I. Chemical Control/ New Products

a. Chemical control

Peach Twig Borer on Prunes, Almonds, and Cling Peaches

EFFICACY AND RESIDUE ANALYSIS OF PYRETHROID INSECTICIDES ON PEST AND BENEFICIAL SPECIES

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Insects and spider mites occasionally result in significant damage or yield loss in California prune, almond and cling peach orchards. The future of conventional pesticides for use on all California crops is becoming increasingly uncertain due to biological and regulatory factors.

The scientific literature implicates in-season applications of both permethrin (Ambush and Pounce) and fenvalerate (Pydrin) with such outbreaks in apple and grape systems, and attributes the mechanism to killing mite predators, dispersing the mites on the tree to create more mite colonies, or some other factor. Permethrin applications at 16 oz per acre in almond orchards were shown to induce spider mite outbreaks in the next season in a published study by Bentley et al. (1987). An unpublished study by Zalom and Hoy found permethrin residues on the bark of almond trees in February from May or hull split applications the previous year. Pyrethroids are very stable compounds, so it is not surprising that such results might occur.

Although the role of pyrethroids in mite and other pest outbreaks has been documented , it is important to revisit them in relation to California orchards as their use increases. They are known to be effective as dormant sprays, but it is not known if they can be safely used at that time. Similarly, the possible contribution of esfenvalerate and permethrin applications either dormant or in-season to secondary outbreaks has not been established. Field trials carefully testing these materials have been conducted to establish guidelines for their possible use in a pest management program.

Methods:

Field trials carefully testing these materials were conducted in small and large orchard plots in 1995 for each commodity including prunes, almonds, and cling peaches. Treatments in the small plots were applied by hand gun to single trees in eight replicated complete blocks. Treatments consisted of dormant season esfenvalerate (Asana), dormant, organophosphate, untreated control treatments, in-season esfenvalerate treatment and in-season esfenvalerate treatment with a miticide for prunes and permethrin was included in the almond and cling peach trial.

Treatments in the large plots, with a minimum of 8 X 8 trees with 3 replicates, were applied by an orchard sprayer. Treatments consisted of Dormant oil, Dormant oil plus Asana, Dormant oil plus Diazinon, and Dormant oil plus 2 Bacillus thuringiensis (Bt) sprays during bloom, Dormant oil Diazinon plus in-season Asana, and Dormant oil Diazinon plus in-season Diazinon for prunes and permethrin was incoporated in the almond and cling peach trial.

Cardboard bands were used to evaluate peach twig borer abundance. Beat sampling was used to evaluate general predators. Monthly mites samples were taken to evaluate webspinning mites, european red mites, and predator mites using a mite brushing machine. Harvest samples were taken from the large prune and almond plots and consisted of 100 fruit taken from 6 trees in the center of the plot and pooled for evaluation.

Pencil sized branches were cut from trees in the esfenvalerate, permethrin and control treatments in the single tree plots periodically during the season, and residue analysis reformed on the samples. A laboratory experiment was conducted late in the summer to determine effect of residues remaining on almond twigs on the western orchard predator mites. Predator mites were placed on 2 cm circular pieces on the twigs that were collected August 24th and evaluated for mortality. We intend to return to these same trees next season to monitor mite populations in the spring.

For the residue analysis, field collected twigs were stored at -21 degrees C in clean mason jars. The twigs can then be thawed, and cut into sections about 1 inch long. Sections for analysis are chosen from the internodal portion of the twigs to determine the surface area without the complication of buds and nodes. The length and diameter if each section is determined and then each is immersed in hexane. They are then placed in a sonic dismembrator and sonicated for 2 minutes to extract the pyrethroids from the plant cuticle. This process gets the insecticide out of the waxy parts of the plant. Results of the extractions have shown that almost all of the insecticide is in the bark and very little or none is in the woody portion. The extracted material is cleaned using solid phase extraction (SPE) chromatography, and analyzed using a Gas Chromatograph. The entire cleanup and analysis process involves about 20 separate steps, and Dr. Stimmann is then able to determine permethrin and esfenvalerate at levels as low as 0.1 ng mm^2 of bark surface.

Results:

The most interesting data was the laboratory test was conducted to determine survivorship of the western orchard predatory mite, *Galandromus* (=*Metaseiulus*) *occidentalis*, on almond twigs collected on August 24, 1995.

Table 11. Survival of *G. occidentalis* 24 hours and 48 hours after being transferred on August 29, 1995, to twigs treated at various dates with esfenvalerate and permethrin.

Material	Application date	Percentage surviving 24 hrs[1/]	Percentage surviving 48 hrs[1/]
untreated	none	–	–
esfenvalerate	2/3/95	19.6	8.4
esfenvalerate	2/3/95+ 7/12/9561.6	61.6	33.7
esfenvalerate	7/12/95	45.5	43.3
esfenvalerate	8/27/95	28.6	6.0
permethrin	2/3/95	53.6	48.1
permethrin	2/3/95 + 7/12/95	51.8	39.7
permethrin	8/27/95	42.9	44.6

1/ n=4 replicates (40 predator mites total per replicate), means were adjusted for control mortality.

Conclusions:

Overall mite abundance was very low in all the orchards probably because of the weather conditions occurring this past spring. Further research is needed to determine whether residues remaining on twigs following applications of these materials is sufficient to create a secondary pest problem. Although this is only the first year of the research and not all of the data is analyzed, preliminary results show trends in the 3 commodities. In all 6 of the field trials including both the single tree plots and the large plots we saw no mite problems with the lower rate (10 oz per acre) of both Ambush and Asana that had been used in previous research. In the 3 large field trials Diazinon did not provide control of peach twig borer. In the lab trial conducted on almond bark collected August 24, 1995 we saw around a 50% mortality of predator mites in all of the treatments. It did not matter if the bark had been sprayed with Ambush or Asana recently or if it had been sprayed dormant. Although, we saw no mite outbreaks this past year, it raises questions about the potential for mite problems in a high mite year. It also makes us wonder if the pyrethroid residues persist to August from a dormant spray, how long will the residue last? What will be the long term considerations or problems associated with repeated applications?