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INSECTICIDE SCREENING TRIALS AGAINST LUCERNE APHIDS, THERIOAPHIS TRIFOLII (MONELL) AND ACYRTHOSIPHON KONDOI SHINJI (HEMIPTERA : APHIDIDAE), IN SOUTH-EAST QUEENSLAND

by R. H. BROADLEY, M.Agr.Sc.; P. D. ROSSITER; H. BRIER, B.Agr.Sc.; D. G. BUTLER, B.Appl.Sc.; and R. J. LLOYD.

SUMMARY

The discovery of two new serious aphid pests of lucerne in Australia (*Therioaphis trifolii* (Monell) and *Acyrthosiphon kondoi* Shinji) was the stimulus for five insecticide trials, in which 16 insecticides were tested at 38 rates. Minimum effective dosages (expressed as g a.c. ha^{-1}) found in these trials were: acephate 500, BASF 6601 300, chlorpyrifos 250, demeton-S-methyl 50, dimethoate 60, endosulfan 250, formothion 150, methamidophos 250, methidathion 400, methomyl 250, monocrotophos 100, parathion 200, pirimicarb 50, and thiometon 49.

BASF 2001 120 provided moderate control while bioresmethrin 100 was ineffective.

I. INTRODUCTION

The spotted alfalfa aphid (SAA), *Therioaphis trifolii* (Monell), became a serious pest of lucerne in north America following its introduction in 1954, but the use of resistant varieties and imported parasites have significantly reduced its importance (Stern and van den Bosch 1959; Neuenschwander, Hagen and Smith 1975). It was collected for the first time in Australia from lucerne in the Lockyer Valley, on 29 March 1977 (Passlow 1977a). Shortly afterwards the blue-green aphid (BGA), *Acyrthosiphon kondoi* Shinji, was also found on lucerne in south Queensland (Passlow 1977b). BGA, of Manchurian origin (Dickson 1975) seriously damaged lucerne in California in 1974 (Sharma, Stern and Hagemann 1976) and in New Zealand in 1976 (Cox 1976).

SAA and BGA rapidly became established in Queensland on lucerne which previously had been free from significant aphid attack. Accordingly, there was an urgent need to develop control methods, and the present investigation was designed to test insecticides for early recommendations towards control.

II. METHODS AND MATERIALS

Five trials were conducted in 1977. Experimental design, plot size, location, aphid species and estimated initial populations are given in table 1. The widely grown lucerne cultivar, 'Hunter River', was used in all trials.

Details of insecticides used are given with the tabulated results. All insecticides were applied from a knapsack sprayer in cool, calm conditions at approximately 200 l ha^{-1}. In trials I, IV and V a 1·5-m four-nozzle boom was employed, while in trials II and III a twin-nozzle lance was used.

Pre- and post-treatment aphid populations were assessed from samples taken with a vacuum sampler possessing a 20-cm diameter orifice. Post-treatment sampling periods in each trial are given with the tabulated results.

Trial I

One sample per plot was taken on each occasion by moving the mouth of the suction tube slowly over 5 m of row (i.e. approximately 1·0 m^2 per plot). Aphids were removed from the nylon collecting bag and hand sieved (2·5-mm mesh) to remove plant debris, suspended in water, filtered through a 90-mm-diameter filter paper and counted using a binocular microscope. Where more than 100 aphids were involved, they were counted from only part of the filter paper and the total population estimated by calculation.

Trials II and III

One sample was taken per plot on each date by holding the opening of the suction tube to the ground at six equidistant sites along a line through each plot (i.e. approx. 0·18 m^2). Aphids were separated from plant debris by sieving (as in trial I), and suspended in 750 ml of water to which three drops of a wetting agent had been added. Two 10-ml aliquots were pipetted off, and spread along paper towelling for subsequent counting of SAA and BGA apterae and alatae.

Trial IV

Procedures were similar to those in trials II and III except that five sites per plot were sampled (i.e. approx. 0·15m^2).

Trial V

A sample was collected by moving the suction orifice over 7 m of row length within each plot (i.e. approx. 1·4 m^2) on each date. Further procedures were as outlined for trials II and III, except that numbers within a 10-ml aliquot from a 750-ml suspension were examined when high populations were involved, and a 10-ml aliquot from a 200-ml suspension when numbers were low.

Analyses of variance and L.S.D. testing were applied after data transformation, to evaluate treatment effects.

III. RESULTS AND DISCUSSION

Control of SAA

SAA were present in all trials (tables 2, 3, 5, 7 and 9).

Effective control was achieved with the following insecticides (rates of application have been expressed in g a.c. ha^{-1}): acephate 500, BASF 6601 300, chlorpyrifos 250, demeton-S-methyl 300 to 50, dimethoate 300 to 60, endosulfan 700 to 250, formothion 150, methamidophos 300 to 250, methidathion 500 to 400, methomyl 300 to 250, monocrotophos 300 to 100, parathion 200, pirimicarb 200 to 50, and thiometon 98 to 49.

TABLE 1

LUCERNE APHID TRIALS—SITE AND DESIGN, LUCERNE HEIGHT AND APHID POPULATION ESTIMATES AT TREATMENT

Trial No.	Site	Dates of Spray Application	Design		Lucerne Height (mm)	Estimated Population of Apterae (x 10^6 ha^{-1})	
			Layout (Treatments by Replicates)	Plot Size (m)		SAA	BGA
I	Lawes	28 Apr. 1977 ..	10 x 3 randomized block	10 x 6	200	7·5	..
II	Wellcamp ..	21 June 1977 ..	10 x 4 randomized block	9 x 3	200	500	21
III	Kingaroy ..	11 July 1977 ..	8 x 4 randomized block	10 x 3	160	600	140
IV	Lawes	1 Aug. 1977 ..	12 x 3 randomized block	10 x 6	150	1 200	100
V	Wellcamp ..	26 Oct. 1977 ..	11 x 3 randomized block	10 x 3	170	130	..

TABLE 2

TRIAL I—MEAN NUMBERS OF *T. trifolii* PER SAMPLE PER PLOT

Treatment	Pre-treatment		1 Day Post-treatment		7 Days Post-treatment	
Insecticide (g a.c. ha^{-1})	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *
Monocrotophos 300	6·426 (618)	5·102 (164)	2·334 (10·3)	4·053 (57·6)	1·606 (4·0)	1·729 (5·6)
Demeton-S-methyl 300	6·442 (628)	4·859 (129)	3·174 (23·9)	4·486 (88·8)	2·856 (16·4)	2·791 (16·3)
Dimethoate 300	6·616 (747)	5·085 (162)	2·855 (17·4)	5·019 (151)	2·732 (14·4)	3·166 (23·7)
Methamidophos 300	6·260 (523)	4·527 (92·5)	3·902 (49·5)	5·242 (189)	3·526 (33·0)	3·376 (29·2)
Endosulfan 700	6·912 (1004)	4·675 (107)	3·520 (33·8)	5·333 (207)	3·762 (42·0)	4·062 (58·1)
Methidathion 500	6·549 (698)	4·833 (126)	2·373 (10·7)	3·785 (44·0)	3·434 (30·0)	4·001 (54·6)
Methomyl 300	6·441 (627)	4·937 (139)	2·998 (20·0)	5·195 (180)	3·961 (51·5)	4·521 (91·9)
Parathion 200	6·403 (604)	4·874 (131)	3·296 (27·0)	5·178 (177)	4·522 (91·0)	4·166 (64·4)
Bioresmethrin 100	6·467 (644)	5·283 (197)	5·105 (165)	5·598 (270)	6·637 (761)	5·189 (179)
Untreated	7·046 (1148)	5·537 (254)	6·830 (925)	5·700 (299)	7·329 (1522)	5·198 (181)
L.S.D. 5%	N.S.D.	N.S.D.	1·429	0·556	1·374	0·636
1%	..	..	1·958	0·762	1·882	0·871

* $\log_e (x)$ or $\log_e (x + 1)$ transformation applied before analysis of variance.
Numbers in brackets are equivalent means.

TABLE 3

TRIAL II—MEAN NUMBERS OF *T. trifolii* PER SAMPLE PER PLOT

Treatment	Pre-treatment		1 Day Post-treatment		3 Days Post-treatment		6 Days Post-treatment	
Insecticide (g a.c. ha^{-1})	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *
Acephate 500	9·024 (8 300)	6·061 (429)	8·670 (5 828)	3·656 (37·7)	3·712 (39·9)	2·622 (12·8)	1·080 (1·9)	1·184 (2·3)
Demeton-S-methyl 150 ..	8·863 (7 066)	5·523 (250)	5·087 (161)	2·165 (7·7)	1·082 (2·0)	1·181 (2·3)	0·909 (1·5)	*** (0)
Dimethoate	8·956 (7 759)	5·226 (186)	6·747 (851)	1·467 (3·3)	0·357 (0·4)	3·466 (31·0)	0·300 (0·3)	0·326 (0·4)
Chlorpyrifos 250	9·055 (8 569)	5·022 (151)	6·404 (604)	1·486 (3·4)	3.481 (31·5)	1·410 (3·1)	1·080 (1·9)	*** (0)
Methidathion 400	8·955 (7 753)	5·212 (183)	6·217 (501)	*** (0)	0·909 (1·5)	1·992 (6·3)	1·082 (2·0)	*** (0)
Endosulfan 350	9·210 (10 006)	5·779 (323)	8·789 (6 565)	4·813 (122)	5·185 (178)	2·023 (6·6)	2·725 (14·3)	2·983 (18·7)
Methamidophos 250 ..	8·862 (7 062)	5·315 (203)	6·486 (656)	0·909 (1·5)	0·000 (0·0)	1·818 (5·2)	0·909 (1·5)	*** (0)
Methomyl 250	9·077 (8 758)	5·453 (233)	5·528 (251)	1·992 (6·3)	4·083 (58·3)	2·163 (7·7)	0·909 (1·5)	*** (0)
Monocrotophos 100 ..	9·299 (10 931)	5·973 (393)	8·118 (3 357)	3·073 (20·6)	0·909 (1·5)	1·818 (5·2)	1·082 (2·0)	*** (0)
Untreated	8·925 (7 521)	4·630 (102)	9·403 (12 135)	5·517 (248)	9·379 (11 844)	6·096 (443)	9·508 (13 473)	6·169 (477)
L.S.D. 5%	N.S.D.	N.S.D.	0·929	N.S.D.	1·623	N.S.D.	2·800	3·116
1%			1·261		2·203		3·800	4·533

* $\log_e (x + 1)$ or $\log_e (x)$ transformation was applied before analysis of variance.

Numbers in brackets are equivalent means.

*** Zero values not analysed.

TABLE 4

TRIAL II—MEAN NUMBERS OF *A. kondoi* PER SAMPLE PER PLOT

Treatment	Pre-treatment	1 Day Post-treatment	3 Days Post-treatment	6 Days Post-treatment
Insecticide (g a.c. ha^{-1})	Apterae *	Apterae *	Apterae *	Apterae *
Acephate 500	5·997 (402)	6·817 (912)	1·136 (2·1)	1·206 (2·3)
Demeton-S-methyl 150	5·827 (339)	3·645 (37·3)	0·909 (1·5)	*** (0)
Dimethoate 150	5·954 (385)	0·020 (0)	0·000 (0)	0·210 (0·2)
Chlorpyrifos 250	6·128 (458)	2·493 (11·1)	0·212 (0·2)	1·206 (2·3)
Methidathion 400	5·848 (346)	4·530 (91·8)	*** (0)	0·909 (1·5)
Endosulfan 350	6·295 (542)	6·755 (858)	5·138 (169)	0·210 (0·2)
Methamidophos 250	5·964 (389)	4·603 (98·8)	0·909 (1·5)	*** (0)
Methomyl 250	6·106 (448)	4·700 (109)	2·901 (17·2)	1·992 (6·3)
Monocrotophos 100	6·010 (407)	4·882 (131)	*** (0)	0·909 (1·5)
Untreated	5·843 (345)	6·821 (916)	7·247 (1 403)	7·232 (1 383)
L.S.D. 5%	N.S.D.	1·797	2·042	2·597
1%		2·438	2·806	3·567

* $\log_e (x + 1)$ or $\log_e (x)$ transformation was applied before analysis of variance.

Numbers in brackets are equivalent means.

*** Zero values not analysed.

TABLE 5

TRIAL III—MEAN NUMBERS OF *T. trifolii* PER SAMPLE PER PLOT

Treatment	Pre-treatment		1 Day Post-treatment		3 Days Post-treatment		8 Days Post-treatment		15 Days Post-treatment	
Insecticide (g a.c. ha^{-1})	Apterae	Alatae	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *
Formothion 150	12 413	309	8·742 (6 256)	2·167 (7·7)	6·469 (644)	0·913 (1·5)	4·771 (117)	3·704 (39·6)	6·549 (697)	4·206 (66·1)
Pirimicarb 100	11 458	206	7·475 (1 762)	1·183 (2·3)	6·372 (584)	0·913 (1·5)	4·048 (56·3)	2·887 (16·9)	4·491 (88·2)	3·331 (27·0)
Pirimicarb 200	7 669	225	6·990 (1 084)	0·000 (0)	6·557 (703)	0·913 (1·5)	2·697 (13·8)	3·546 (33·7)	3·297 (26·0)	3·627 (36· 6)
Monocrotophos 100 ..	8 747	197	8·876 (7 159)	4·162 (63·2)	6·699 (811)	2·908 (17·3)	5·018 (150)	2·482 (11·0)	5·141 (170)	1·834 (5·3)
Dimethoate 150	6 450	178	8·208 (3 670)	2·908 (17·3)	6·045 (421)	0·913 (1·5)	4·276 (70·9)	2·473 (10·0)	5·139 (170)	4·071 (57·6)
Demeton-S-methyl 150 ..	12 319	84·4	7·062 (1 166)	1·825 (5·2)	6·596 (731)	0·913 (1·5)	3·163 (22·6)	3·332 (27·0)	3·254 (24·9)	4·238 (68·3)
Acephate 150	11 991	244	9·341 (11 395)	4·954 (141)	7·457 (1 731)	3·921 (49·4)	6·305 (546)	2·738 (14·5)	6·150 (468)	1·852 (5·4)
Untreated	9 883	203	9·604 (14 820)	5·574 (263)	9·258 (10 492)	5·182 (177)	9·323 (11 195)	4·870 (129)	9·850 (18 960)	5·623 (276)
L.S.D. 5%	N.S.D.	N.S.D.	0·809	2·367	0·644	2·180	1·809	N.S.D.	1·691	2·348
1%			1·102	3·223	0·877	2·968	2·463		2·302	3·197

* $\log_e (x + 1)$ transformation was applied before analysis of variance.

Numbers in brackets are equivalent means.

TABLE 6

TRIAL III—MEAN NUMBERS OF *A. kondoi* PER SAMPLE PER PLOT

Treatment	Pre-treatment		1 Day Post-treatment		3 Days Post-treatment		8 Days Post-treatment		15 Days Post-treatment	
Insecticide (g a.c. ha^{-1})	Apterae	Alatae	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *
Formothion 150	3 525	37·5	7·169 (1 298)	1·825 (5·2)	5·560 (259)	0·000 (0)	3·697 (39·3)	1·847 (5·3)	5·550 (256)	1·896 (5·7)
Pirimicarb 100	2 138	28·1	6·523 (679)	0·000 (0)	5·626 (277)	0·000 (0)	3·296 (26·0)	1·621 (4·1)	5·438 (229)	0·651 (0·9)
Pirimicarb 200	2 166	113	5·952 (383)	0·000 (0)	5·989 (398)	0·913 (1·5)	1·623 (4·1)	3·357 (27·7)	4·307 (73·2)	0·651 (0·9)
Monocrotophos 100 ..	2 616	56·3	7·977 (2 913)	2·738 (14·5)	6·437 (624)	1·083 (2·0)	5·346 (209)	2·918 (17·5)	5·655 (285)	0·913 (1·5)
Dimethoate 150	1 997	65·6	6·789 (887)	0·913 (1·5)	5·469 (236)	0·000 (0)	1·477 (3·4)	1·530 (3·6)	5·010 (149)	1·825 (5·2)
Demeton-S-methyl 150 ..	2 916	65·6	6·331 (561)	0·000 (0)	6·827 (922)	0·913 (1·5)	0·746 (1·1)	2·054 (6·8)	4·432 (83·1)	0·745 (1·1)
Acephate 150	2 506	84·4	8·426 (4 564)	3·821 (44·6)	7·028 (1 127)	2·738 (14·5)	6·609 (741)	1·825 (5·2)	6·665 (783)	2·908 (17·3)
Untreated	3 359	65·6	8·669 (5 818)	2·337 (9·4)	8·616 (5 516)	2·908 (17·3)	8·483 (4 832)	3·651 (37·5)	8·106 (3 314)	4·326 (74·7)
L.S.D. 5%	N.S.D.	N.S.D.	0·827	2·302	0·973	2·081	2·022	N.S.D.	1·533	N.S.D.
1%			1·126	3·134	1·325	2·833	2·754		2·087	

* $\log_e (x + 1)$ transformation was applied before analysis of variance.

Numbers in brackets are equivalent means.

TABLE 7

TRIAL IV—MEAN NUMBERS OF *T. trifolii* PER SAMPLE PER PLOT

Treatment	Pre-treatment		1 Day Post-treatment		3 Days Post-treatment		7 Days Post-treatment	
Insecticide (g a.c. ha^{-1})	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *
Pirimicarb 100	9·839 (18 755)	6·214 (499)	7·332 (1 528)	2·394 (10·0)	6·969 (1 063)	3·116 (21·6)	1·841 (5·3)	2·470 (10·8)
75	9·610 (14 910)	4·684 (107)	7·167 (1 296)	2·887 (16·9)	6·756 (859)	3·345 (27·4)	3·792 (43·3)	1·862 (5·4)
50	9·810 (18 210)	6·147 (466)	6·546 (697)	0·836 (1·3)	6·232 (509)	1·444 (3·2)	2·347 (9·5)	1·862 (5·4)
Demeton-S-methyl 150 ..	9·860 (19 158)	5·858 (349)	7·499 (1 806)	1·444 (3·2)	6·727 (835)	3·298 (26·0)	0·418 (0·5)	1·231 (2·4)
100 ..	9·733 (16 859)	5·798 (329)	7·248 (1 405)	3·210 (23·8)	6·887 (979)	3·838 (45·4)	2·994 (19·0)	2·808 (15·6)
50 ..	9·565 (14 256)	5·980 (395)	6·839 (934)	1·444 (3·2)	6·845 (939)	2·280 (8·8)	3·460 (30·8)	1·976 (6·2)
Endosulfan 350	9·998 (21 984)	6·189 (487)	8·210 (3679)	3·705 (39·6)	6·479 (651)	4·087 (58·5)	0·722 (1·1)	2·394 (10·0)
250	9·591 (14 629)	6·222 (503)	8·551 (5 171)	3·345 (27·4)	7·233 (1 385)	2·814 (15·7)	4·440 (83·8)	2·628 (12·8)
150	9·679 (15 972)	5·609 (272)	9·046 (8 487)	4·788 (119)	8·173 (3 543)	3·791 (43·3)	6·753 (855)	4·228 (67·6)
50	9·833 (18 635)	6·014 (408)	9·433 (12 493)	4·457 (85·2)	9·114 (9 086)	6·299 (543)	9·857 (7 022)	5·516 (248)
Monocrotophos 100 ..	9·994 (21 895)	6·336 (564)	6·671 (790)	3·688 (39·0)	5·921 (373)	2·394 (10·0)	4·209 (66·3)	1·976 (6·2)
Untreated	9·859 (19 124)	5·686 (294)	9·662 (15 708)	5·002 (148)	9·723 (16 699)	6·915 (1 006)	10·114 (24 686)	7·506 (1 819)
L.S.D. 5%	N.S.D.	N.S.D.	1·238	N.S.D.	1·208	N.S.D.	2·729	3·026
1%			1·683		1·642		3·709	4·113

* $\log_e (x)$ or $\log_e (x + 1)$ transformation was applied before analysis of variance.

Numbers in brackets are equivalent means.

TABLE 8

TRIAL IV—MEAN NUMBERS OF *A. kondoi* PER SAMPLE PER PLOT

Treatment		Pre-treatment		1 Day Post-treatment		3 Days Post-treatment		7 Days Post-treatment	
Insecticide (g a.c. ha^{-1})		Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *
Pirimicarb	100	7·665 (2 131)	3·230 (24·3)	4·379 (78·8)	0·722 (1·1)	3·116 (21·6)	0·000 (0·0)	0·361 (0·4)	0·361 (0·4)
	75	7·498 (1 803)	2·280 (8·8)	3·594 (35·4)	1·444 (3·2)	2·280 (8·8)	0·000 (0·0)	0·000 (0·0)	0·000 (0·0)
	50	7·116 (1 230)	1·672 (4·3)	4·019 (54·7)	0·000 (0·0)	4·445 (84·2)	0·000 (0·0)	1·083 (2·0)	0·000 (0·0)
Demeton-S-methyl	150	7·232 (1 382)	3·069 (20·5)	5·086 (161)	0·000 (0·0)	2·280 (8·8)	0·000 (0·0)	1·083 (2·0)	0·361 (0·4)
	100	7·053 (1 155)	0·722 (1·1)	2·577 (12·2)	0·722 (1·1)	3·002 (19·1)	1·444 (3·2)	1·083 (2·0)	0·361 (0·4)
	50	7·439 (1 701)	1·558 (3·7)	3·905 (48·6)	0·722 (1·1)	2·395 (10·0)	0·722 (1·1)	0·361 (0·4)	0·000 (0·0)
Endosulfan	350	6·537 (689)	1·444 (3·2)	6·799 (896)	0·722 (1·1)	4·698 (109)	0·000 (0·0)	0·000 (0·0)	0·000 (0·0)
	250	6·977 (1 071)	3·002 (19·1)	7·074 (1 180)	0·722 (1·1)	5·267 (1·93)	3·116 (21·6)	0·361 (0·4)	0·000 (0·0)
	150	7·556 (1 910)	4·019 (54·7)	7·701 (2 210)	0·722 (1·1)	6·845 (938)	1·558 (3·7)	4·548 (93·5)	0·969 (1·6)
	50	7·621 (2 040)	3·838 (45·4)	7·960 (2 864)	1·444 (3·2)	6·866 (958)	1·558 (3·7)	6·733 (838)	1·939 (5·9)
Monocrotophos	100	7·038 (1 138)	3·642 (37·2)	3·497 (32·0)	0·722 (1·1)	4·971 (143)	0·000 (0·0)	1·774 (4·9)	1·501 (3·5)
Untreated		7·601 (1 999)	2·461 (10·7)	8·071 (3 200)	1·444 (3·2)	7·226 (1 374)	4·923 (136)	7·393 (1 623)	4·726 (112)
L.S.D. 5%		N.S.D.	N.S.D.	2·738	N.S.D.	1·502	1·788	1·950	1·407
1%				3·722		2·041	2·430	2·651	1·913

* $\log_e (x + 1)$ transformation was applied before analysis of variance.

Numbers in brackets are equivalent means.

TABLE 9

TRIAL V—MEAN NUMBERS OF *T. trifolii* PER SAMPLE PER PLOT

Treatment	Pre-treatment		1 Day Post-treatment		3 Days Post-treatment		7 Days Post-treatment	
Insecticide (g a.c. ha^{-1})	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *	Apterae *	Alatae *
Dimethoate 150 ..	6·880 (972)	4·325 (74·6)	2·029 (6·6)	1·889 (5·6)	1·936 (5·9)	4·176 (64·1)	3·928 (49·8)	5·496 (243)
100 ..	6·626 (754)	4·379 (78·8)	2·517 (11·4)	2·323 (9·2)	1·175 (2·2)	3·404 (29·1)	4·174 (64·0)	5·401 (221)
80 ..	7·092 (1 202)	4·143 (62·0)	2·660 (13·3)	2·391 (9·9)	2·079 (7·0)	3·263 (25·1)	4·192 (65·2)	5·603 (270)
60 ..	7·334 (1 530)	4·426 (82·6)	2·611 (12·6)	2·531 (11·6)	2·287 (8·8)	4·041 (55·9)	4·622 (101)	5·592 (267)
Thiometon 98	7·129 (1 246)	4·750 (115)	2·809 (15·6)	2·339 (9·4)	1·669 (4·3)	3·157 (22·5)	4·200 (65·7)	5·325 (204)
73·5	6·692 (805)	4·157 (62·9)	2·807 (15·6)	2·197 (8·0)	2·200 (8·0)	3·582 (34·9)	4·218 (66·9)	5·433 (228)
49	6·827 (921)	3·573 (34·6)	3·398 (28·9)	2·687 (13·7)	2·655 (13·2)	3·533 (33·2)	4·401 (80·6)	5·010 (149)
BASF 2001 120	6·941 (1 033)	4·579 (96·4)	3·474 (31·3)	2·535 (11·6)	3·435 (30·0)	4·028 (55·2)	5·012 (149)	5·462 (234)
BASF 6601 300	6·678 (793)	3·551 (33·8)	3·220 (24·0)	1·955 (6·1)	1·455 (3·3)	3·172 (22·9)	2·914 (17·4)	5·081 (160)
Demeton-S-methyl 75 ..	7·419 (1 667)	4·168 (63·6)	2·512 (11·3)	2·268 (8·7)	1·949 (6·0)	3·758 (41·9)	4·625 (101)	5·789 (326)
Untreated	7·453 (1 725)	4·697 (109)	7·756 (2 335)	5·985 (396)	7·538 (1 877)	5·508 (246)	5·784 (324)	5·276 (195)
L.S.D. 5%	N.S.D.	N.S.D.	0·784	0·749	1·328	0·919	0·768	N.S.D.
1%			1·070	1·022	1·812	1·254	1·048	

* The $\log_e (x + 1)$ transformation was applied before analysis of variance.

Numbers in brackets are equivalent means.

Acephate 150, BASF 2001 120 and endosulfan 150 and 50 provided moderate control. Bioresmethrin 100 was ineffective.

Control of BGA

The effects of insecticides against BGA are shown in tables 4, 6 and 8.

Minimum effective dosages

The minimum effective dosages (expressed as g a.c. ha^{-1}) of insecticides used against both aphid species were: acephate 500, chlorpyrifos 250, demeton-S-methyl 50, dimethoate 150, endosulfan 250, formothion 150, methamidophos 250, methidathion 400, methomyl 250, monocrotophos 100 and pirimicarb 50.

BASF 6601 300, dimethoate 60, parathion 200 and thiometon 49 were shown to be effective against SAA, but opportunities to test these rates against BGA did not occur. Further studies might allow dosage reductions for some chemicals.

Additional investigations are required to evaluate relevant materials for effects on the lucerne aphid parasite/predator complex.

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All authors except Mr Butler are officers of Entomology Branch, Queensland Department of Primary Industries. Messrs Broadley, Rossiter, and Lloyd are stationed at Toowoomba, Q. 4350 and Mr Brier is stationed at Kingaroy, Q. 4610. Mr Butler is an officer of Biometry Branch, Toowoomba, Q. 4350.