

Implementation

FINAL YEAR OF AN IPM DEMONSTRATION PROGRAM USING "SOFT INSECTICIDES" TO MANAGE INSECTICIDE RESISTANCE AND DAMAGE FROM THE OBLIQUEBANDED LEAFROLLER IN NY APPLE ORCHARDS

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Abstract: This study was conducted from 1999-2001 to compare organophosphate (OP) resistance and control of OBLR in plots treated with soft insecticides. OP resistance remained stable in field populations of OBLR during the 3 years of the study. OBLR control in the soft plots was better than that obtained with standard treatments. Plum curculio (PC) control was not adequate in most of the soft blocks and, in 2001, damage was observed even in blocks that had no PC damage during the first year of the study. This soft insecticide program did not provide adequate control of internal lepidoptera in some of the blocks for multiple seasons, although control of the apple maggot was acceptable. Foliar pests such as tentiform leafminers, green apple aphids, white apple leafhoppers, and mites were not serious problems in the soft pesticide blocks. Tarnished plant bug damage was generally similar in growers' standard programs and the soft pesticide blocks. Secondary pests such as rosy apple aphids and the San Jose scale were problems in some of the soft pesticide blocks. The overall insect damage in the standard and soft pesticide was fairly similar during all seasons of the 3-year study, except in one orchard, which suffered severe damage from curculio and internal lepidoptera. The costs of insecticides applied in the standard and soft pesticide programs were similar.

Introduction

The objectives of this 3-year study conducted during the growing seasons of 1999, 2000, and 2001 were 1) to determine if populations of OBLR will decline in orchards treated for several consecutive seasons with soft pesticides and 2) to determine if resistance levels of OBLR to organophosphates will decline in orchards not treated with organophosphate insecticides.

Materials and Methods

These studies were conducted in 5 plots ranging from 30-4 acres in size set up in commercial apple orchards in western NY. At each site, a grower's comparison block was chosen that had horticultural characteristics (cultivars, tree size and spacing, training systems, age of planting) that were as similar as possible to those of the research plots. The growers applied standard insecticide sprays to these comparison blocks at each site. Pest populations were sampled throughout the season in these standard blocks and insect fruit injury was sampled at harvest in these standard blocks so that population levels and damage could be compared at

each site in the research and standard block. In the "soft" pesticide blocks, Dipel was applied at petal fall and first cover to control the obliquebanded leafroller and internal lepidoptera. Provado was applied when needed to control aphids and tentiform leafminers. Spintor was applied at the first estimated egg hatch of the obliquebanded leafroller (early July), followed by two more sprays at 14-day intervals to control subsequently hatching obliquebanded leafroller larvae, internal lepidoptera, and apple maggots.

During each year of the study, overwintering OBLR larvae were collected from the soft pesticide blocks prior to bloom and colonized in the laboratory in order to monitor levels of resistance of larvae to organophosphate insecticides. Neonate larvae from the F₁ generation of each colony were tested for susceptibility to azinphosmethyl and chlorpyrifos in laboratory bioassays using treated petri dishes to monitor contact activity of the insecticides. The responses of these larvae were compared to those of a "susceptible" colony of OBLR from a population that had never been exposed to insecticides.

Results and Discussion

At the beginning of this study during the 1999 growing season, larvae from the 5 orchards in the blocks selected for the "soft" pesticide treatments were about 30-15X more resistant to azinphosmethyl and 3-4X more resistant to chlorpyrifos than larvae from the susceptible colony. OBLR larval populations declined substantially in all of the "soft" pesticide blocks during the second and third year of the study and it was difficult to obtain sufficient larvae to establish a colony from several of the research blocks. However, in those blocks from which larvae were bioassayed, levels of resistance to both materials remained fairly constant during the three years of the study, despite the absence of selection pressure from organophosphate applications in the "soft" pesticide blocks. For example, overwintering OBLR larvae that were bioassayed from 2 of the "soft" pesticide blocks during the beginning of 2001 growing season were about 20X more resistant to azinphosmethyl and 2-4X more resistant to chlorpyrifos than susceptible larvae.

During the initial year of the study in 1999, control of OBLR was slightly better in the "soft" pesticide plots than in the growers' standard blocks, but more than 5% of the fruit was damaged in most of the blocks. However, during the two remaining years of the trial, OBLR damage substantially declined and remained at fairly constant low levels of 1-3% average fruit damage. OBLR damage also declined in the growers' standard blocks during the 2000 and 2001 seasons, but control in these blocks was generally not as good as in the "soft" plots (Figs. 1 and 2).

Secondary foliar pests such as mites, aphids, leafminers, and leafhoppers were generally not serious problems in the "soft" pesticide blocks during all three years of the study. However, some of the primary pests that cause fruit injury were not adequately controlled by the "soft" program. Plum curculio was one of the most serious pests in the "soft" blocks. Fruit injury from this pest steadily increased in the "soft" blocks during the second and third year of the study and damaged 10-15% of the fruit in 2 of the plots during the 2001 growing season. By the end of the third season of this study, curculio damage was found even in the "soft" blocks in which no damage had been detected during the initial season. Also, control of internal lepidoptera failed in one of the "soft" blocks, resulting in almost 30% fruit injury from this pest. Several of the other "soft" plots had traces of internal lepidoptera during the 2000 and 2001 growing seasons,

although these low levels would probably not have been detected in normal fruit inspections. Apple maggots were not a serious problem in the "soft" plots, and only one damaged apple was observed in any of these plots during 3 years of harvest sampling. Levels of tarnished plant bugs in both the standard and soft plots were fairly similar during the study and usually an average of 1-3% of the apples in both treatments was damaged by this pest. Rosy apple aphids and scales were sporadic problems in the soft pesticide blocks, but damage in general was similar to that observed in the standard blocks. Although an economic analysis of data has not been completed, the costs of pesticides in the "soft" blocks and grower's standard plots appeared to be fairly similar.

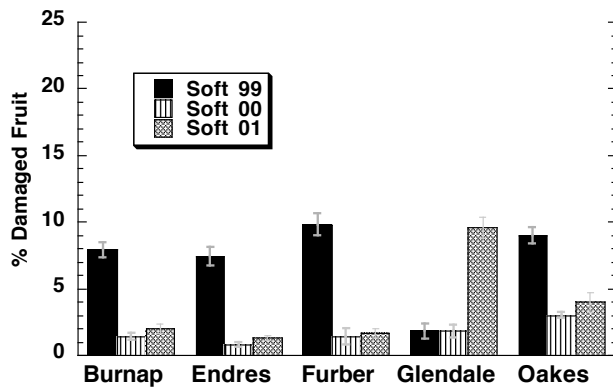


Fig. 1. Total OBLR damage in soft pesticide plots, 1999-2001.

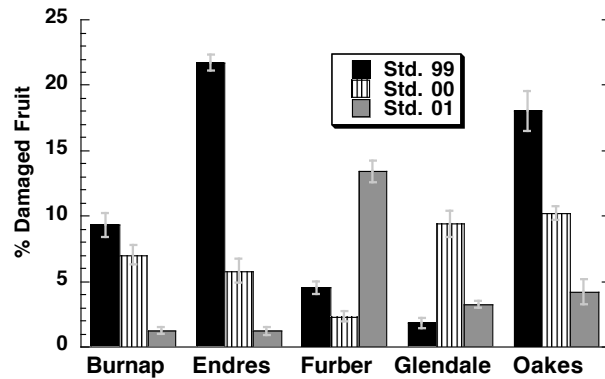


Fig. 2. Total OBLR damage in standard pesticide plots, 1999-2001.