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## Virus diseases of annual medics.

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A. Persistence of AMV in Annual Medic Swards - 87A19, 87MT50

In 1990, the fourth year of this trial, although the medic plants were numerous the burr medic swards at Avondale grew poorly and weeds were widespread in the plots, especially long storksbill, flatweed and grasses. Poor growth was due to nodulation failure caused by low soil pH (5.3 in water). Hardly any medic plants were left in the Zodiac medic plot at Avondale while few remained at Mt Barker.

Table 1. Persistence of AMV infection in grazed swards, fourth year

Cultivar	% AMV incidence in plot	% AMV transmission in harvested seed
Circle Valley	37	1
Santiago	1	0.3
Serena	29	12
Zodiac	-	-
Zodiac A*	16	-

\* Mt Barker plot.

The virus was recovered in all plots tested in 1990 and, where tested, in seed after harvest (Table 1). Levels of infection in plots would have been higher if sampled later (done mid September). Thus despite weed occurrence and poor medic growth there was no sign of AMV dying away over time in grazed infected medic swards. Low AMV levels with cv. Santiago were consistent with previous years findings with this cultivar.

B. Effect of AMV on the Productivity of Burr Medic Swards After Cropping, Regeneration and Grazing - 88A21

88A21 was allowed to regenerate in 1990 following cropping with barley in 1989. It was hard grazed in summer and autumn (first germination was in February following summer rains). Then, at the beginning of June sheep were excluded and the buffers resown with oats. It was subsequently grazed again from mid-August to early-September (3 weeks) but as grazing was uneven all plots were mown (4 cm cutting height) at the end of this period to even them up.

AMV spread sooner from seed-infected medic plants in the regenerated swards than in trial 90A5 which was newly sown, achieving levels of > 50% by mid August and of over 80% by early September. Spread also occurred to control plots but did not exceed 12% infection. Herbage yield was significantly decreased by AMV infection in the cv. Circle Valley plots, losses of 5-13% being recorded (Table 2). Seed yields were also significantly decreased by infection; losses of 2-29% being recorded. There was a significant interaction between infection and cultivar for seed yields due to the greater impact of infection on cv. Circle Valley than on cv. Serena. Levels of infection in seed harvested were very high reflecting the early spread of infection.

Table 2a. Effect of AMV on the productivity of regenerated grazed burr medic swards

% Seed infected in 1988	Mowing treatment	Herbage yield (kg/ha) at October 2	Seed yield (kg/ha)
<u>cv. Serena</u>			
21	+	-	491 ( 2)*
0	+	-	499
14	-	-	399 (15)
0.1	-	-	471
<u>cv. Circle Valley</u>			
3	+	2,564 (13)*	518 (29)
0	+	2,931	729
2	-	2,414 ( 5)	500 (17)
0	-	2,539	601

Level of significance [S.E.D.]

Infection	0.027 [ 98]	0.002 [28]
Cultivar	-	< 0.001 [28]
Infection x cultivar	0.240 [139]	0.048 [40]
D.F.	12	28

\* Figures in parenthesis are % yield losses due to infection.

Table 2b. AMV spread in regenerated grazed burr medic swards

% Seed infection in 1988	Mowing treatment	% Plants with AMV infection (September 26)	% Infection in harvested seed
<u>cv. Serena</u>			
21	+	98	68
0	+	12	0.2
14	-	100	50
0.1	-	6	0.1
<u>cv. Circle Valley</u>			
3	+	98	32
0	+	11	2
2	-	100	20
0	-	11	0.4

C. Effect of AMV on the Productivity of Newly Sown Burr Medic Swards -  
90A5

90A5 was sown in early June and grazed portions of plots were grazed from August 15-September 7. There were major differences in the plots due to seed source. With all three cultivars the infected seed stocks produced more vigorous growth. This was visible from July to September in ungrazed portions of plots but was largely removed by grazing. When the phosphorus content of the seed stocks sown was determined it was higher in infected than healthy seed. Seed phosphorus seemed the most likely cause of better growth of infected seed.

Spread of AMV infection was slow until September after which it rapidly increased reaching 98-100% by mid October; infection in control plots reached 8-16%. Herbage growth rates were significantly decreased by infection between September 7 and October 2 for all three cultivars and between September 7 and October 16 for cvs Circle Valley and Santiago (Table 3). Overall, seed yields were also significantly decreased by infection. With the ungrazed treatments seed yield losses were still recorded due to infection with cvs Santiago and Serena despite the greater herbage biomass in the infected plots. However, with Circle Valley the greater biomass in the infected ungrazed plots outweighed the effect of virus infection and no seed yield loss was recorded. This lack of loss in seed yield with ungrazed cv. Circle Valley caused significant interactions between cultivar and infection and grazing, cultivar and infection. Weight/seed was significantly depressed by infection. However, there was no decrease in weight/seed recorded with cv. Circle Valley. AMV was readily detected in the seed harvested from plots sown with infected seed.

Table 3a. Effect of AMV on herbage production in newly sown, grazed burr medic swards

% Infection in seed sown/ grazing treatment	Herbage yield at end of grazing on September 7	Herbage growth rate (kg/ha/day)	
		September 7- October 2	September 7- October 16
<u>cv. Serena</u>			
20/+	1,000	39 (17%)	-
0/+	938	47	-
20/-	2,506	32 (35%)	-
0/-	1,703	49	-
<u>cv. Santiago</u>			
9/+	1,101	45 (26%)	35 (42%)
0/+	967	61	60
9/-	2,058	47 (29%)	33 (38%)
0/-	1,411	66	53
<u>cv. Circle Valley</u>			
9/+	985	43 (20%)	41 (23%)
0/+	934	54	53
9/-	2,232	48 (19%)	41 (32%)
0/-	1,548	59	60

\* Figures in parentheses are % yield losses due to infection.

Table 3b. Statistical analysis of herbage yield data in Table 3a

	Herbage growth rates	
	Sept. 7-Oct. 2	Sept. 7-Oct. 16
<u>Level of significance</u>		
Grazing	n.s.	n.s.
Cultivar	n.s.	n.s.
Infection	0.004	0.003
Grazing x cultivar	n.s.	n.s.
Grazing x infection	n.s.	n.s.
Cultivar x infection	n.s.	n.s.
Grazing x cultivar x infection	n.s.	n.s.
<u>S.E.D. [D.F.]</u>		
Infection	4 [18]	5 [12]

Table 3c. Effect of AMV on seed production in newly sown grazed, burr medic swards

% Infection in seed sown/ grazing treatment	Seed yield, kg/ha	Seed wt mgm/seed	% Seed transmission in seed harvested
<u>Serena</u>			
20/+	918 (13%)*	2.75	27
0/+	1,058	3.13	0
20/-	977 (25%)	3.13	27
0/-	1,311	3.18	0
<u>Santiago</u>			
9/+	984 (32%)	2.63	5
0/+	1,452	3.45	0
9/-	1,053 (19%)	2.95	2
0/-	1,298	3.63	0
<u>Circle Valley</u>			
9/+	695 (10%)	2.80	6
0/-	770	2.78	0
9/+	793	2.95	8
0/-	688	2.95	0.1

\* Figures in parentheses are % yield losses due to infection.

Table 3d. Statistical analysis of seed yield and weight data in Table 3c

	Seed yield	Seed weight
<u>Level of significance</u>		
Grazing	n.s.	0.011
Cultivar	< 0.001	0.005
Infection	< 0.001	< 0.001
Grazing x cultivar	n.s.	n.s.
Grazing x infection	n.s.	n.s.
Cultivar x infection	< 0.001	< 0.001
Grazing x cultivar x infection	0.021	n.s.
<u>S.E.D. [D.F.]</u>		
Grazing	-	0.04 [ 3]
Cultivar	56 [12]	0.07 [12]
Infection	30 [18]	0.05 [18]
Cultivar x infection	67 [18]	0.09 [18]
Grazing x cultivar x infection	86 [18]	-

Table 3e. AMV spread in newly sown, grazed burr medic swards

% Infection in seed sown/ grazing treatment	% Plants with late season infection		
	September 4	October 4	October 17
<u>Serena</u>			
20/+	30	87	-
0/+	-	4	-
20/-	30	82	-
0/-	-	4	-
<u>Santiago</u>			
9/+	15	82	98
0/+	-	6	16
9/-	13	78	98
0/-	-	5	8
<u>Circle Valley</u>			
9/+	22	96	100
0/+	-	5	16
9/-	26	93	98
0/-	-	6	12



D. Effect of BYMV on the Productivity of Burr Medic Spaced Plants

Spaced plant trials were done with BYMV - Melilotus isolate. Young plants of burr medic cvs Serena and Circle Valley growing in jiffy pots were inoculated with BYMV containing sap or mock-inoculated with healthy sap in the glasshouse and then transplanted out on the South Perth plots in paired rows. The rows were separated by oat buffers. Obvious symptoms of vein clearing, mottle, leaf pallor and/or reduction in leaf size developed in infected plants (strongest with cv. Serena). Many BYMV-inoculated plants without symptoms were removed along with the plants in the same positions in the healthy row pairs. Some pairs of plants were also removed due to contamination (symptom appearance) in the healthy plant of the pair. Herbage and root dry weights were decreased by 40-51% in Circle Valley; with cv. Serena herbage dry weight was decreased by 38% (Table 4). Not enough plants were left for some to remain for seed yield determinations.

Table 4. Effect of BYMV infection on productivity of burr medic-spaced plant trials\*

Treatment	Herbage dry wts (gm)	Root dry wts (gm)
<u>cv. Circle Valley - 13 pairs (15 wk duration)</u>		
Healthy	90.74†	14.95†
BYMV-infected	44.63	8.91
Significance‡	< 0.001	0.001
S.E.D. (D.F.)	6.60 (12)	1.36 (12)
% Loss	51	40
<u>cv. Serena - 7 pairs (12 wk duration)</u>		
Healthy	21.87	-
BYMV-infected	13.47	-
Significance	0.042	-
S.E.D. (D.F.)	3.28 (6)	-
% Loss	38	-

\* Healthy plants growing in jiffy pots (1/pot) were divided into two comparable groups, one of which was inoculated with BYMV-mel. isolate containing sap of cv. Daliak and the other mock inoculated with healthy cv. Daliak sap. The jiffy pots were transplanted out 3-4 weeks later for Circle Valley and 11 days later for cv. Serena in 1 metre rows arranged in pairs (1 healthy and 1 infected row/pair) at South Perth, 6 plants/row. The plots were spaced 2 m apart and a cereal barrier row of oats sown midway between them. BYMV-inoculated plants that did not show BYMV symptoms were removed along with the plants in the same positions in the corresponding row pairs. Herbage and roots were harvested individually from each plant. Dry wts were obtained after drying tops and roots in an oven at 60°C for at least 2-3 days. Burrs were threshed and clean seed wts obtained.

† Figures are mean values in grams/plant.

‡ For significance calculations used infected and healthy pairs of plants and did analysis of variance.