BUPROFEZIN: A SELECTIVE PESTICIDE FOR GREENHOUSE WHITEFLY CONTROL

N.A. MARTIN and P. WORKMAN

*Entomology Division, DSIR, Private Bag, Auckland***SUMMARY**

Buprofezin (25 mg ai/litre) was sprayed onto tomato plants infested with greenhouse whitefly, *Trialeurodes vaporariorum*, and its parasite, *Encarsia formosa*. Juvenile whitefly reaching pupation were reduced to one tenth of those in an identical unsprayed greenhouse. The proportion of parasitised pupae was equally high in both greenhouses. Buprofezin, 25 mg ai/litre, combined with methomyl, 250 mg ai/litre, to kill adult whitefly, also reduced whitefly reaching pupation by at least one tenth while a high proportion of the pupae were parasitised. Because of this selectivity buprofezin has an important role in greenhouse crop integrated pest management.

INTRODUCTION

Buprofezin (Applaud 50 WP) is a promising new pesticide for whitefly control (Yasui *et al* 1985). It kills larval whitefly during moulting, reduces adult longevity, and causes adults to lay infertile eggs. The pesticide has two possible roles in greenhouse integrated pest management. Firstly, because it is harmless to *Phytoseiulus persimilis* (Anon. 1985), buprofezin could be used at the recommended field rate of 250 mg ai/litre, to control whitefly where *P. persimilis* is used to control two-spotted mite. Secondly, because buprofezin is also reported to be harmless to the whitefly parasite, *Encarsia formosa* (Anon. 1985), low concentrations of buprofezin which allow some larvae to survive could be used together with the parasite to control whitefly.

This paper reports two unreplicated trials which tested the effects of low concentrations of buprofezin on whitefly and *Encarsia* populations. In the second trial methomyl was used to kill adult whitefly which can invade greenhouses from adjacent properties.

METHODS

Tomato plants (cv. Viroso) were planted in two greenhouses on 22 May 1984 (Trial 1) and 18 June 1984 (Trial 2). In each greenhouse the plants were arranged in four rows (two double rows) with 16 plants per row.

In Trial 1 plants were layered but in Trial 2 the shoot tops were removed on 24 October when the plants reached the supporting wire.

The environment controls were set to give a night minimum temperature of 12 °C, a day minimum of 16 °C and a day maximum of 20 °C though higher day temperatures were reached.

The plants were infested with whitefly when planted, but further whitefly were released when required but well before any spraying. In each trial *Encarsia* was established by placing 300 pupae in each greenhouse three times at 2 weekly intervals. Very high populations of whitefly and *Encarsia* were established (Fig. 1).

In Trial 1, buprofezin 25 mg ai/litre was sprayed on the plants in House A on 28 August 1984 and 10 mg ai/litre was sprayed on the plants in House B on 6 November 1984. Citowet, 0.25 ml/litre was added to the spray solution.

In Trial 2, buprofezin (25 mg ai/litre) and methomyl (250 mg ai/litre) (Lannate 20 AC), with 0.25 ml Citowet/litre, were sprayed on the plants in House A on 26 September 1985. The plants were sprayed to point of run off and the spray was directed at the underside of the leaves, using a Cambrian C.S.P.14 pressure sprayer. Tags were

Proc. 39th N.Z. Weed and Pest Control Conf.

Fig. 1: Total number of whitefly pupae (hollow symbols) and parasitised pupae (solid symbols) per leaf on plants sprayed with a) buprofezin (25 mg ai/litre) and b) buprofezin (25 mg ai/litre) and methomyl (250 mg ai/litre). Tag B was put on the top of plants when they were sprayed. Approximately two new leaves grew each week. LSM = least significant multiplier.

attached to the tops of the plants at intervals to allow leaves of a similar age to be sampled. Whitefly are mainly at the same stage of development on leaves of the same age (Martin and Workman 1984).

Estimates of the number of whitefly pupae and the percent parasitism were made by selecting 16 leaves at a known distance from a tag.

Data were transformed ($\log n + 1$) for analysis and differences between treatments in the same date were compared using least significant multiplier (LSM).

RESULTS

Trial 1 (1984)

The low concentration, 10 mg ai/litre, of buprofezin caused no apparent reductions in whitefly populations whereas 25 mg ai/litre reduced pupal populations by one tenth compared with the untreated greenhouse (Fig. 1a). The proportion of parasitised pupae was equally high in both greenhouses. (Compare distances between hollow and solid symbols on log scale in Fig. 1).

Trial 2 (1985)

The mixture buprofezin and methomyl reduced whitefly pupae to less than one tenth of the numbers in the untreated house (Fig. 1b). A high proportion (62-91%) of whitefly pupae was parasitised. The decline in the untreated whitefly population was probably due to predation on juvenile stages by the high numbers of adult parasites.

DISCUSSION

A low concentration, 25 mg ai/litre (one tenth recommended field rate), of buprofezin substantially reduced whitefly populations but allowed some to survive and support the parasite population. Growers frequently have too many whitefly on greenhouse tomato plants for the recommended number of *Encarsia* to control and keep populations below levels which cause honey dew and sooty mould problems. It would be uneconomic to introduce higher numbers of *Encarsia* per hectare. One buprofezin application just before or after parasite introductions may keep whitefly populations below a damaging level.

Whitefly adults can invade from neighbouring properties. In these circumstances it is important to kill the adults. Methomyl by itself will kill adult whitefly but the whitefly can lay large numbers of eggs (up to 5 per day (Martin 1985)). Methomyl can be used with buprofezin to reduce the population and allow the parasite to survive. Methomyl will kill the adult *Encarsia* only, but after 3-4 days the residues are no longer toxic.

With these two pesticides to assist whitefly control, all major current problems (Martin *et al* 1984) for integrated pest management of greenhouse tomatoes have been solved.

Buprofezin could be used by itself at full strength to give effective whitefly control. However whitefly in Europe have rapidly become resistant to all pesticides that are registered for its control (Wardlow 1985). It is important that all new pesticides for whitefly control are conserved. If buprofezin is used in conjunction with *Encarsia* this could delay or even prevent resistance developing in this potentially very useful pesticide.

ACKNOWLEDGEMENTS

To Nihon Nohyaku Co. Ltd, Japan and Dr R. Buchanan, Ivon Watkins-Dow Ltd, New Zealand for supply of buprofezin. To staff at DSIR, Pukekohe Research Station for assistance. P. Thakurduras, AMD, DSIR for statistical analysis.

REFERENCES

- Anonymous, 1985. Technical information, Applaud 25 WP on citrus scales and Mealy bugs. June 1985. 14 p.
- Martin, N.A., 1985. Greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood), life cycle. *DSIR Information Series No. 105/41* 2 p.
- Martin, N.A., Workman, P., Burgess, E.P., and Wearing, C.H., 1984. Integrated pest control in greenhouse crops. *Proc. 37th Weed and Pest Control Conf.*: 253-256.
- Wardlow, L.R., 1985. Attacking multiple resistance. *Sting. Newsletter on Biological Control in Greenhouses No. 8*: 13-15.
- Yasui, M., Fukada, M., and Maekawa, S., 1985. Effects of buprofezin on different developmental stages of the greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood) (Homoptera: Aleyrodidae). *Appl. Ent. Zool.* 20 (3): 340-347.