FIRST SEASON FRUIT EFFECTS FOLLOWING DAMINOZIDE APPLICATIONS TO KIWIFRUIT

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SUMMARY

The first year yield of export quality kiwifruit (*Actinidia deliciosa* (A. Chev.) cv. Hayward) was examined after a single petal fall application of the growth regulator daminozide (1500 or 2000 ppm) to female kiwifruit vines. From five trials, average fruit weight at harvest was 10.3 g (or 12%) heavier after treatment. Treatment reduced the proportion of small non-export fruit and increased the percentage of fruit graded into the larger fruit categories resulting in an average 15.8% increase in export packout.

INTRODUCTION

Due to excessive vigour of kiwifruit vines grown in many parts of New Zealand, the 'harvest index', defined as the proportion of dry matter accumulation which is harvested compared to that which is apportioned to vegetative growth, may not be optimum. In certain crops, plant growth regulators may be used to alter the distribution of dry matter, to maximise the proportion of energy devoted to fruit production rather than to excessive vegetative growth, which may be lost at pruning (Loreti *et al* 1984; Nickell 1983). Two small preliminary trials conducted in the Bay of Plenty in 1976 and 1979 on Bruno and Hayward varieties of kiwifruit vines, confirmed the vegetative growth reduction effects of daminozide (Alar-85) applied at petal fall and also suggested that the harvested fruit were significantly larger than untreated fruit. Replicated trials began in 1980 to quantify the vegetative effects and to measure the effects on export yield of kiwifruit from daminozide treated vines. The current season export yield effects of a single (1st year) petal fall application of daminozide are reported in this paper.

METHOD

The trials reported in this paper were conducted on commercial kiwifruit orchards. Trials A (Pergola) and B (T-bar) were laid down at Katikati in mid December 1980 and T-bar trials C, D and E in mid December 1981 at Kumeu, Te Puke and Nelson respectively. Fruit was harvested during the mid May-early June period.

The daminozide petal fall treatments (Table 1) were applied by handgun at 1400 kPa pressure and sprayed to the point of runoff using 6-10 litres of spray per vine (2000-3300 litres/ha). Each plot contained 3 or 4 mature female kiwifruit vines. Treatments were replicated 3-6 times.

As harvest approached, samples of 12 fruit picked at random from each treatment were tested by refractometer for percent soluble solids. The fruit from each plot was harvested and graded separately through commercial packing sheds to the New Zealand Kiwifruit Authority's export standards. The numbers of fruit per grade, including the number and weight of non-export fruit were recorded. From trials, C, D and E, samples of 100 fruit per plot were taken from the graded fruit on the basis of the percentage of fruit which graded into each export size or non-export category. These fruit were individually weighed and measured with vernier callipers for their length (stem to calyx), greatest width and depth. Treatment effects on trials C, D and E were investigated using an analysis of variance of the fruit weights, export trays and fruit dimension data. Results from A and B were not analysed because harvest records were not available from individual plots.

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RESULTS AND DISCUSSION

Table 1 shows that in all trials daminozide treatments increased the average fruit size at harvest. Treated fruit was 9-12 g heavier than untreated fruit. This fruit size increase was not due to crop load, as in four of the five trials the daminozide treated vines actually carried more fruit.

TABLE 1: Individual fruit weights, fruit number and export trays of fruit harvested per vine after a petal fall application of daminozide to kiwifruit.

Trial	daminozide (ppm)	Mean fruit weight (g)	Fruit per vine	% Export grade fruit	Export trays/vine †
A	0	87	923	71	18.2
	1500	97	990	78	21.3
	2000	99	1007	77	21.5
B	0	93	962	75	21.0
	2000	103	913	89	25.3
C	0	78	830	66	14.6
	2000	88*	918	68	16.3*
D	0	93	563	79	12.6
	2000	104*	593	81	13.9*
E	0	85	935	68	17.2
	2000	94*	984	75	20.2*

* Significantly different from untreated: $P < 0.05$

LSD 0.05 values for trials C, D and E respectively were:

Mean fruit weight., 3.24, 2.62, 3.38., Export trays/vine., 1.39, 1.18, 1.42.

† Corrected for fruit number effect by standardising against untreated.

The increased fruit size resulted in an extra 1.3 to 4.3 trays of export fruit per vine, an increase of 10.3-20.5%. In calculating the numbers of export trays per vine, varying fruit numbers per vine have been allowed for by correcting fruit number to that of the untreated vines.

Table 2 demonstrates how the increase in average fruit size resulted in a shift in distribution towards the larger export size grades (where fewer fruit are required to fill a tray). Primarily because of the size effect the daminozide rates gave 6.1 and 6.2% more fruit suitable for export. Both the increase in fruit size and the increased proportion of fruit graded as suitable for export, combined to significantly increase the production of export fruit from treated vines.

TABLE 2: The effect of a petal fall application of daminozide on the distribution of fruit into export size grades or non-export categories expressed as a percentage of total fruit harvested (Mean of 5 trials).

daminozide (ppm)	Export Size								Non-Export	
	25	27	30	33	36	39	42	46	undersize	damaged or misshapen
0	4.1	0.7	6.6	13.3	15.5	10.5	10.6	10.2	21.6	6.9
*1500	10.6	-	14.9	11.4	12.5	12.5	7.1	7.8	17.7	4.7
2000	7.9	2.1	13.7	16.9	14.2	8.1	7.8	7.0	14.2	8.1

* single trial result

** measured in 2 trials only

Table 3 details how daminozide treatment significantly increased the average fruit length, width and depth in trials C, D and E. The length was increased by an average of

TABLE 3: The effect on fruit dimensions and percentage of fruit with widths greater than their lengths following a petal fall application of daminozide.

Trial	daminozide (ppm)	Dimensions (mm)			% fruit with width > length	
		Length	Width	Depth	Export Size	Undersize
C	0	56.7	49.5	45.4	3.0	4.3
	2000	58.1*	51.2*	47.0*	3.3	6.3
D	0	62.5	50.3	46.1	0.6	1.8
	2000	63.6*	52.2*	47.8*	1.1	1.5
E	0	56.4	51.7	47.3	6	10.0
	2000	57.5*	54.3*	49.6*	16.0*	8.3

* Significantly different from untreated: $P < 0.05$

1.2 mm (2.0%) the width by 2.1 mm (4.1%) and the depth by 1.8 mm (3.9%). The additional weight gained by the treated fruit made the fruit bigger in all dimensions although the fruit width and depth have increased proportionally more than their lengths. This shape change is only of importance if fruit becomes unsuitable for export.

Daminozide did not significantly increase the proportion of fruit with width greater than length for both export size and undersize fruit from Kumeu and Te Puke (Trials C and D). A significant change was measured in the fruit from Nelson (Trial E) where treatment with daminozide increased the number of export size fruit with width greater than length. No change was measured in the undersize fruit, although the results show that the untreated fruit from Trial E is proportionally wider than fruit from Trials C and D. Personal observations suggest that fruit from colder areas of New Zealand are proportionally flatter than fruit from those areas with milder winters. Daminozide applied at petal fall did not affect the ripening (soluble solids content) of the kiwifruit on the vine or affect the harvest date.

Repeated (yearly) petal fall applications of daminozide to female kiwifruit vines have continued to give substantial increases in export production due mainly to an increase in flower (fruit) number which occurs in the year following treatment (Cliffe and Venning unpublished data). Another effect of daminozide treatment was to reduce vegetative growth and thus reduce the orchardists summer and winter pruning (Cliffe and Venning 1985).

Until residue tolerances are accepted internationally, daminozide will not be registered for use on female kiwifruit vines in New Zealand.

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