1981

Kabatiella caulivor, root rot resistance, bluegreen aphid, asessment of Medicago murex, clover establishment techniques

D J. Gillespie

EXPERIMENTAL SUMMARY - 1981

D.J. GILLESPIE

PLANT RESEARCH DIVISION

1. Kabatiella caulivora
2. Root rot resistance
3. Bluegreen aphid
4. Assessment of Medicago murex
5. Clover establishment techniques

Kabatiella caulivora (clover scorch)

In contrast to previous years where all overseas introductions and most crossbreds were tested for resistance to Kabatiella, only selected clovers are now being screened so as to reduce the number requiring testing to a manageable size. Clovers possessing high formononetin, excessively late maturity, or other serious disadvantages, are now excluded from the Kabatiella screening programme. In spite of this, 1,272 lines were eligible for screening in 1981 and approximately 1,000 lines will probably be screened in 1982.

Disease levels were assessed twice during spring - in mid-September and early October. The season favoured disease development and many susceptible clovers had completely collapsed by the time of the final assessment. A considerable number of resistant and tolerant clovers were identified. Seventy overseas introductions and 313 crossbred clovers scored 3.0 or less at the final assessment, indicating minimal disease development.

Most of the resistant introductions were lines from Sardinia which were identified in 1980 as possessing some resistance and were retested this year for confirmation. Of the 313 introductions from France tested for the first time this year 21 scored 3.0 or less (7%). This is somewhat less than the figure of 12 per cent of Sardinian lines scoring 3.0 or less when tested for the first time in 1980.

Fifty seven per cent of crossbred clovers scored 3.0 or less. This indicates the considerable success being achieved in breeding for Kabatiella resistance using resistant parent lines previously identified in this programme.

As well as disease assessment, plant vigour ratings on all clovers were made twice during the growing season (three times for controls). These ratings complement those made in Perth and are of considerable value in selecting clovers (especially crossbreds) that are otherwise similar in many respects including Kabatiella resistance. The data from this screening programme is at present being recorded on the EXIR computer programme.

Vigour and clover scorch ratings for the 20 control varieties are shown in Table 1.

TABLE 1

KABATIELLA SCREENING - 1981
Vigour and clover scorch ratings
Controls (average four replications)
0-10

Variety	Vigour 11/5	Vigour 28/7	Vigour 20/8	Scorch 16/9	Scorch 7/10
65188T	7.0	3.50	4.25	2.5	3.5
65331D	8.0	3.0	3.75	3.3	4.0
70088B	8.50	7.0	6.0	2.5	5.0
70124B	9.50	8.50	7.75	1.5	2.7
Meteora	7.50	4.0	4.0	1.6	3.2
Larisa	8.50	4.0	4.0	3.5	4.3
Trikkala	9.0	7.0	6.5	3.7	5.5
Yarloop	9.0	6.50	6.5	6.0	8.8
Esperance	7.0	3.50	5.0	1.0	1.0
Seaton Park	8.50	5.50	6.25	5.5	8.5
Dinninup	8.0	9.0	6.75	3.8	7.1
Woogenellup	8.50	5.0	6.0	4.5	7.7
Clare	8.50	9.50	7.5	3.5	3.8
Mt Barker	8.50	5.0	6.0	3.5	5.3
*DMN 12.3.1	8.50	5.0	6.25	0	2.5
*MND 7.2	8.50	7.50	7.5	1.5	3.0
*GD 56.8.1	8.50	6.50	7.25	1.5	2.7
*GD 56.16.3	8.50	5.50	6.25	2.25	3.8
*GD 17.30.4	8.50	7.50	7.25	0	1.7
*DA 20.19.2.1	8.0	5.50	6.25	0	2.7

* Crossbreds selected as possible replacements for Woogenellup

The Woogenellup alternative crossbreds again performed well in terms of both clover scorch resistance and winter vigour. The best crossbreds were GD17.30.4, MND 7.2, and GD56.8.1.

Full details of the vigour and scorch ratings for all 1272 clovers tested in 1981 are available but are not included in this summary.

Root rot resistance screening

One hundred and seven clovers selected as low in formononetin, tolerant of clover scorch, mid to late season maturity, and reasonable winter vigour were tested at two sites for root rot resistance.

One site failed due to excessive grass residues interfering with germination and at the other site only moderate levels of root rot developed. This was insufficient to satisfactorily separate susceptible from tolerant clovers, although the retested lines gave similar rankings to previous years (e.g. Dinninup again the most resistant and Mt Barker the most susceptible of the control varieties).

This is the first time in four years of field testing that insufficient root rot has developed to enable tolerant clovers to be identified. It was undoubtedly due to the relatively dry mild conditions occurring immediately after sowing, as root rot is worst when constantly wet conditions occur at germination and emergence.

At present we are forced to use the field for root rot screening as it is not possible to reproduce the disease consistently in glasshouse conditions.

Bluegreen aphid (BGA) resistance screening

BGA resistance testing of a large range of selections and crossbreds being considered as replacements for Dwalganup and Daliak was undertaken this year. The most promising crosses have Daglish, Dalkeith or Bellevue as a parent. BGA screening indicatd that Daglish has a high degree of tolerance, and Dalkeith and Bellevue moderate levels of tolerance to aphid infestation.

Most of the crosses tested have inherited the aphid tolerance of Daglish except for the BD crosses. The 8B crosses have BGA damage scores better than either parent.

TABLE 2
BGA resistance of clover crossbreds being selected as replacements for Dwalganup and Daliak

Parent line	Damage score	Crosses	Damage score
1. Daglish x	2.0	MD 7.1.3.1.3	2.25
Midland B	4.4	MD 12.1.3.2	2.50
2. Daglish x	2.0	HD 5.1.2.1	2.75
Mt Helena A	3.6	HD 5.2.4	2.75
		HD 20.1.2	3.0
3. Daglish x	2.0	ND 11.1.2	2.5
Northam C	2.8	ND 23.2.2	2.25
4. Daglish x	2.0	BD 6.2.3.2	4.0
Bellevue	3.25	BD 19.1.1	3.25
5. Bellevue x	3.25	8B 19.2.2.2	2.25
Dalkeith	2.75	8B 40.2.1.1	2.0

Scale: 0 = No damage
1 = yellowing on a few leaves only
2 = Yellowing on many leaves
3 = Some leaves dead - much yellowing on remaining leaves
4 = Many leaves dead - some plants dying.
5 = All plants dead or dying

The results of all clovers tested in this experiment together with those of the four control varieties are shown in Table 3.

TABLE 3

Sub clover screening for bluegreen aphid resistance
ranked from tolerant to susceptible
(ratings at 49 days from commencement)

Variety		Variety		Variety	
1. 8B40.2.1.1	2.0	28. 47275		51. Gingin Brook	
2. Daglish		29. Collie B		52. Clackline	
		30. 65195B		53. 39314YA	
3. ND23.2.2		31. BD19.1.1		54. 65332F	4.0
4. 8B19.2.2.2	2.25	32. GB346 23.2.3.1	3.25	55. BD6.2.3.2	
5. MD7.1.3.1.3		33. Belmont		56. 65311	
6. Clare (control)		34. 65313B			
		35. 68046A		57. Dwellingup A)	4.25
7. Spencers Brook		36. 65320			
8. MD12.1.3.2	2.50			58. Can 428	
9. ND11.1.2		37. Bellevue		59. 39316Y	4.5
10. Graylands		38. Can 434A		60. Walebing	
		39. Q095	3.50	61. Daliak (control)	
11. Dalkieth		40. 65328G			
12. Nedlands B		41. 65328N		62. Darlington	4.75
13. 30908		42. 65178E			
14. 65328F	2.75			63. Mulwala	5.0
15. HD5.1.2.1		43. Northam A_2			
16. HD5.2.4		44. Williams C		64. Boyup B	Not Rated
17. CD4 Sub A (control)		45. 12693G			
		46. 24420			
		47. 47273A	3.75		
18. Midland A		48. 65328L			
19. Northam F		49. 65177A			
20. Baulkamaugh		50. 47267E			
21. Lake Widgeon					
22. 47299C	3.0				
23. 65332C					
24. 65332E					
25. HD20.1.2					
26. 65321A					
27. 14217A (control)					

Because of the importance of these results in deciding which clover may be ultimately released for the Dwalganup/Daliak zone, repeat tests of the most promising clovers were undertaken using both seedling and vegetative plants.

The repeat seedling screening failed due to problems maintaining the aphid population. The causes of this failure are being investigated at present. Only a few clovers were retested as vegetative plants but the results were very similar to the earlier seedling screening.

TABLE 4: Bluegreen Aphid resistance of some mid season crossbreds.

Clover	Damage Score	
	Seedling	Vegetative
8B 19.2.2.2	2.25	2.5
8B 40.2.1.1	2.0	2.75
MD 7.1.3.1.3	2.25	2.75
MD 12.1.3.2	2.5	2.5
BD 6.3.1	-	2.75
CLARE	2.25	3.0
DALIAK	4.5	4.0

Genetics of BGA resistance in sub clover:

A preliminary experiment, in conjunction with the University of W.A. Agronomy Department, was undertaken in an attempt to determine the genetics of B.G.A. resistance. 18 parent lines and 17 F1 progeny were screened in this initial experiment and useful results were obtained.

Analysis of variance of the F1 values gave a gross heritability of 0.86 which is very encouraging. It appears the genes for BGA resistance are showing complete dominance and possibly the inheritance is simple. This will be elucidated in the F2 generation which will be screened in 1982/83.

Table 5 shows the results obtained for parents and F1 progeny at the conclusion of the experiment.

TABLE 5: B.G.A. Genetic Study

	Damage Scores•	
	Parents	F1
Williams C x Treeton	3.5 x 2.0	2.0
Williams C x DA08.9.6.2	3.5 x 2.5	2.0*
Williams C x Bacchus Marsh	3.5 x 2.5	3.0
Williams C x Northam C	3.5 x 3.3	3.0*
Northam C x Bacchus Marsh	3.3 x 2.5	2.0
Northam C x 14217A	3.3 x 2.5	1.6
Boyup Brook x 14217A	1.5 x 2.5	1.6
47275 x 14217A	4.25 x 2.5	2.5
14217A x 65177A	2.5 x 2.6	2.0*
Mt Barker x 65177A	2.0 x 2.6	2.0
65177A x Nungarin	2.6 x 2.0	2.0
47275 x Mt Barker	4.25 x 2.0	2.0
47275 x Gingin	4.25 x 4.5	4.5
47298 x Baulkamaugh	1.5 x 2.5	2.0
47298 x DA08.9.6.2	1.5 x 2.5	2.0
47298 x 47272B	1.5 x 2.5	1.6
47267E x Treeton	2.0 x 2.0	2.0*

* One Rep. of F1 only

• Final ratings 67 days from commencement.

Preliminary assessment of Medicago murex:

M. murex is a mid season maturity medic adapted to a wide range of soil types. It possesses a burr with short straight spines or no spines at all, and so should result in only minimal fleece contamination. A wide range of M. murex was originally collected in Sardinia in 1977 from many soil types including infertile sands with a pH as low as 5.5

Preliminary assessment of some of these lines was carried out in 1981 at South Perth (in rows) and at Augusta (in small plots). Measurements were made of winter and spring growth, growth habit, aphid tolerance, identification markers, maturity, burr characteristics and seed yield.

Some of these observations for the most promising lines are shown in TAble 6 together with those of medic and sub clover control varieties.

Many of the M. murex swards at Augusta were outstanding in appearance and production, outyielding all the medic and subclover control varieties. Winter production was especially encouraging as it was thought that winter dormancy could be a major problem with this species. M. murex appears to be well adapted to hard grazing as it rapidly forms a dense, semi prostrate sward and in its native Sardinian habitat was frequently collected in hard grazed sites.

Seed production was excellent with the best lines producing up to 60% more seed than Jemalong or Circle Valley and four to five times the yield of the sub clovers. (Table 6).

A range of pod types exist within this species but many lines have pods with either no spines (c.v. Inermis) or with short inocuous spines that would cause no problems with fleece contamination. Lines with these pod types will be selected wherever possible.

Hard seed tests are currently in progress but no results are available. There is no information available on hard seed levels in this species, and indeed little agronomic information of any kind as M. murex has never been subject to selection and evaluation anywhere.

Observations on regeneration, production and rhizobial survival will be made during 1982 as well as expanding the number of test sites to at least three.

TABLE 6: Characteristics of Medicago murex at Perth/Augusta

Line	Days to 1st Flower (Perth)	Vigour-Augusta Winter	Vigour-Augusta Spring	+B.G.A. Density 0 - 5	•Spines on Burr 0 - 4	Seed yield Augusta (kg/ha)
C.D. 50.3	117	7	7	3	2	530
50.5	115	7.5	6.8	3	2	336
53.1	114	6.5	5.8	3	1	369
53.4B	115	9.5	7.5	2	1	486
53.5	114	8.5	6.5	3	2	211
64.4	120	6.0	6.5	1	2	344
73.1	110	7.5	6.0	3	3	262
79.4	123	6.5	8.5	2	0	430
141.2	114	8.5	6.0	2	2	366
157.4	113	9.5	7.5	3	1	365
Jemalong	105	8	5.0	2	2	361
Circle Valley	90	8	4.0	2	1	301
Trikkala*	114	2	2.5	-	-	126
Woogenellup*	122	2.5	2.8	-	-	56

* Very poor establishment of sub plots due to severe wash after germination

\+ Bluegreen aphid density 0 = no aphids
5 = Dense aphids over all plant parts

• Spines on burrs 0 = Spineless
1 = Short sparse spines
2 = Medium length but sparse
3 = Medium length and dense
4 = Very spiny

Clover Establishment Techniques

Difficulties have been experienced in many high rainfall areas with successful clover establishment into old pastures with high grass and weed populations. Cropping is not often practised in many of these areas.

A trial was undertaken at Keysbrook to investigate the effects of early and late grazing; sowing at the break or sowing at 3 - 4 weeks; early and late cultivation; and weed sprays. Trikkala at 12 kg/ha was sown into deteriorated pasture with negligible clover seed reserves.

Spectacular differences in both pasture composition and dry matter production were obtained. Tables 7 - 10 show the actual figures for all treatments for clover establishment density, spring clover percentage, spring pasture yield, and spring clover yield respectively. Seed yield data is not yet available.

(a) Grazing: The early grazing treatment commenced 6 weeks after germination - the standard recommendation of the Department of Agriculture for new pasture sowings. Late grazing to "favour" new pastures is often practiced by farmers and this treatment commenced 11 weeks after germination. Sheep were stocked at 10 dse/ha in both cases.

Early grazing was clearly superior to late grazing for all measurements in all treatment combinations. Table 11 summarizes the effects of early and late grazing.

In addition to improvements in clover percentage and dry matter production, an extra 5 weeks of grazing was obtained from the early grazed treatment.

TABLE 7 Clover Density Plants/sq metre August 3, 1981

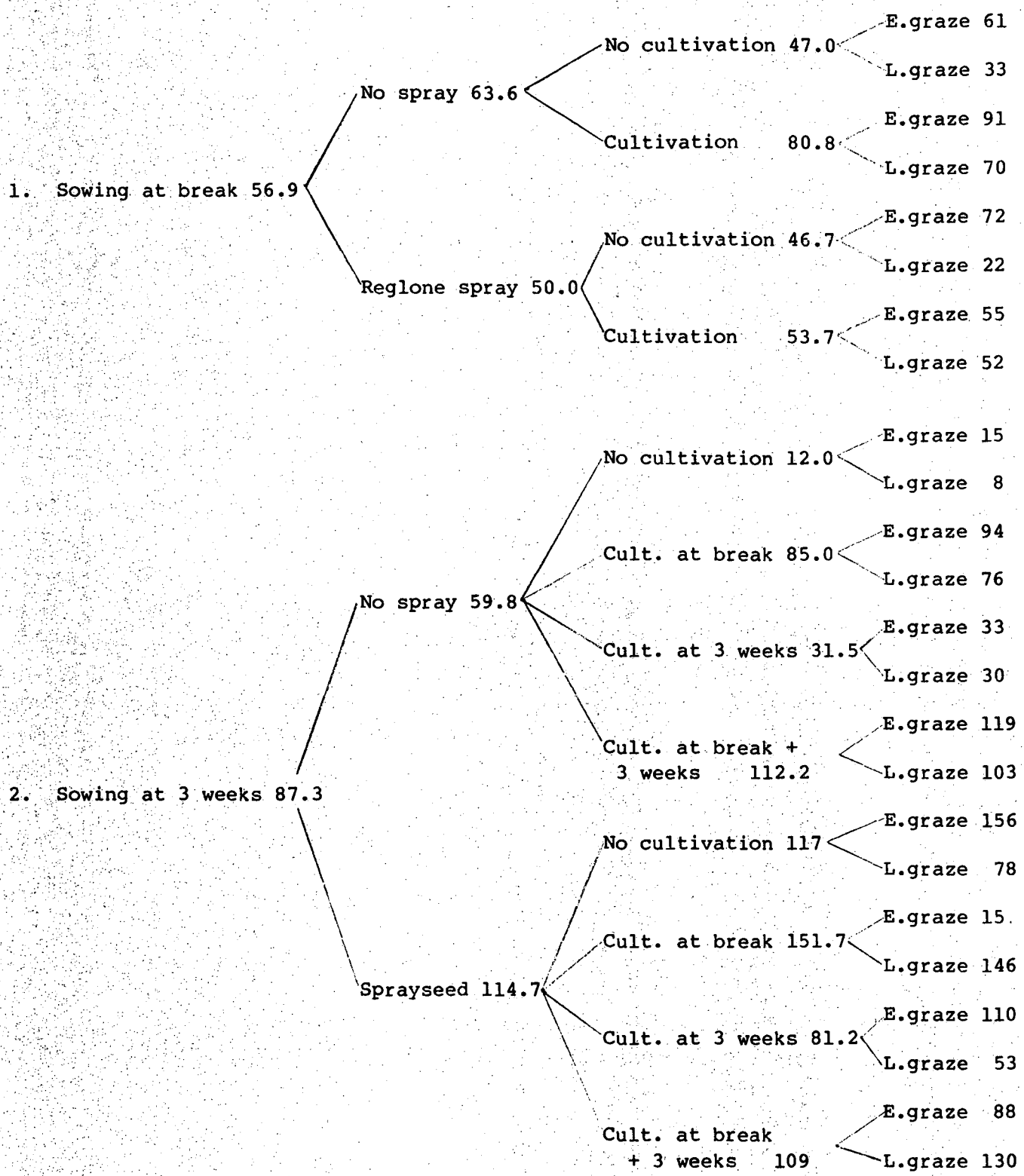

TABLE 8 Spring Clover % October 12, 1981

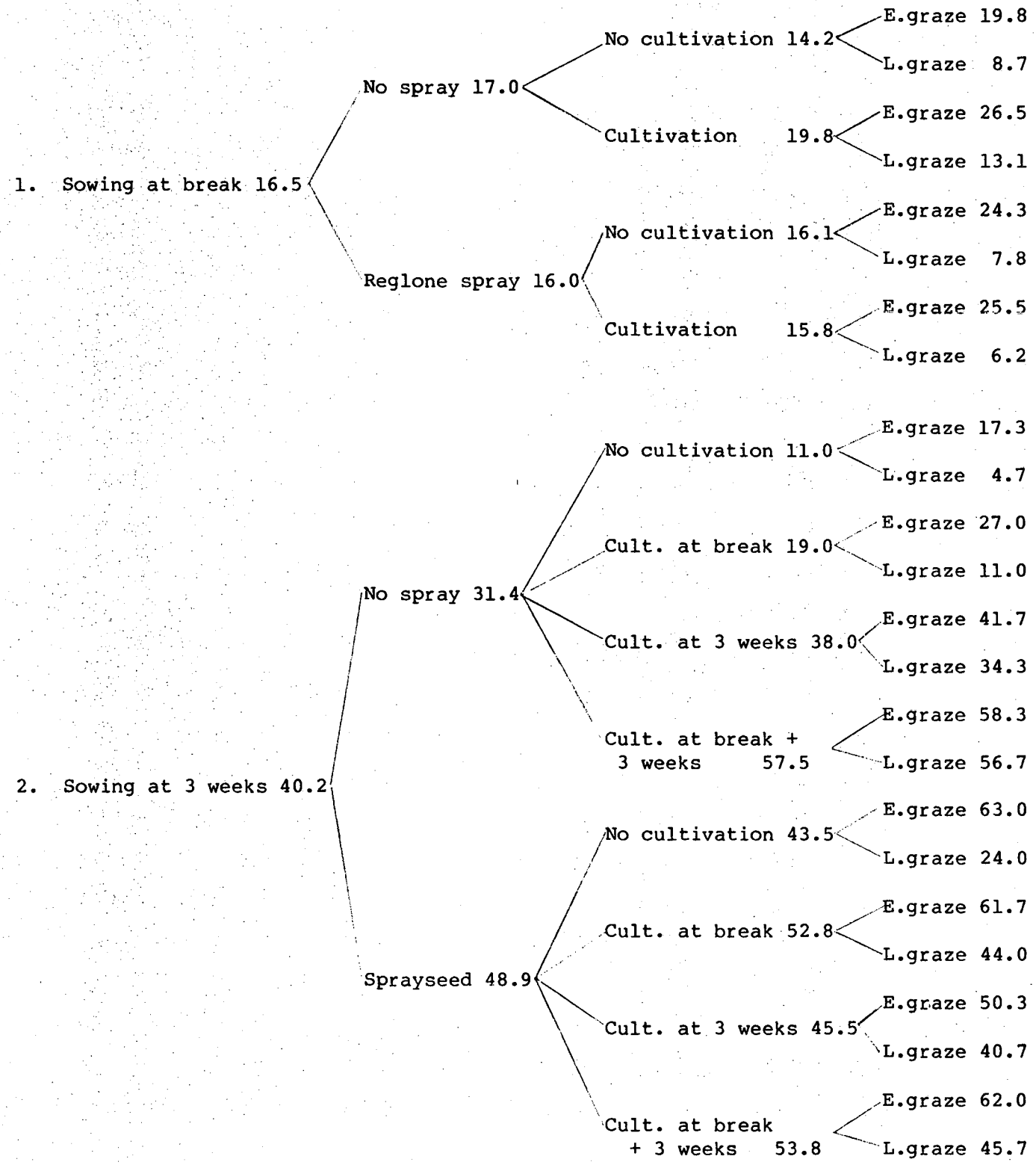

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TABLE 9 Pasture Yield kg/ha October 12, 1981

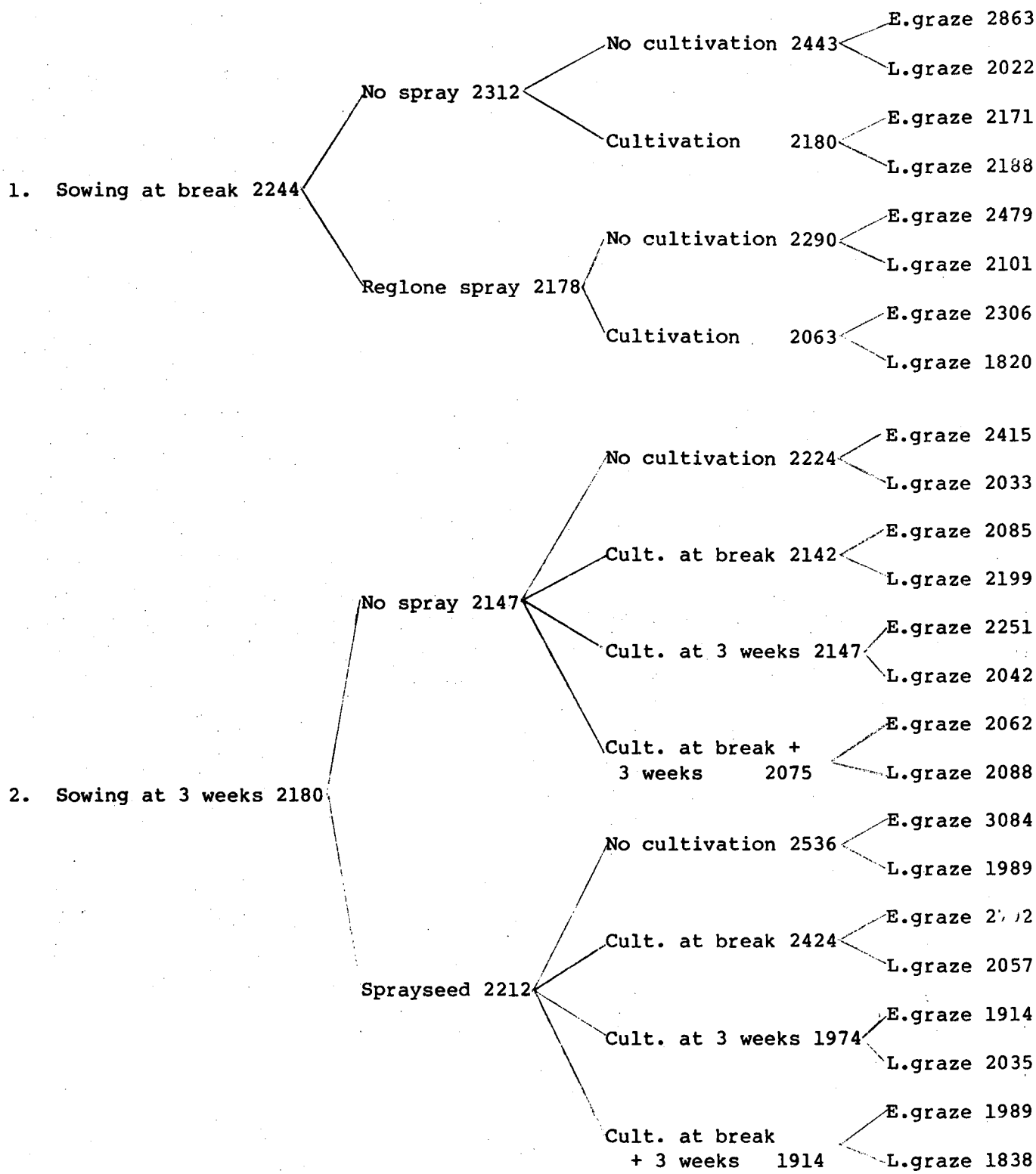

TABLE 10 Spring Clover Yield October 12, 1981
Kg/ha

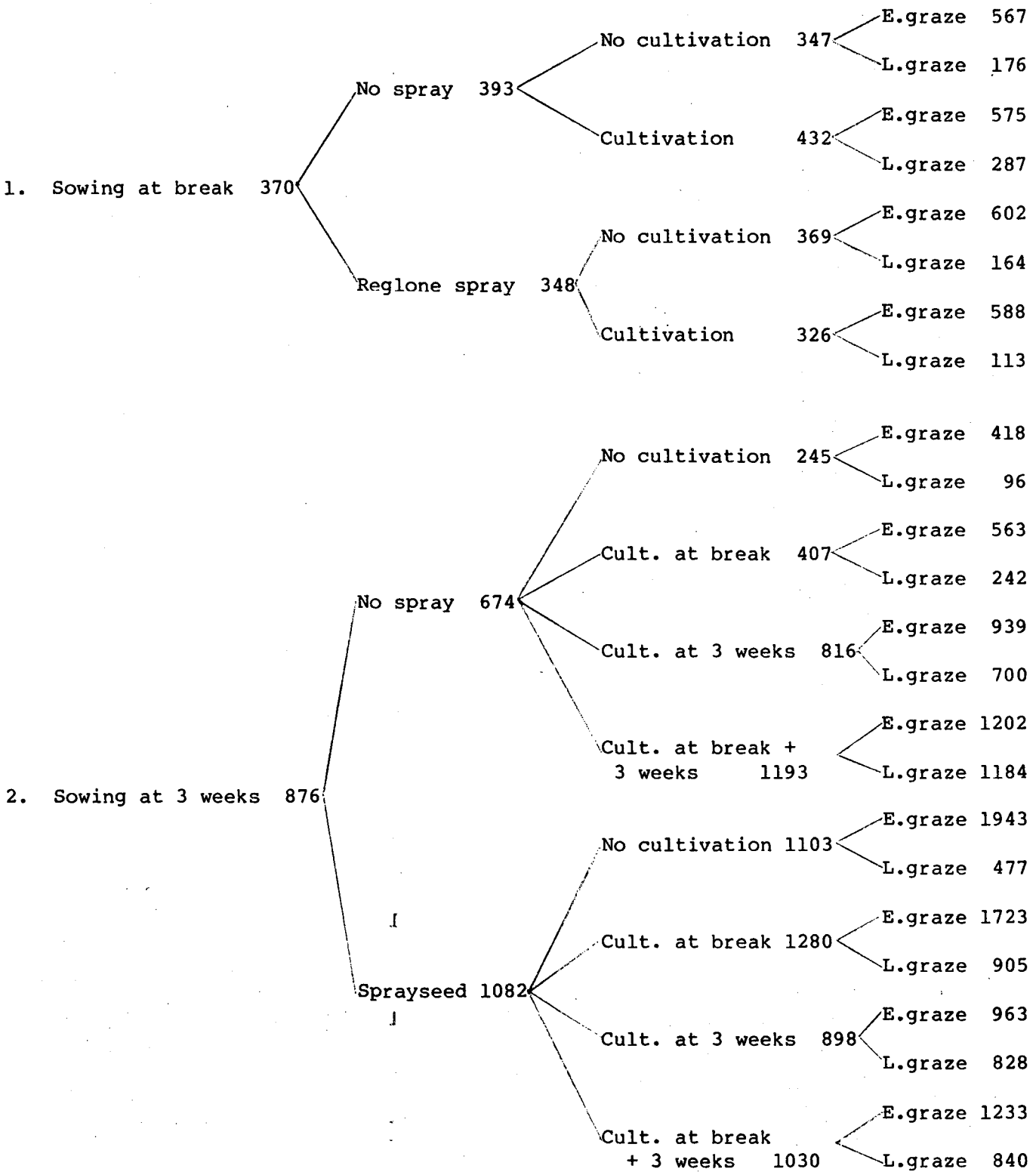

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TABLE 11 The effect of commencing Grazing at 6 weeks and 11 weeks on pasture establishment

	Early Grazing	Late Grazing
Winter clover density Plants/sq metre	88	67
Spring clover % *	40	25
Spring Weed % *	34	48
Spring Pasture Yield * Kg/ha	2368	2034
Spring Clover Yield * Kg/ha	943	501

* Sheep removed for 4 weeks prior to assessment.

b) Time of sowing: Comparison was made between (1) sowing at the break of the season (or just prior to the break) and controlling competing species later either by grazing or pasture sprays and (2) controlling other species first by spraying or cultivation after germination, then sowing 3 - 4 weeks after the opening rains.

Reglone spray was used to control broadleaf weeds when clover was sown at the break. This was inneffective because of (a) serious damage to nearly emerged clover and (b) a large percentage of the competing weeds were grasses and not broadleaf weeds. In practice therefore the break sowing had no weed control except by grazing. It was generally inferior to sowing at 3 weeks where good weed control was obtained.

Sowing at the break resulted in lower clover density and clover percentage in both winter and spring, but considerably higher total yields in winter and similar yields in spring compared to sowing at 3 weeks with weed control. However, sowing at 3 weeks without weed control was no different to sowing at the break.

c) Weed sprays: The effects of Reglone spray have been discussed above. Sprayseed was used at 2.0 L/ha 3 days prior to seeding and was highly effective in controlling competing species and increasing clover density (Tables 7 - 10). Observations on winter production showed a major reduction in yield with this treatment due to removal of all competing species (Winter measurements were not recorded), however by spring this difference had disappeared.

d) Cultivation: Two times of cultivation were used. Cultivation at the break ensured a reasonable seed bed for clover sowing compared with uncultivated pasture where seed was virtually dropped on the surface and only slightly covered with trailing harrows. Cultivation at 3 weeks was an alternative to sprayseed for weed control, and also resulted in a prepared seedbed more suited to clover establishment.

Cultivations always reduced both winter and spring production, but increased clover percentage, (Table 12), two cultivations having more of an effect than one. There was an interaction between cultivation and other forms of weed control (spraying or grazing) i.e. The increase in clover yield due to cultivation was non existent in early grazed plots treated with sprayseed.

TABLE 12 The effect of cultivation on pasture establishment

	No Cultivation	Break Cult	3 week Cult	Break + 3 week Cultivation
Winter clover density Plants/sq metre	56	93	56	110
Spring clover % *	21	27	42	56
Spring Weed % *	55	48	26	14
Spring Pasture Yield *	2373	2202	2061	1995
Spring Clover Yield *	516	611	857	1112

There are several clear cut conclusions to this trial which are probably applicable to many other medium to high rainfall non-cropping areas with deteriorated pastures and high weed populations.

1) Early grazing (e.g. 6 weeks after germination) at normal stocking rates is clearly superior to late grazing or no grazing. Just how early is the optimum is uncertain.

2) Some form of weed and grass control is essential in order to increase clover production and total sward yields. Whether sprays or cultivations achieve this best is uncertain and may well vary from site to site and season to season.

3) Sowing directly into uncultivated pasture is quite successful provided weeds and grasses are controlled with sprays such as sprayseed.