SPIDER MITE CONTROL PRACTICES IN GREENHOUSE FLOWER CROPS

R.B. CHAPMAN and D.R. PENMAN

Entomology Department, Lincoln College, Canterbury

SUMMARY

A postal survey of 95 commercial flower growers was carried out to determine the crops most seriously affected by spider mites, the range of miticides used to control these pests, the frequency of miticide use and the perceived occurrence of miticide resistance. The results indicated that carnations, *Gypsophila*, roses, orchids and chrysanthemums were frequently infested with mites and that cyhexatin, propargite, dicofol, bromopropylate and azocyclotin were the most commonly used miticides. Approximately half the growers used five or fewer sprays per season, but some sprayed weekly. Twenty percent of growers considered resistant mites were present in their crops.

INTRODUCTION

Twospotted spider mite (TSSM) (*Tetranychus urticae*) is one of the most important pests of greenhouse crops (Martin *et al* 1984). It causes injury to a wide range of plants and can be difficult to control because it usually infests the undersides of leaves and has become resistant to a range of insecticides and miticides (Chapman 1982).

This paper focuses on the methods used to control TSSM in cut flower crops. In 1984 the value of cut flowers exported from New Zealand exceeded \$NZ 6.6 million and is expected to increase by at least 50% this year (Anon. 1984). One factor that could limit the success of marketing cut flowers overseas is the contamination of consignments by insect and mite pests. For example, Mullinder (1985) reported 42% of carnations and 86% of *Gypsophila* were intercepted by Australian quarantine officials and fumigated this past season, although these figures have recently been disputed (Gormack 1985).

To achieve pest-free produce, many local growers have resorted to intensive application of pesticides. While this may resolve the problem in the short term it could exacerbate long term control of pests, especially with the development of pest resistant strains. In addition, unwanted pesticide residues could also accumulate on flowers and foliage.

To determine the extent of TSSM control problems in cut flower crops a survey of commercial growers was carried out. The main objectives were to identify the crops most seriously affected by TSSM, the range of miticides currently used to control these pests, the frequency of miticide use and the perceived occurrence of miticide resistance. Information of this type could be useful in directing research into alternative mite control methods (e.g., integrated control) or making better use of existing miticides to delay resistance development.

METHODS

A questionnaire, with a reply paid envelope, was sent to 95 commercial cut flower growers throughout New Zealand during November, 1984. The addresses were supplied by the New Zealand Nurserymen's Association Inc. and included all listings in the Commercial Flower Growers' Group. A summary of questions asked in the questionnaire is presented with the results.

A reminder was sent during December, 1984 and no further returns were received after February, 1985.

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RESULTS

Of the 95 questionnaires posted 63 (66%) were returned. Fifty two replies reported TSSM problems on one or more crops, while 11 replies were invalid, incomplete or reported no TSSM problems. Considering only valid returns, there was a 55% response which compares very favourably with similar surveys of commercial orchardists (e.g., Hancox and Penman 1982).

Incidence of TSSM in cut flower crops

Respondents were asked to list the flower crops they grew and to indicate those that were infested by sufficient TSSM to warrant one or more miticide sprays in a year. They were also asked to state whether the crops were grown predominantly for export or the local market. A summary of responses to this section of the questionnaire is presented in Table 1.

TABLE 1: Major cut flower crops infested by spider mites.

Crop	Number with mite problems	Export/Local	Number crops >1 miticide/year
Carnations	24 (34%)	15/9	19 (79%)
<i>Gypsophila</i>	10 (14%)	7/3	9 (90%)
Roses	8 (11%)	5/3	5 (63%)
Orchids	8 (11%)	5/3	5 (63%)
Chrysanthemums	8 (11%)	2/6	8 (100%)
Others	13 (18%)	—	—
Total*	71		

* Note: This total exceeds the number of survey returns because some growers produced more than one type of crop.

Five crops, carnations, *Gypsophila*, roses, orchids and chrysanthemums, were regularly reported to be infested with TSSM. This is possibly a reflection of the extent to which these crops are grown rather than their relative susceptibilities to infestation by TSSM. Carnations, chrysanthemums, roses and orchids were also the most commonly exported crops (Anon. 1984).

Use of miticides on cut flower crops

Respondents were asked to list the miticides they had used in the previous year and to indicate how frequently they were applied. A summary of responses to this section is presented in Table 2.

TABLE 2: Use of miticides on commercial cut flower crops.

Miticide	Number of respondents using a product	No. of applications/year (% of respondents)			
		5	6-10	10	Maximum
cyhexatin	23 (26%)	53	24	24	25
propargite	14 (16%)	53	27	18	50
dicofol	11 (13%)	60	30	10	16
bromopropylate	9 (10%)	50	33	17	30
azocyclotin	9 (10%)	50	33	17	50
Others	21 (24%)	—	—	—	—
Total*	87				

* Note: This total exceeds the number of survey returns because some growers used more than one product.

A wide variety of pesticides were reported to be used for the control of mites, however, the majority of growers used one or more of the commonly available miticides that are registered for use on other crops. Chemicals listed in the 'Others' category were mostly organophosphorus insecticides which may still be effective in some situations.

The maximum number of miticide applications used by some growers is alarmingly high and in several instances represents one application per week.

Approximately half the growers were more restrictive with their use of miticides applying five or fewer sprays in one year. No distinction between the use of miticides on different crops was made in most instances.

The perception of and response to miticide resistance

The following questions were asked to determine the significance of TSSM resistance to miticides in cut flower crops.

1. Do you consider resistant mites occur on your property?

Ten (20%) respondents considered there were resistant TSSM present, 19 (38%) considered there were no resistant TSSM present and 19 (38%) were uncertain. Four respondents did not answer this question.

2. To which chemicals are they resistant?

Of the specific miticides, resistance to cyhexatin, propargite, bromopropylate and dicofol was considered to occur. Resistance to some commonly used insecticides like demeton-s-methyl, mevinphos and omethoate was also reported.

3. How often were these chemicals sprayed?

Response to this question was poor, but of those reporting resistance, applications in the range 15-50 sprays per year were usual. Some products had been applied for as long as seven years.

4. What was your immediate response to the appearance of resistant TSSM?

Ten growers reported they have changed to another product, while four growers stated they increased application rates to control the resistant mites.

5. Would you consider an alternate approach to TSSM control, e.g., integrated mite control?

The responses to this question were equally divided. Nine growers would consider the use of integrated mite control, while the other nine were strongly opposed and appended their responses with comments about the potential for contaminating crops with predators.

DISCUSSION AND CONCLUSIONS

The main assumption made in this survey is that growers can recognise and correctly identify TSSM. Other mites may occasionally infest cut flower crops (e.g., tydeid and anystid mites), but these are non-damaging species although sometimes they are significant as contaminants (Mullinder 1985). As long as this assumption is valid, then TSSM is the most significant arthropod pest of these crops as more respondents reported the occurrence of TSSM than any insect pest (Chapman unpublished). The presence of TSSM on most cut flower crops reported in the survey was not surprising (Table 1). This polyphagous species has a wide host range from many plant families and will develop extensive populations under optimum environmental conditions. No conclusions can therefore be drawn from the results on the relative susceptibilities of cut flower crops to TSSM infestation. Perennial plants like orchids and roses could constantly be troubled by TSSM as overwintering sites on the plant are numerous. By contrast, annual crops, providing they were free of mites before being transferred to greenhouses, should experience fewer problems.

The high proportion of flower crops requiring one or more miticide sprays per year is consistent with the widespread occurrence of TSSM (Table 1). Since most crops reported in the survey were grown for export and, therefore, require high phytosanitary standards, spraying with miticides was normally practised. However, this does not always infer crops grown for local sale received fewer miticides. Rather, the surplus produce from some export crops was placed on the local market (a comment made by a number of growers).

The range of specific miticides that was used to control TSSM is the same used to control plant feeding mites on other crops (Table 2). None have registrations for use on ornamentals except cyhexatin (O'Connor 1984), and this is the only miticide recommended on the Export Flower Crop Spray Schedules shortly to be published by the Ministry of Agriculture and Fisheries. While this lack of registered miticides appears not to hinder growers in their use of products registered for other crops, it can restrict

the recommendations made by advisors (B. Sinclair, pers comm). In addition, little is known about the potential side effects (e.g., phytotoxicity) of these pesticides on many flower crops.

One consequence of intensive miticide applications (15-50 sprays per year) is the development of resistant mite strains. Twenty percent of growers suspected resistant mites were present on their properties. This could only be confirmed by comparing these mites with a known susceptible strain using standard resistance testing techniques (Chapman 1982). Circumstantial evidence in the form of growers requiring a change to alternative chemicals or an increase in application rates to maintain adequate control does however support their judgement.

From the results of this survey, it would appear that control of TSSM poses commercial flower growers a difficult problem. The high phytosanitary standards demanded by countries that import these horticultural products clearly dictate the need for efficient pest control. It can be inferred from the survey results that some growers attempt to achieve this by applying an excessive number of sprays. It is likely these growers will create an additional problem by selecting miticide resistant strains which will eventually result in poor levels of mite control. Owing to the currently limited range of miticides, such intensive spraying should clearly not be encouraged. The alternatives to intensive spraying are pest monitoring to improve spray timing (hence spray effectiveness) and integrated mite control using predatory mites (Burgess 1984). Both approaches require further research to test their wider applicability and acceptability in commercial cut flower crops.

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