M. murex in trials at these centres is presented in reports by M. Ewing and P. Dixon.

(c) Row evaluation - South Perth

All murex lines from Sardinia together with 7 lines from the University collection of Dr J.McComb, were grown in rows during 1982 - a total of approximately 90 lines. As in 1981, measurements of leaf markers, growth habit, flowering, burr formation, burr characteristics and hard seed levels were made. In addition, a check for isoflavone content was made during the season, and coumestrol levels of burrs and tops for all selections will be made during summer.

Several lines continue to be outstanding in vigour, seed production and burr characteristics. Sufficient seed of some of these lines is now available to start more detailed field evaluation, including grazing trials in 1983.

It is hoped a further 150 or so M. murex lines from the South Australian collection will be made available in 1983 for initial row evaluation together with a small recent collection from Algeria made by Dr G. Gintzburger.

5. CLOVER ESTABLISHMENT TECHNIQUES

Two experiments were undertaken on medium rainfall deteriorated pasture sites at Toodyay, following similar experiments at Keysbrook in 1981 (see 1981 Experimental Summary). One experiment was in a pasture paddock, the other in stubble following a barley crop.

The experiments examined the effects of time of seeding, cultivation, and herbicide sprays, on establishment and production of Daliak sub clover sown at 10 kg/ha. Assessments were made of establishment density, winter pasture composition, spring yield and composition, and seed yield.

All treatments on the stubble site failed during winter due to a combination of factors - site was grass dominant due to failed cereal crop in 1981 (waterlogged); failure to graze area when required allowing weeds to choke out clover; severe attack of lucerne flea.

These problems were not present on the pasture site and good establishment and clover production was achieved with the best treatments. Large differences between treatments in initial establishment density were recorded (range 18-150 plants per sq metre), and these differences persisted right through to seed set with only minor changes (see Tables 4-10).

Table 4. Clover establishment techniques - pasture paddock

Clover density - plants per sq metre
- 14/7/82

			A	18
		No Spray 34	B	25
			C	59
Sowing Dry (14/4/82)	38			
			A	27
		Spray (Kerb) 43	B	55
			C	45
			A	27
		No Spray 52	B	50
			C	79
Sowing at Break (10/5/82)	67			
			A	29
		Spray (Kerb) 82	B	108
			C	108
			A	54
		No Spray 76	B	91
			C	82
Sowing at 3 weeks after break (8/6/82)	97			
			A	150
		Sprayseeded 117	B	122
			C	78

A. No cultivation - seed dropped on surface and covered with harrows only.

B. Combine cultivation only at seeding and trailing harrows.

C. Scarified at or prior to break. Shallow combine cultivation at seeding and trailing harrows.

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Table 5. Clover establishment techniques - pasture paddock

% Clover
- 16/8/82

			A	5
		No Spray 10	B	9
			C	17
Sowing Dry 16				
			A	9
		Spray (Kerb) 21	B	15
			C	38
			A	4
		No Spray 11	B	11
			C	19
Sowing at Break 18				
			A	19
		Spray (Kerb) 24	B	25
			C	27
			A	4
		No Spray 11	B	17
			C	11
Sowing at 3 weeks after break 19				
			A	22
		Sprayseeded 29	B	42
			C	24

A. No cultivation - seed dropped on surface and covered with harrows only.

B. Combine cultivation only at seeding and trailing harrows.

C. Scarified at or prior to break. Shallow combine cultivation at seeding and trailing harrows.

Table 6. Clover establishment techniques - pasture paddock

% Grass
- 16/8/82

			A 51
	No Spray	51	B 50
			C 52
Sowing Dry	26		
			A 1
	Spray (Kerb)	1	B 2
			C 1
			A 49
	No Spray	58	B 66
			C 60
Sowing at Break	31		
			A 0
	Spray (Kerb)	3	B 3
			C 5
			A 55
	No Spray	49	B 53
			C 38
Sowing at 3 weeks after break	36		A 13
	Sprayseeded	20	B 18
			C 25

A. No cultivation - seed dropped on surface and covered with harrows only.

B. Combine cultivation only at seeding and trailing harrows.

C. Scarified at or prior to break. Shallow combine cultivation at seeding and trailing harrows.

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Table 7. Clover establishment techniques - pasture paddock

% Bare ground - 16/8/82

		A	7
	No Spray 5	B	5
		C	2
Sowing Dry 22			
		A	52
	Spray (Kerb) 39	B	36
		C	30
		A	6
	No Spray 4	B	2
		C	5
Sowing at Break 25			
		A	51
	Spray (Kerb) 45	B	37
		C	47
		A	9
	No Spray 12	B	5
		C	22
Sowing at 3 weeks 19 after break			
		A	28
	Sprayseeded 28	B	22
		C	32

A. No cultivation - seed dropped on surface and covered with harrows only.

B. Combine cultivation only at seeding and trailing harrows.

C. Scarified at or prior to break. Shallow combine cultivation at seeding and trailing harrows.

Table 8. Clover establishment techniques - spring assessment - yield (kg/ha) - botanical composition.

Treatment	22/9/82 % composition (average 3 reps) Clover	Capeweed	Grass	Weed	Yield (kg/ha)
1a	4	48	26	22	2276
1b	17	37	22	24	2403
1c	31	24	34	11	2531
2a	10	80	0	10	1784
2b	10	81	0	9	1761
2c	34	63	0	3	2132
3a	7	40	25	18	2269
3b	24	21	34	21	2412
3c	39	17	36	8	2466
41	10	84	0	6	1884
4b	17	77	0	6	2053
4c	15	83	0	2	2325
5a	7	46	38	9	1698
5b	28	35	34	3	2402
5c	8	60	26	6	2500
6a	26	42	14	19	2218
6b	45	22	22	11	2377
6c	11	63	6	20	2367

1 = Sown dry, no spray
2 = Sown dry, Kerb
3 = Sown at break, no spray
4 = Sown at break, Kerb
5 = Sown at 3 weeks, no spray
6 = Sown at 3 weeks, Sprayseed

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Table 9. Clover establishment techniques - pasture paddock

Spring clover yield - 22/9/82
kg/ha

			A 91
		No Spray 409	B 409
			C 785
Sowing Dry 387			
			A 178
		Spray (Kerb) 341	B 176
			C 725
			A 159
		No Spray 548	B 579
			C 962
Sowing at Break 425			
			A 188
		Spray (Kerb) 292	B 349
			C 349
			A 138
		No Spray 321	B 673
			C 200
Sowing at 3 weeks 484 after break			A 580
		Sprayseeded 627	B 1070
			C 260

A. No cultivation - seed dropped on surface and covered with harrows only.

B. Combine cultivation only at seeding and trailing harrows.

C. Scarified at or prior to break. Shallow combine cultivation at seeding and trailing harrows.

Table 10. Clover establishment techniques - pasture paddock

Seed yield - Dec 1982
kg/ha

			A 42
		No Spray 83	B 87
			C 119
Sowing Dry 68			
			A 23
		Spray (Kerb) 52	B 28
			C 104
			A 73
		No Spray 122	B 143
			C 150
Sowing at Break 89			
			A 31
		Spray (Kerb) 56	B 77
			C 59
			A 84
		No Spray 92	B 117
			C 76
Sowing at 3 weeks after break 110			A 154
		Sprayseeded 128	B 152
			C 77

A. No cultivation - seed dropped on surface and covered with harrows only.

B. Combine cultivation only at seeding and trailing harrows.

C. Scarified at or prior to break. Shallow combine cultivation at seeding and trailing harrows.

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The most successful technique involved using sprayseed and sowing three weeks after the break - either dropping the seed on the surface or sowing straight in with a combine. This resulted in about 75% establishment rate and over 150 kg/ha of seed set in a year with a very dry finish.

Almost as successful, was sowing at the break with a combine or working up with a scarifier then immediately sowing. Initial establishment was lower with this method but winter and spring growth were good and seed set was also close to 150 kg/ha. Dropping seed on the surface at this time with no weed control was not successful.

Control of grasses with "Kerb" was highly efficient and resulted in good clover establishment, especially at the break of the season when the ground was worked up. However, capeweed dominated these Kerb treated plots later in the season in spite of reasonably heavy stocking. The result was suppression of clover and reduced seed set. On average the kerb treated plots set only 52% of the seed set on untreated plots.

Apart from "Kerb", other techniques that were unsuccessful were:

(a) sowing dry or at the break if the seed was dropped on the surface; and
(b) working up at the break then sowing at 3 weeks with or without sprayseed.

This latter technique was also tested at Keysbrook in 1981 and resulted in reduced establishment. The reason appears to be poor depth control on a soft, ridged, previously scarified paddock.

Summarising the results from these 1981 and 1982 trials, together with those undertaken in other parts of the State in the last few years, it appears the most important consideration for successful clover establishment in old pastures is good weed control, either by sprays, cultivation and/or early grazing.

6. SALINITY EFFECTS ON IRRIGATION PASTURES

Assessment of pasture production and composition recommenced on this Benger site this year after installation of slotted drainage tube and resowing of the pasture.

Previous research at this site had shown that root zone salinity was controlled by a shallow, brackish watertable. High clover salt levels, clover mortality during the irrigation season and an increase in the proportion of relatively salt tolerant "kikuyu" indicated that the brackish watertable was affecting production from the area.

Perforated drainage tube was installed 1.7 metres deep at spacings of 6 and 12 metres to give a watertable draw-down after irrigation of 1.2 metres in either 2 or 6 days. Pastures were resown in April 1982 and pasture assessments commenced in November at the start of the irrigation season.

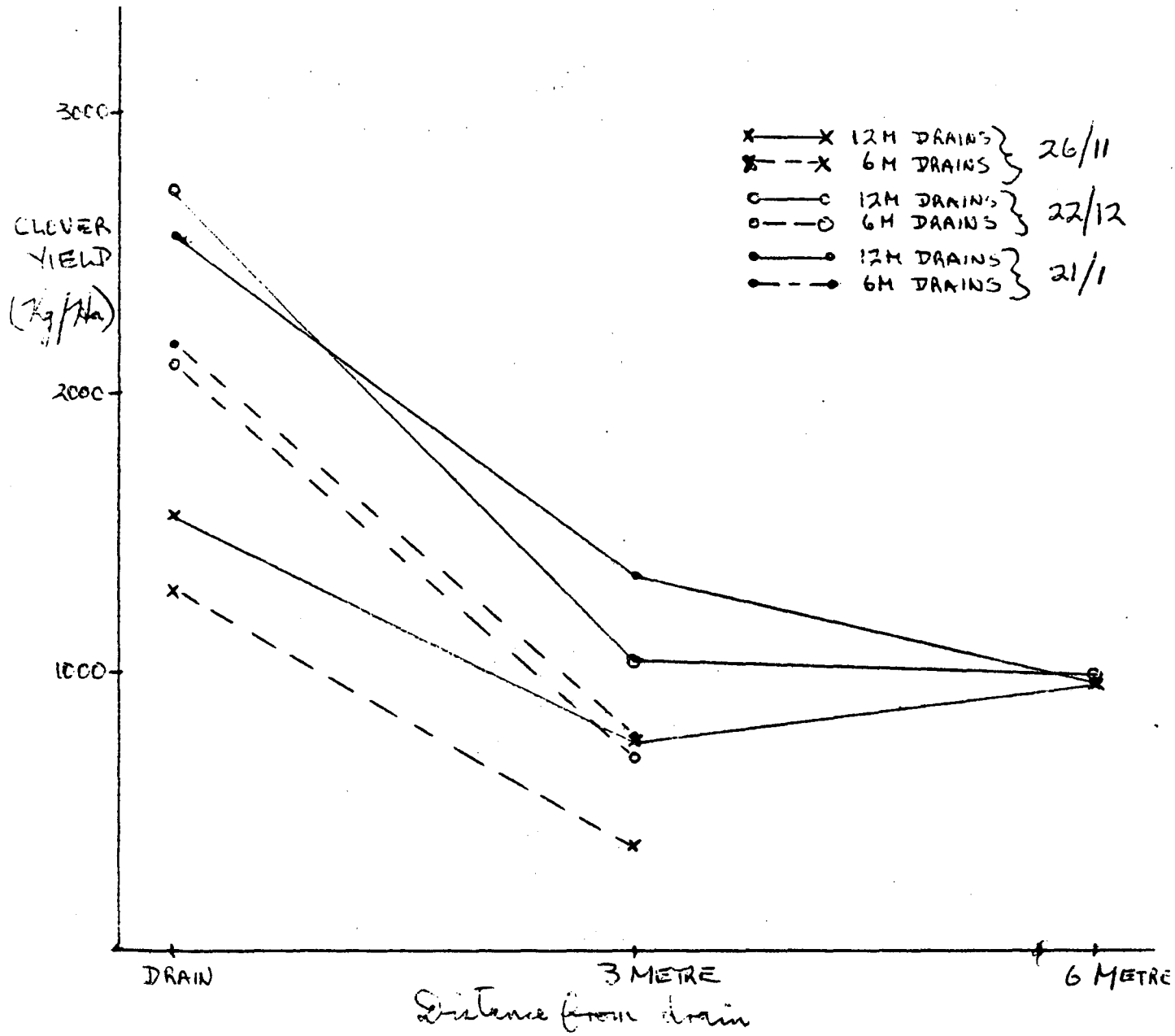
Seven 50 metre strips for each treatment, were assessed and mown at monthly intervals. Major increases in total pasture production and especially clover production were recorded where drainage was installed. Averaged over the three assessments made to January 21 clover production on the drained plots was 4 times that of the control plots, while total production was 40% higher (see Table 11).

Table 11. Pasture yields (dry matter kg/ha, 2 weeks growth).

Date	Parameter	Treatment (drain spacing)		
		Control	12 m	6 m
26/11	Total	1923	2365	2143
	Clover	562	1165	896
	% clover	29	49	41
22/12	Total	2092	3287	3347
	Clover	499	2754	1499
	% clover	24	53	45
21/1	Total	2327	3267	3254
	Clover	157	1764	1575
	% clover	7	54	48

Although the drained plots overall were considerably better than the control plots, there were large variations in pasture production within the drained plots, depending on proximity to the drain (see Table 12).

Table 12. Effect of distance from drain on clover production.



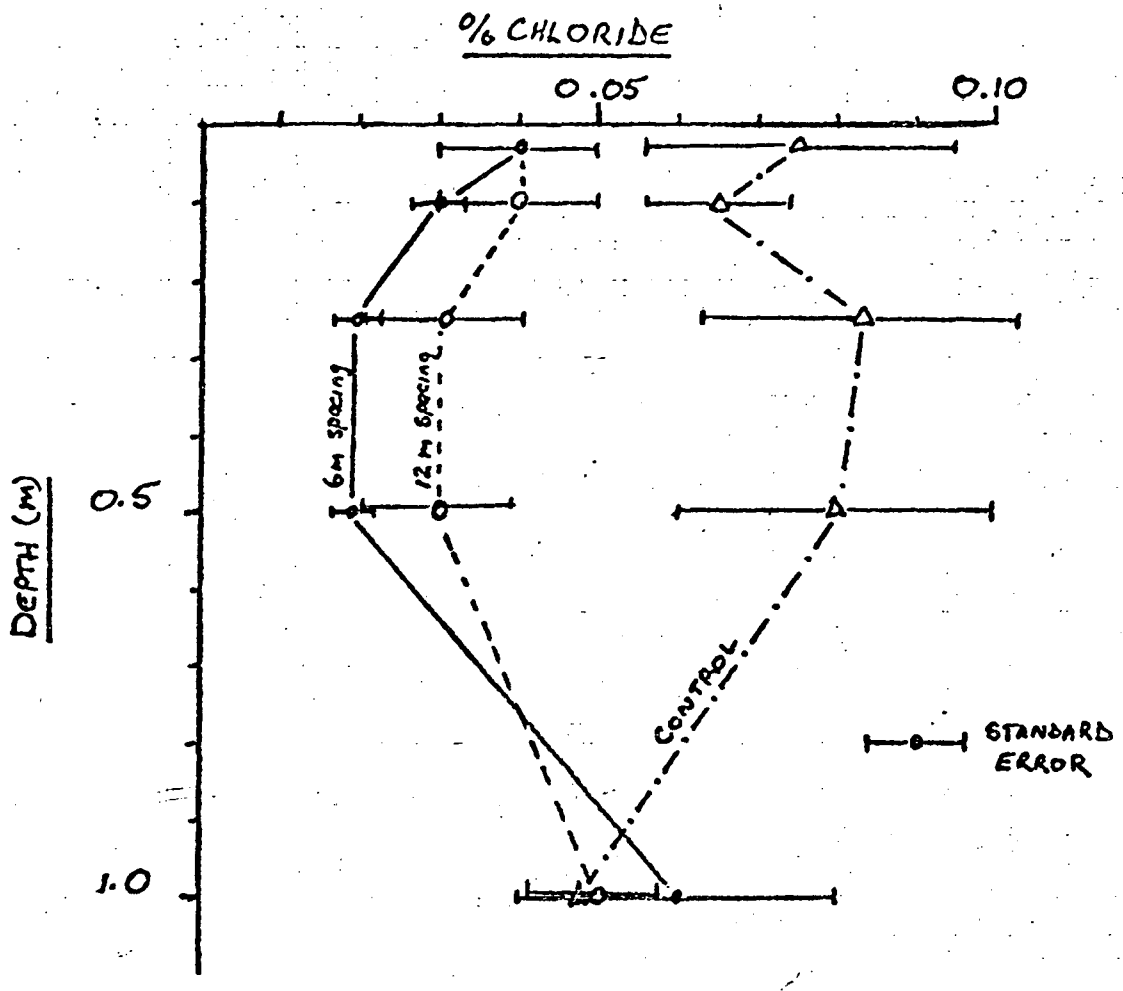
Clover production immediately over the drains averaged 2.5 times the production from strips situated 3 metres from the drainage line. (There was no further drop off with strips 6 metres from the drain). Clover production over the drains was five times that of the control plots and production 3 metres from the drains doubled that of the controls.

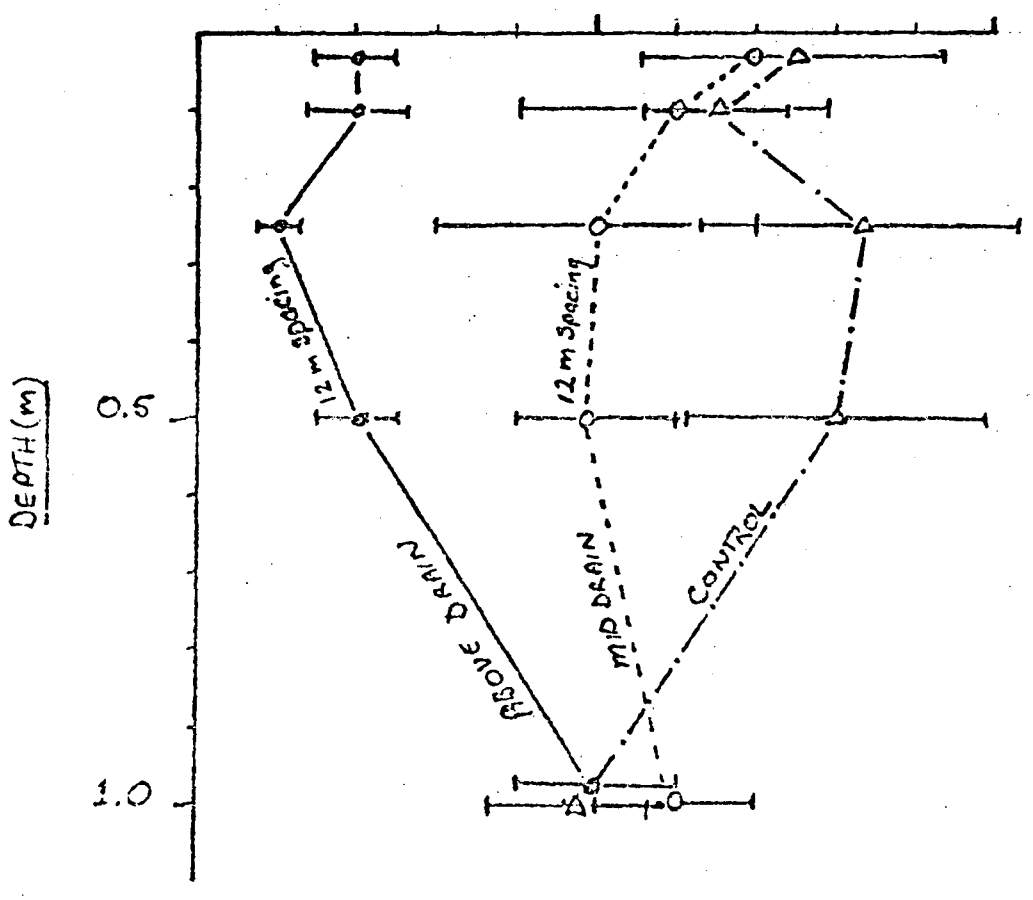
Assessments will continue for the rest of the irrigation season.

Soil salinity profiles, water table movements, and ground water discharge is monitored by Mr Ross George of Resource Management. Salinity trends have correlated very closely with clover productivity to date (see Table 13).

Table 13. Soil salinity - Benger.

Sampled 4/11/82





7. CLOVER VARIETIES, SEEDING RATE AND SUPER RATE EFFECTS ON GROWTH, MOISTURE USAGE, AND SEED PRODUCTION

This is a joint experiment with Dr Bill Bowden. The trial was established on new land gravelly sand at Toodyay in autumn 1982. Three clover varieties, two seeding rates, two super rates and two defoliation treatments were used to create differences in vegetative growth and moisture usage. There were three replications.

Only dry matter production assessments during the growing season are reported here. Defoliation treatments were applied using a reel mower set to 3.0 cm. The number of defoliations varied with variety as the last defoliation was timed to be approximately 20 to 25 days after flowering commenced for each variety. Northam was defoliated twice, Seaton Park three times and Mount Barker four times.

Visual assessments of total dry matter prior to mowing were made by two observers and calibration cuts were taken at each assessment. The amounts removed by mowing were recorded. Results are presented in Tables 14 to 16.

Moisture availability and rooting depth were assessed by Dr Bowden.

Seed yield and seed parameters are being measured at present.

Growing season rainfall was 435 mm. The season commenced on May 23 and the last effective rains occurred on October 5.

Table 14. Dry matter yields (kg/ha) - undefoliated plots.

Variety	Seed rate	P rate	11/8	7/9	22/9	14/10
Northam	5	10	126	267	866	227
	5	160	467	1083	2803	1464
	100	10	577	767	1516	566
	100	160	1793	3150	4222	3282
Seaton Park	5	10	139	267	786	1114
	5	160	404	950	2819	3746
	100	10	540	617	1630	1842
	100	160	1810	3517	4969	6248
Mount Barker	5	10	49	129	428	834
	5	160	280	617	2111	3485
	100	10	368	450	1235	1656
	100	160	1236	2550	4380	6164

Flowering dates:

Northam	13/8	(82 days)
Seaton Park	2/9	(102 days)
Mount Barker	22/9	(122 days)

Table 15. Dry matter yields (kg/ha) - defoliated plots.

Variety	Seed rate	P rate	11/8	7/9	22/9	14/10
Northam	5	10	111	300	765	281
	5	160	490	1135	2758	1851
	100	10	639	829	1820	769
	100	160	1735	2949	4213	3265
Seaton Park	5	10	168	317	821	1028
	5	160	430	869	2711	3653
	100	10	553	560	1442	1609
	100	160	1444	3279	4821	6070
Mount Barker	5	10	119	192	640	967
	5	160	356	719	2051	3150
	100	10	466	526	1405	1884
	100	160	1228	2038	4356	5726

* Yields include quantities removed by mowing.

Table 16. Quantities removed by reel mower set at 3.0 cm.

Variety	Seed rate	P rate	11/8	7/9	22/9	14/10
Northam	5	10	0	0	-	-
	5	160	2	29	-	-
	100	10	29	36	-	-
	100	160	349	869	-	-
Seaton Park	5	10	0	3	23	-
	5	160	2	13	209	-
	100	10	10	2	37	-
	100	160	196	1194	840	-
Mount Barker	5	10	0	2	19	79
	5	160	2	9	83	756
	100	10	9	7	44	118
	100	160	105	973	734	1461