RE-EVALUATION OF THREE PRE-EMERGENCE HERBICIDES FOR BUTTERCUP SQUASH AT PUKEKOHE

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SUMMARY

New formulations of chloramben and chlormethazole were evaluated singly or in combination with alachlor on squash (*Cucurbita maxima*) in a late November sowing at Pukekohe. Alachlor at 1.5 kg ai/ha was the most effective treatment. Chloramben at 4.2 kg ai/ha suppressed early squash growth but not final fruit yield. Toxicity symptoms were encountered with the new formulation of chlormethazole, but there were no significant effects on plant growth and squash yield.

INTRODUCTION

Squash is an important fresh vegetable export crop for New Zealand worth \$18.4 million f.o.b. in 1984, when it ranked second to onions (\$40.3 million f.o.b.). Eighty percent of squash produced nationally is grown in the Pukekohe region.

The main management problem in squash is early season weed control, when there is insufficient leaf canopy to smother weeds. Wilson (1979) recommended alachlor at 2 kg ai/ha, or a mixture of alachlor + chlormethazole at 1 + 1.5 kg ai/ha. Subsequently chlormethazole was withdrawn from the market, but a new formulation became available in 1984 for trial assessment. Chloramben as an emulsifiable concentrate had been available for a number of years but had received little attention from growers. In 1983 a new powder formulation of chloramben became available for trial evaluation.

Because of these changes in formulation a trial was conducted to study the effect of these herbicides on early plant growth, weed control efficacy and final yield. The herbicides used were alachlor, chloramben and chlormethazole, and some mixtures of alachlor plus the other chemicals.

METHOD

The trial site was on Patumahoe clay loam followed for 8 months after an onion crop. It was ploughed and shaped into 1.5 m beds. Squash (cv. Delica) seed was sown 2 cm deep and 15 cm apart in single rows in each bed (44,000 plants/ha) on 26.11.84. Plots measured 6 m in length and 1.5 m in width. Eight herbicide treatments (details in Tables 2 and 3) were each replicated four times in a randomised block design. Herbicides were applied on 27.11.84 with a modified Oxford sprayer calibrated at 400 litres/ha and 200 kPa. After rain (20 mm) the day prior to sowing, the soil was moist and in very fine tilth with no clods or crop residues. Chemicals were further activated by two irrigations (each 12 mm) 2 and 4 days after herbicide application. Subsequently, good rainfall during the first 4 weeks after planting (Table 1) resulted in very good crop establishment.

Early crop growth at the 2 to 3 true leaf stage was measured as dry weight of alternate plants in each plot on 20.12.84. The plant population remaining after sampling was 22,000 plants/ha. Weed populations were determined in the untreated control plots on 20.12.84 from weed counts within quadrats (25 x 25 cm) randomly placed at four positions per plot. Some initial handweeding in the control plots was then done before a final clean-up on 29.12.84. Weed populations were recorded from six quadrats/plot in all other treatments, and the weeds removed, on 4.1.85. The squash was harvested at maturity on 21.2.85, and the number and total weight of fruit recorded.

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TABLE 1: Daily precipitation (mm) during the first four weeks after planting squash crop.

Day	Week 1	Rainfall (mm)			Week 4
		Week 2	Week 3	Week 4	
1	0*	0.5	30.2	0	
2	0	6.0	0.6	0	
3	12*	0	20.2	0	
4	0	0	4.2	26.9	
5	12*	1.0	0	0.2	
6	0	0	8.0	0.1	
7	0	15.5	0.5	0	
TOTAL:	24	23	63.7	27.2	

* irrigation

RESULTS AND DISCUSSION

There was very good weed control from all treatments due to good seedbed preparation and post-treatment irrigation and rain (Table 1) which activated the herbicides. Warm and moist weather also promoted rapid growth of the squash and the early establishment of leaf canopy.

In the untreated controls there was a rapid flush of seedling weeds within 2 weeks of planting. Redroot (*Amaranthus powelli*) and black nightshade (*Solanum nigrum*) were the most numerous weed species accounting for 52 and 21% of the total weed population respectively.

Alachlor (Lasso 50% EC) at 1.5 kg ai/ha performed well, having no detrimental effect on early crop growth or final squash yield (Table 2), and providing the best weed control of the three herbicides tested individually. However it is known to be weak on *Polygonum* sp, fathen (*Chenopodium album*) and fumitory (*Fumaria* spp.).

Chloramben (Amiben 83% NS) at 4.2 kg ai/ha significantly reduced early plant growth (Table 2) but only reduced fruit yields when applied at the high rate in combination with alachlor. This mixture resulted in a similar yield to the handweeded control which was affected by early weed competition and root damage from weeding knives.

TABLE 2: Effect of herbicides on plant survival, early plant growth and final yields of squash:

Treatment	Rate kg ai/ha	Plant survival (% of control)	Mean plant dry weight at 3 weeks (g)	Squash Yield	
				Total No. of fruit (thou/ha)	Total Weight (t/ha)
handweeded control	-	(100)	2.49	22.3	25.4
alachlor	1.5	99	2.46	20.7	29.1
chloramben	4.2	99	1.62	22.7	30.2
chlormethazole	1.5	100	2.56	24.0	28.6
alachlor + chloramben	1.5 + 4.2	99	1.60	22.3	32.0
alachlor + chloramben	1.5 + 8.4	97	0.63	22.0	26.0
alachlor + chlormethazole	1.5 + 1.5	100	2.12	23.7	30.7
alachlor + chlormethazole	1.5 + 3.0	91	2.19	20.7	27.2
SED		4.8	0.28	0.99	1.51
CV%		7	21	8	10

Chloramben gave very good control of redroot and was also effective on fathen and wireweed (*Polygonum aviculare*) but more data is needed on wireweed as the population was low (10 plants/m²) (Table 3). Black nightshade was moderately

susceptible to chloramben, whilst fumitory, shepherd's purse (*Capsella bursa-pastoris*) and groundsel (*Senecio vulgaris*) were resistant. Although the mixture alachlor + chloramben at 1.5 + 4.2 kg ai/ha caused a significant reduction in early crop growth, there were no plant deaths and fruit yields were not significantly affected. Weed control was also excellent.

TABLE 3: Weed counts at five weeks after herbicide application.

TABLE 5. Weed counts at five weeks after herbicide application.									
Species (No/m ²)	HWC*	Herbicide							Rate (kg ai/ha)
		al ¹	cha ¹	chm ¹	al + cha	al + cha	al + chm	al + chm	
		1.5	4.2	1.5	1.5 + 4.2	1.5 + 8.4	1.5 + 1.5	1.5 + 3.0	
redroot	560	1	3	21			1	1	
black nightshade	223		22	12			1		
shepherd's purse	89	3	10						
fathen	60	7							
speedwell	35		6	37					
twincress	16		2						
wireweed	10	5	1						
fumitory	9	2	9	5	1		1		
barnyard grass	13	1	3	11					
groundsel	7	1			3	2			
other species	24	4	1	2	1	2			
all	1046	24	57	88	5	4	3	1	

*Weed recording in HWC (handweeded control) after three weeks.

¹Herbicide names have been abbreviated as follows: al = alachlor, cha = chloramben, = chlormethazole.

Chlormethazole (Probe 75% WP) at 1.5 kg ai/ha gave the least effective weed control. It resulted in the highest population of redroot (22 plants/m²) and failed to control speedwell (*Veronica persica*) and barnyard grass (*Echinochloa crus-galli*). Chlormethazole scorched the squash cotyledons but did not reduce early crop growth or fruit yield.

The alachlor plus chlormethazole mixtures provided excellent weed control and did not significantly suppress early growth or reduce squash yields. However, a few plants died suddenly 2 weeks after sowing in part of one plot treated with alachlor + chlormethazole at 1.5 + 3.0 kg ai/ha. It is not known why this damage occurred, but it appears to be consistent with findings in other recent trials with the product (Prince pers. comm.).

CONCLUSIONS

Alachlor at 1.5 kg ai/ha performed very well in this trial. The herbicide did not adversely affect early crop growth or squash yield and gave excellent weed control.

The new formulation of chloramben also proved effective in controlling weeds, but caused a check to early plant growth. There is likely to be some risk of crop damage with chlormethazole.

REFERENCES

- Wilson, G.J., 1979. Weed control and crop tolerance in cucurbits. *Proc. 32nd N.Z. Weed and Pest Control Conf.*: 123-127.