Demonstration and Implementation of Reduced-Risk Pesticides in Fresh Cut Roses

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California growers produce 70% of all greenhouse fresh cut roses grown in the United States, which generated $64 million in revenue in 1998. Cut roses are traditionally subject to frequent pesticide applications; 50 to 60 applications per year is not uncommon. This heavy pesticide use is due in part to a lack of effective IPM programs for rose growers as well as a reluctance on the part of growers to consider IPM techniques such as biological control.

Recently, several factors have caused rose growers to re-examine the need for IPM programs:

- Many of the pesticides traditionally used by rose growers have re-entry intervals of at least 12 hours, so no flowers can be cut during that time except under the provisions of the Early Entry Exemption. It is likely that the Exemption will be phased out during the next few years.

- The availability of the pesticides traditionally used by rose growers may be limited as the Food Quality Protection Act (FQPA) is implemented.

- Some pesticides have become less effective because of insect or mite resistance.

Many of the new products that are coming on the market to replace materials threatened by the FQPA have novel chemistries and modes of action. These materials are also generally reduced-risk, meaning that they tend to be more specific, work more slowly and have shorter residuals than traditional compounds. This means that they work best in an IPM context. For example, one miticide may kill only eggs and immatures but not adults, while another may do best against adults. Scouting must be done in order to determine the prevalent life stage so the most effective compound will be chosen.

In addition, reduced-risk materials are generally more compatible with natural enemies than conventional pesticides. This presents the possibility of using chemical and biological control of mites and thrips in the same rose crop. The goal of this project is to evaluate the efficacy of new reduced-risk materials that are becoming available to rose growers and to determine how to use these in an IPM program for fresh cut roses.

Objectives

1) Evaluate efficacy of reduced-risk pesticides against key pests of fresh cut roses.
2) Include promising reduced-risk pesticides into IPM programs for fresh cut roses.

Work To Date

Work completed since our last report has addressed Objective 2. Efficacy trials using several new reduced risk materials were described in our previous report. Here we will discuss the compatibility of some of these products with natural enemies that are used by rose growers. The materials tested were Cinnamite, Floramite and Relay. Orthene and Avid were included as controls. We used the beneficials most likely to be employed by rose growers. These were two aphid natural enemies, *Aphidius colemani* and *Aphidoletes aphidimyza*, and one mite natural enemy, *Phytoseiulus persimilis*. When determining if a material is compatible with natural enemies, we considered both direct and residual effects. A pesticide that would kill a natural enemy on direct contact may have a less serious effect if the natural enemy only encounters the spray residue.

The results of our experiments with *Aphidius colemani* indicate that it is not very compatible with most of the pesticides tested. Cinnamite and Orthene caused nearly 100% mortality upon direct contact. Residual mortality of Orthene remained at 100%, while residual mortality of Cinnamite was still too high to be acceptable (Figure 1.) Figure 2 shows that the moratality of *Aphidius* caused by Floramite was no different than that of water after 48 hours. Avid, however, caused 100% mortality. Thus if it was necessary to use a miticide when *Aphidius* was present, Floramite would be the best choice to avoid high parasitoid mortality.

The aphid predator, *Aphidoletes aphidimyza*, was also sensitive to all of the materials tested against it (Figure 3.) Direct and residual mortality of Cinnamite, Relay and Orthene were all at least 50%, which would significantly impact aphid control by the predator.

The mite predator, *Phytoseiulus persimilis*, appears to be compatible with Floramite (Figure 4.) Avid caused nearly 100% mortality after 24 hours. Thus Floramite appears to be compatible with *Phytoseiulus persimilis* while Avid does not.

Development of rose IPM programs.

In order to effectively use reduced risk pesticides in the rose greenhouse, they must be employed as part of an IPM program. In comparison to traditional materials, these compounds tend to act more slowly, have shorter residual times, and act only on selected life stages. They also tend to be compatible with natural enemies. A knowledge of number and distribution of rose pests that is gathered through scouting will enable growers to make the most effective use of these materials. Thus as we evaluate these materials for use in the greenhouse we are also developing sampling plans for key rose pests. These scouting techniques will be incorporated into our rose IPM program. We will develop and test this plan in the Watsonville, Santa Barbara and San Diego areas.

Twospotted spider mite

Work on the development of a mite sampling plan for bent-cane roses has been completed in Watsonville (Casey and Parrella 1999). We have determined that most mites are located on the first to third leaves above and below the crown area of the plant (see Table 1). Thus this is the area of the plant from which samples will be selected as we develop our sampling program. This information also suggests that targeting miticide applications to the crown area of bent-cane rose plants will be the most efficient spray technique.

Sampling has also begun in the Santa Barbara area to examine both twospotted spider mite and *Phytoseiulus persimilis* distribution. A preliminary threshold of 5 mites per leaf on 40% of samples will be tested as we develop our IPM program, which will begin in February, 2000.

Literature Cited

Casey, C.A. and M.P. Parrella. 1999. Development of a sampling plan and thresholds for twospotted spider mite on greenhouse roses. Presented at the annual meeting of the Entomological Society of America, Atlanta, GA December 12-16, 1999.

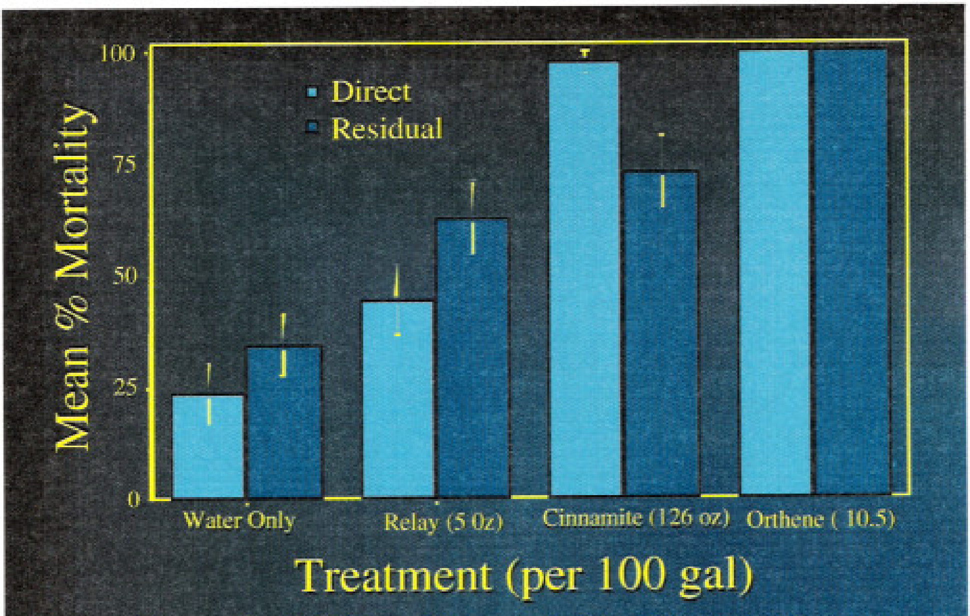

Figure 1. ***Aphidius colemani*** **adults: 24h evaluation**

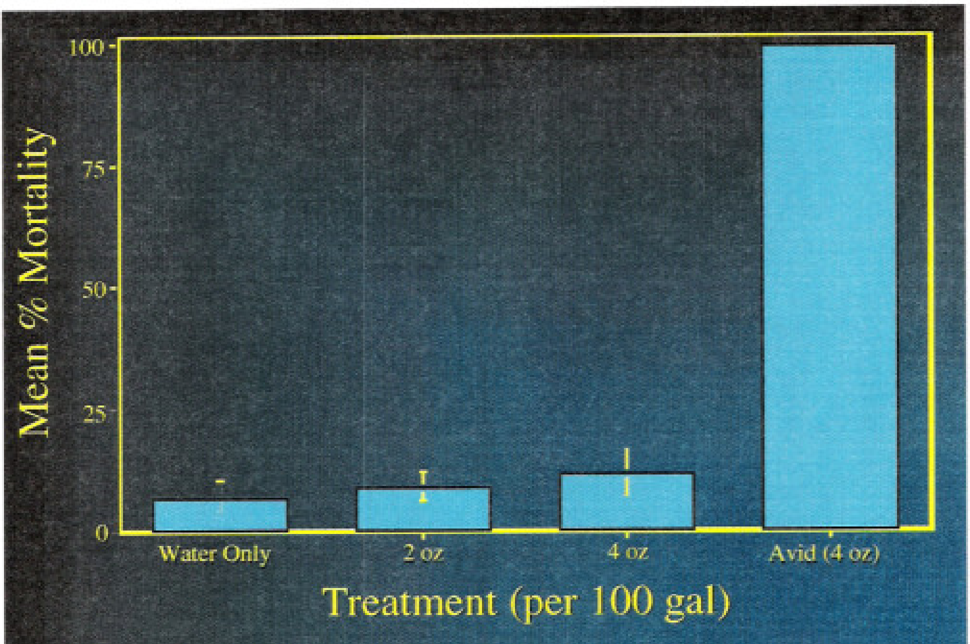

Figure 2. ***Aphidius*** **and Floramite: 48h evaluation**

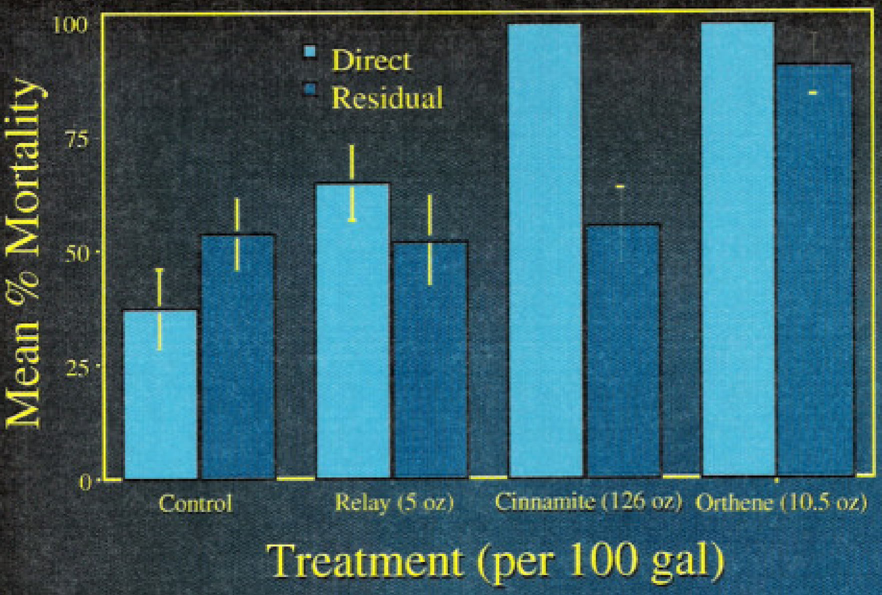

Figure 3. ***Aphidoletes aphidomyza*** **adults: 24h evaluation**

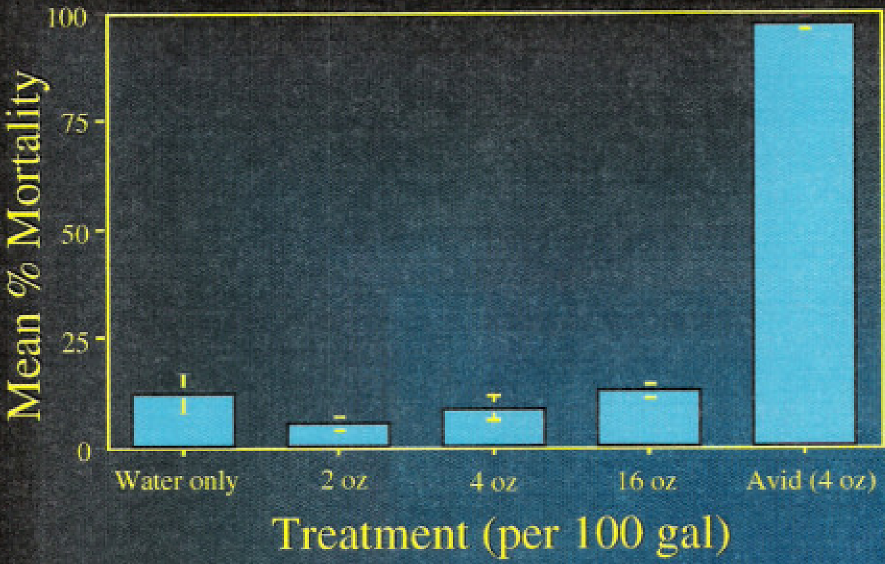

Figure 4. Floramite and *Phytoseiulus* : 24h evaluation

Vertical Position **Mean no. of mites per leaf**

9U	0.61
7U	0.87
5U	0.84
3U	1.28*
1U	0.93*
1L	1.25*
3L	0.91*
5L	0.70
7L	0.53
9L	0.42

Table 1. Mite distribution by vertical position within the bent-cane rose plant. The number of mites on the 1st, 3rd, 5th, 7th, and 9th leaves above and below the bend was recorded weekly. Most mites were observed on the 1st and 3rd leaves in either direction from the bend. The differences in mite density were significant at $p<0.001$.