PEST CONTROL IN BOXES OF CYMBIDIUM ORCHID FLOWERS WITH DICHLORVOS-IMPREGNATED PLASTIC

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SUMMARY

Plastic resin impregnated with dichlorvos was cut into strips 2-3 mm thick and 8 mm wide. Green peach aphids (*Myzus persicae*) on Cymbidium orchid blooms, two-spotted mites on dwarf bean (*Phaseolus vulgaris*) leaves and *Tyrophagus neiswanderi* on leaf discs were dead or moribund after 8 h when each was kept in sealed glass jars (580 ml) at 12°C with 10 mm of the strip. In a commercial box of 100 Cymbidium orchid blooms, with each flower spike sleeved in plastic, a 1 m length of dichlorvos strip (16 strips of 60 mm + 1 strip of 40 mm) failed to kill all aphids and mites after 17 h at 12°C. Dichlorvos plastic-impregnated strip cannot be recommended for killing pests in boxes of orchids.

INTRODUCTION

Cut flowers exported to Australia, Japan and the United States of America are fumigated if live insects and mites are found on arrival. This fumigation can reduce the shelf-life and quality of the flowers, and hence the price realised. Insects and mites should be completely controlled by pesticide sprays in the greenhouse or field but pests such as aphids and thrips can fly onto flowers any time before or after harvest until the lid is placed on the box.

In an attempt to kill all insects and mites on the flowers some growers are reported to have placed pieces of plastic impregnated with dichlorvos (Vapona strip) in boxes of cut flowers. The volatile insecticide is released during the 4-24 h from packing until inspection at the destination. This potentially simple and safe way to disinfest flowers would be particularly suitable for crops grown under integrated pest control (Martin *et al* 1984).

In preliminary tests small scale experiments were conducted to find the dose necessary to kill three kinds of pest found on Cymbidium orchid flowers. This was followed by two tests using dichlorvos strips with full boxes of flowers.

METHODS

Preliminary tests

Dichlorvos-impregnated plastic (8 × 60 × 160 mm) was cut into uniform strips 2-3 mm thick and 8 mm wide and into lengths as required. The thinnest possible strips were used to give the greatest surface area for evaporation of the pesticide. Unused pieces were stored in airtight glass jars. From the batch used for each experiment an unused sample was kept for analysis of dichlorvos concentration. All samples contained 20% (w/w) dichlorvos. After use each piece was weighed before disposal to check the dose used.

The tests were conducted in sealed 580 ml glass Agee jars, the smallest jar that could conveniently hold a Cymbidium orchid bloom. The test insects and mites were placed in jars on the appropriate substrate with different doses of dichlorvos strip and mortality was assessed at three different intervals, once per jar. Each treatment was replicated four times.

Ten mature green peach aphid were placed on each Cymbidium orchid flower with the stem in a jar of water which was sealed at the neck with plastic shrink wrap. Lengths of dichlorvos strip were cut to give two separate doses and were placed in the bottom of the jars which were sealed. The jars were held at 25°C or 12°C in order to test whether

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the lower temperature reduced insecticidal activity of dichlorvos. An untreated control was held under similar conditions.

Ten female two-spotted mites were placed on a dwarf bean leaf with the stem in a jar of water and treated and assessed as for the aphids.

Ten large *Tyrophagus neiswanderi* were placed on a disc of tobacco (*Nicotiana tabacum*) leaf held in a small open plastic petri dish and surrounded by silicon grease to minimise insects escaping. This test was at 12°C.

Commercial flower box test

In test A, 540 mm (9 strips of 60 mm) of strip was used in a 100-bloom box (1010 × 373 × 100 mm) with one piece placed inside the lower end of the plastic sleeve covering each of the 9 flower spikes. Ten two-spotted mites were placed on one flower per spike and 10 green peach aphids were placed on another flower on each spike. A bean leaf with 21 two-spotted mites and a potato (*Solanum tuberosum*) leaf with 46 aphids were placed on the flower stalks in the centre of each box and outside the plastic sleeves. The treated and untreated boxes were held at 12°C for 16 h.

In test B, 1 m (16 strips of 60 mm + 1 strip of 40 mm) of strip was used in a 100-bloom box with a piece of strip placed inside each end of the plastic sleeve of the ten spikes. Bean leaves with 10 two-spotted mites were placed with 5 spikes inside the sleeve and on the top flower close to a dichlorvos strip. A cage with 10 green peach aphids on a potato leaf was placed inside the sleeve at the centre of 5 spikes. The plastic cages had wire mesh at each end. The treated and untreated boxes were held at 12°C for 17 h.

TABLE 1: Percentage mortality of green peach aphid, two-spotted mite and *Tyrophagus neiswanderi* after exposure in sealed jars to dichlorvos strips 0, 5, and 10 mm long. Temperature = 12°C.

species	exposure time hours	dichlorvos strip length (mean weight)					
		0		5 mm (185 mg)		10 mm (361 mg)	
		No.	% mortality	No.	% mortality	No.	% mortality
Green peach aphid	4	31	13	41	85	38	95
	6	33	9	39	90	36	89
	8	37	16	40	98	37	100
		0		5 mm (214 mg)		10 mm (378 mg)	
		No.	% mortality	No.	% mortality	No.	% mortality
Two-spotted mite	4	38	3	40	10	40	10
	6	41	0	40	63*	40	70*
	8	37	3	38	95*	40	90*
		0		5 mm (180 mg)		10 mm (346 mg)	
		No.	% mortality	No.	% mortality	No.	% mortality
<i>T. neiswanderi</i>	4	38	11	40	100	36	100
	6	31	61	39	100	33	100
	8	37	0	37	100	37	100

*The live two-spotted mites behaved abnormally.

RESULTS

Preliminary tests

At 12°C, 10 mm of strip killed all *T. neiswanderi* and green peach aphid in 8 h. Two-spotted mites were either dead or moribund at the same dose in 8 h (Table 1). *T.*

neiswanderi was the most susceptible species to dichlorvos. At 25 °C all two-spotted mites were dead after 4 h with 5 mm of strip, the lowest dose tested at this temperature. Green peach aphids were also killed at lower doses at 25 °C than 12 °C but at some of the lower doses tested the few survivors were always in the throat of the flower where the concentration of dichlorvos was probably lower.

Commercial box tests

In test A most two-spotted mites and green peach aphids survived though there was higher mortality of green peach aphids on the potato leaf placed on the flower stalks than on the flowers in the plastic sleeve. At the higher dose (test B) only 6 out of 45 two-spotted mites died despite close proximity to the dichlorvos strip and only 2 out of 50 caged green peach aphids died.

DISCUSSION

Dichlorvos strip killed the green peach aphids and two-spotted mites quickly at low doses in jars with only a small amount of plant material. However when the density of flowers was increased and packaging included, increased quantities of dichlorvos strip failed to kill a high proportion of the two-spotted mites and green peach aphids. The dichlorvos may have been absorbed by the packaging and flowers but dichlorvos is rapidly hydrolysed (Shell Chemicals N.Z. Ltd pers. comm.) and high humidity within the plastic sleeve surrounding the flower spike may have neutralised the pesticide. In the small jar tests surviving green peach aphids were always found in the throat of the flower where conditions for hydrolysis of the pesticide would be greatest.

On the evidence presented here dichlorvos impregnated plastic strip cannot be recommended for disinfestation of Cymbidium orchids in boxes.

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REFERENCES

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