CONTROL OF GREENHOUSE WHITEFLY WITH OXAMYL GRANULES

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SUMMARY

Greenhouse tomato plants infested with adult and larval greenhouse whitefly (*Trialeurodes vaporariorum*) were treated with 0, 0.1, 0.2 and 0.4 g ai oxamyl (10% granules) per plant. The treatments were repeated 4 weeks later. All doses of oxamyl substantially reduced the presence of adult whitefly on the treated plants despite their continual presence in the greenhouse and possible migration from the control plants. The lowest dose, 0.1 g ai per plant, did not kill all larvae initially on the plants. The results suggest that two applications of this dose 3 weeks apart can kill all adults before they lay eggs and hence eliminate whitefly from a greenhouse.

INTRODUCTION

Soil applied oxamyl granules are used in Europe to control whitefly on greenhouse tomato crops (Du Pont (NZ) Ltd, pers comm). Two applications 3 weeks apart of 0.1 g ai of 10% oxamyl (Vydate) granules per plants are used, with the last application being made at least 2 weeks before picking. This treatment is often used in the winter when it is difficult to establish the whitefly parasite, *Encarsia formosa* (Anon 1981) though the parasite is subsequently used when the hours of sunshine increase. In New Zealand, whitefly control in greenhouses is often difficult in late summer and autumn due to immigration from high density populations outdoors. Oxamyl treatment would be useful in late autumn to reduce whitefly populations in crops before winter, either as a preliminary control measure before use of the parasite, or chemical control in its own right. A trial at Pukekohe Research Station was designed to examine the efficacy of oxamyl.

MATERIALS AND METHODS

Tomatoes cv 'Virosa' were sown on 14 May and planted on 22 June in two glasshouses. In each house 64 plants were arranged in two double rows and divided into eight plots of eight plants. The glasshouses were operated with a night minimum temperature of 12 °C, and a day minimum of 16 °C with the ridge vent opening at 20 °C.

On 29th June when 5% of plants had first truss flowers open, adult whitefly were released into each house, 6/plant in one house and 20/plant in the other. Tubes of whitefly were opened under each plant however the whitefly were often observed to fly to other plants.

On 27th July, when whitefly larvae were present and the second truss was flowering (Fig 1), oxamyl granules were placed at the base of plants. Each plant received 0, 0.1, 0.2 or 0.4 g ai of 10% granules. A second application was made 4 weeks later on 24 August when the fifth truss was flowering (Fig. 1). The tops of the plants were pinched out at the level of the supporting wire on 5 October.

Each week after the first oxamyl application and until 5 October, the presence or absence of whitefly adults on each plant was recorded.

When observations showed that the immature whitefly at each level on the plant had reached pupal stage, leaves were sampled from the central four plants of each plot and the number of whitefly pupae were assessed. The leaves sampled and dates of sampling are shown in Fig. 1.

The data from each sampling date were analysed independently. The data were transformed to log (n + 0.5) and the treatment means compared using a t-test.

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Fig. 1: (Above) The size of the tomato plants, the distribution of whitefly when oxamyl was applied and the position and time each leaf sample was taken. The circles with numbers represent flower and fruit trusses.

Fig. 2: (Top right) Percentage of tomato plants with adult whitefly present. Thirty two plants were sampled per treatment.

Fig. 3: (Right) Numbers of whitefly pupae on untreated and oxamyl treated tomato plants. The position on the plant and date of sampling is shown on the horizontal axis (cf Fig. 1).

RESULTS

After the first application of granules, whitefly adults were present on only a few of the oxamyl treated plants compared with their presence on most or all the untreated plants (Fig. 2).

There were significantly ($p < 0.05$) fewer whitefly pupae on treated plants than control plants, except on leaves sampled on 21 September. Then only leaves from plants receiving 0.2 and 0.4 g of oxamyl had significantly fewer pupae than those from the control (Fig. 3).

DISCUSSION AND CONCLUSION

The population of whitefly on the control plants remained almost constant for 3 months instead of the expected rapid increase. This suggests that the adult whitefly continually dispersed to oxamyl treated plants where many were killed.

The presence of adult whitefly throughout the trial was a severe test of the granular application of oxamyl. The treated plants were continually exposed to invasion by adult whiteflies which could lay eggs before feeding and ingesting the pesticide. All three oxamyl treatments reduced the numbers of whitefly but 0.1 g (the recommended rate in the UK) was the least effective. The low pupal numbers on leaves between the 2nd and 4th truss (sampled 28 Sept and 12 Oct) were the combined result of the insecticide killing most adult whitefly before eggs were laid and mortality of some of the subsequent larvae. The increasing number of pupae above the fourth truss (Fig. 3) is the result of the declining effect of the second oxamyl application on adult mortality.

Despite continual invasion by adult whitefly the experiment showed clearly that 0.1 g oxamyl per plant reduced adult whitefly populations for at least 3 weeks (Fig. 2). Trials in England have shown that protection from adult whitefly from one application of granules can last for 4-6 weeks though the effectiveness was reduced in larger plants (Stacey and Parr 1977).

In the present experiment the two leaves sampled below the second truss had eggs and larvae present when the oxamyl was first applied (Fig. 1). The high number of surviving pupae on these leaves showed clearly that oxamyl was much less effective at killing larval whitefly (Fig. 3) than adults. Laska (1980) showed that larval mortality caused by oxamyl granules was affected by growing media and plant species.

The main benefit from using oxamyl at 0.1 g/plant comes from its ability to kill adults before they lay eggs rather than its ability to kill larvae. It can prevent immigrants from establishing and if two doses 3 weeks apart are used to give 6 weeks control of adult whitefly, populations of whitefly within a glasshouse can theoretically be eliminated.

Phytotoxicity by 0.1 g oxamyl per plant has been reported in tomatoes (Laska 1980; Stacey and Parr 1977) but no leaf burning or flower abortion was noticed in the Pukekohe experiment even at the highest dose of 0.4 g/plant.

Oxamyl is a very poisonous chemical and soil to which it has been applied must not be handled for 4 weeks after use (Anon 1981). However, simple and safe-to-use granule applicators are available. The product has major advantages, firstly that even a single application gives several weeks control of whitefly adults and secondly that the parasite *Encarsia formosa* can be introduced shortly after oxamyl application.

REFERENCES

- Anonymous, 1981. *Advisory Note, State Horticultural Advisory Service Experimental Station Guernsey* No 7 (19 Feb 1981) p. 9.
- Laska, P., 1980. Effectiveness of pesticides applied to plant roots against the glasshouse whitefly (*Trialeurodes vaporariorum*) and their phytotoxicity. *Bulletin, Vyzkumny a slechtitelsky Ustav Zelinarsky Olomouc* No 23/24: 51-67.
- Stacey, D.L. and Parr, W.J., 1977. Assessment of new chemicals for use in integrated control programmes. *Report Glasshouse Crops Res. Inst.* 1976. p. 99.