

# IPM IN TREE, FRUIT AND NUT CROPS

## Minimizing pear pest control costs through integrated pest management

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Integrated pest management—involving one-fifth of California's pear growers—has reduced pest-control costs, saved three-quarters of a million dollars in pear disease control, and diminished the environmental disruption caused by heavy spray programs.

Funded in 1973 by the U.S. Department of Agriculture, a large-scale IPM program on Bartlett pear orchards, led by U.C. Cooperative Extension, was initiated among 84 growers with 3,433 acres in six California counties. By 1976, when growers no longer received federal support, the number of participating growers initially introduced to pest management by this program had dropped; but the land under IPM management had increased to 7,082 acres. This includes growers who did not take part in the federal program.

Growers under IPM programs almost always were more than able to pay for monitoring costs by the savings they realized in reduced use of chemicals for insect and mite control.

Although diseases of pears are not under consideration in this article, they were part of the federally supported program. Plant pathologists participating in IPM programs have estimated that growers using IPM monitoring for fireblight disease saved approximately \$750,000 per season in 1975 and 1976. (See *California Agriculture*, October 1977.)

### Behind the program

The need for integrated pest management was felt by growers, farm advisors, and private consultants in the late

1960s. Pears in California are attacked by some 30 species of insects and mites. Codling moth has been the worst pest because of its direct damage to fruit and its regular recurrence. The moth has been controlled by heavy dosages of broad-spectrum, persistent chemicals that are both expensive and disruptive to the environment. Moreover, the chemicals destroy beneficial organisms that help regulate other pests—spider mites, aphids, scale insects, and pear psylla. Released from their natural control, these secondary pests often reached damaging levels, and still more pesticides were needed for their control.

Between 1969 and 1972 growers in El Dorado County, in the North Coast area, and in the Sacramento Valley worked with farm advisors on methods of monitoring pest populations and applying pre-

cisely timed, lower-dosage treatments. Costs for insect and mite control were reduced significantly.

In 1973 the Extension Service and Animal Plant Health Inspection Service of the USDA provided funds for a large-scale IPM program on pears in California, to be directed by U.C. Cooperative Extension. Private consultants monitored orchards, collected data, and made recommendations. Extension personnel developed monitoring techniques and recorded the impact of pesticides on secondary pests, target species, natural enemies, and the environment.

From 1973 to 1976 Cooperative Extension staff compared several orchards under contract to IPM consultants with several not under IPM programs. These comparisons were made in the two major but quite different pear-producing areas



Low dosage rates and precise timing of insecticide applications (left) for control of pear pests can be made based on the data gathered by careful insect monitoring (right).

in the state—the Sacramento River district and Lake County.

The average savings per acre to IPM growers in 1976 ranged from \$6.21 in Lake County to \$49.37 in the Sacramento River district—mainly because of lower costs for codling moth and mite control.

Pears grown in the Sacramento River district are used primarily for canning, but individual growers are attempting to sell as much as 30 percent of their crop on the fresh market. This is the earliest major pear-harvesting district in the United States; harvest generally begins in early July. Almost all Lake County pears are grown for fresh shipment through grower-owned cooperatives.

Growers in both areas must provide a pesticide use report which lists all chemicals, formulations, and rates used during the crop year. These reports are the source of the statistics used in this study. Records from orchards comprising approximately 2,400 to 2,600 acres—about 20 percent of the total acreage in both districts—were utilized in the study.

### Control costs

Insect control costs have more than doubled over the past five years. Most of this increase can be attributed to the rise in the cost of materials, especially petroleum-derived products. However, in each of those five years total insecticide costs were lower on the average in the IPM orchards than in the non-IPM orchards.

In the Sacramento River district, average control costs in IPM orchards rose from \$35.97 per acre in 1972 to \$84.94 per acre in 1976. Most of the price increase occurred between 1973 and 1974 after the petroleum crisis. In addition, monitoring costs doubled over the five-year period.

Insecticide costs varied considerably among IPM and non-IPM growers. In 1976 individual-grower pesticide costs in IPM orchards ranged from \$49.52 per acre to \$79.50 per acre. The costs to non-IPM growers varied even more, from a low of \$75.58 to a high of \$139.30 per acre.

The major cost differences between IPM and non-IPM orchards were for the control of worms and mites. In 1976, for example, worm control average costs in IPM orchards were \$10.16 compared with \$50.42 in non-IPM orchards. Guthion, which is not disruptive to mite predators when used correctly, was the only material used for worm control in IPM orchards; consequently in 1976 costs per acre were only \$18.33. In non-IPM orchards more Guthion was used, in addition to Imidan and chlordimeform, for worm control. The use of these materials at high rates necessitated the average use of \$39.12 worth of miticides per acre for twospotted spider mite and European red mite control because their predaceous mites were not able to survive the treatments for worms. The cost of materials for rust mite control was significantly higher in non-IPM orchards. This was primarily

due to the rise in cost of sulfur compounds and the lack of sampling for rust mite which caused entire orchards to be treated, while a partial treatment was often sufficient in IPM orchards.

Cost savings in the Sacramento River district have risen dramatically over the past three years and potential savings over the next few years are even greater, although the total pesticide costs in IPM orchards are increasing.

In Lake County, IPM growers did not realize nearly as much total savings as IPM growers in the Sacramento River district. In 1973, the first year any Lake County growers were under an IPM program, they spent \$1.60 more per acre for insecticides and monitoring than non-IPM growers, who did not incur the expenses of monitoring.

IPM programs in Lake County were more costly than those in the Sacramento River district in 1975 and 1976. The extra cost was due to the increased emphasis on rust mite control with materials that also gave some psylla control. In 1976 individual grower pesticide costs in IPM orchards ranged from \$60.28 to \$120.50 per acre. Non-IPM grower pesticide costs varied from \$63.58 to \$168.32 per acre. Most of the costs in non-IPM orchards were for worm control, whereas in IPM orchards the major cost was generally mite control. Mite control costs have historically been higher there than in the Sacramento River district because predaceous mites have not been a controlling factor. In addition, chlordimeform has been used by some IPM growers, as well as non-IPM growers, thus contributing to the reduction of predators. The almost exclusive use of this expensive material instead of the much cheaper Guthion is the main reason for the high cost of worm control in non-IPM orchards.

In Lake County the cost differential between IPM and non-IPM programs has gradually become greater over the past three years in Lake County as confidence in the IPM programs increased. If this trend continues, savings should be even greater in the future.



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