

# Do Lepidopteran Pests of Apples in Commercial Orchards of Massachusetts Increase Under Multi-year Absence of Summer Insecticide Sprays?

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Among insects that attack apples in New England, pests such as tarnished plant bug, European apple sawfly, plum curculio, and apple maggot normally are the ones against which most insecticide sprays are directed. Fortunately, we do not often experience damaging populations of lepidopteran pests such as codling moth, lesser appleworm, or leafrollers in our commercial orchards. Such lepidopteran pests are, however, an annual threat to apple quality in commercial orchards in other regions of North America.

There are two principal reasons why we usually see rather little evidence of these kinds of lepidopterans in most New England orchards. First, organophosphate insecticide sprays directed against plum curculio and apple maggot also act to control these lepidopterans. This would not be the case if the lepidopterans were resistant to organophosphates, but possible resistance has turned up in only a handful of New England orchards and only in the case of obliquebanded leafroller. Second, under the relatively cooler climatic conditions of New England, these lepidopterans rarely have more than two generations per year. In warmer climates, three or more generations are common (especially for codling moth). The threat to fruit quality increases as a direct function of number of generations per year.

Recently, some New England growers who market their apples directly to consumers have shown increased interest in adopting advanced-level integrated pest management (IPM) practices that involve controlling apple maggot with odor-baited red sphere traps rather than spraying apple maggot with insecticide. Without insecticide coverage of fruit beyond residual activity of the last spray against plum

curculio in June, second generations of codling moth, lesser appleworm, and leafrollers could pose a threat to fruit quality in orchards practicing advanced-level IPM. The threat could become increasingly greater over successive years as populations build internally in orchards during July, August, and September in the absence of insecticide.

Here, we report results of a study of damage to apples by lepidopteran pests in blocks of apple trees in commercial orchards in Massachusetts where, for eight consecutive years, no insecticide was applied to the blocks after mid-June.

## ***Materials & Methods***

Each test block was about one-half acre in size and was accompanied by a nearby comparison (check) block that annually received two or three sprays of azinphosmethyl or phosmet during July and August to control apple maggot. All test blocks received odor-baited red spheres on perimeter apple trees to control apple maggot, but no insecticide after the last spray in mid-June against plum curculio. One test and one check block were located at corners of a larger block of apple trees in each of six commercial orchards. Blocks were comprised of McIntosh, Cortland, Empire, or Delicious apples. The study extended from 1991 to 1998.

Annually at harvest, 200 fruit were sampled per block for injury by lepidopteran pests.

## ***Results***

Results for each pest are presented in the form of regression lines (Figure 1) that depict a trend toward

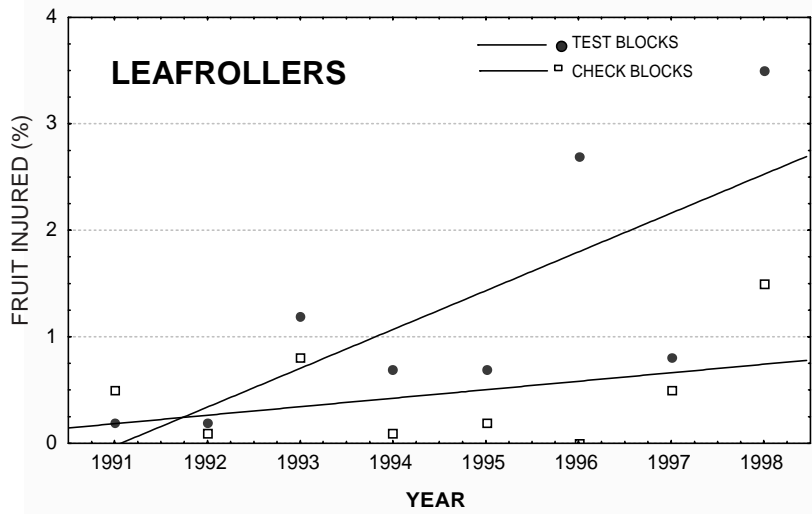
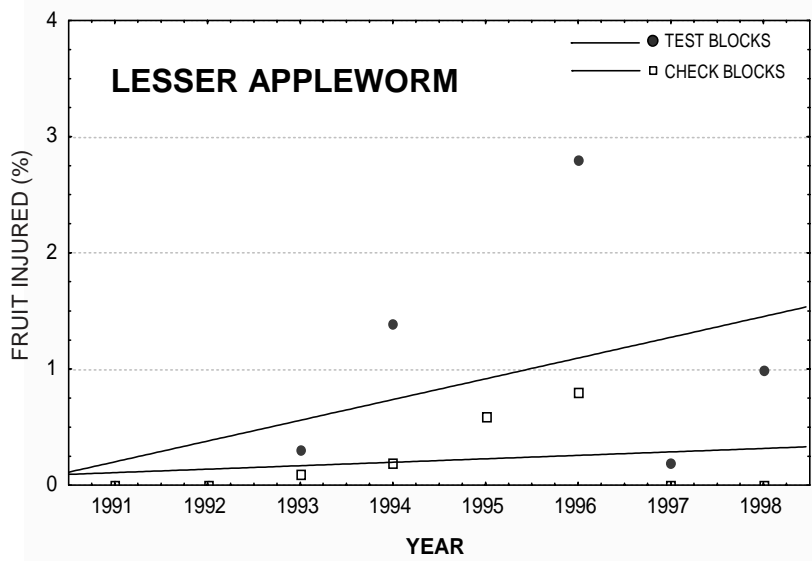
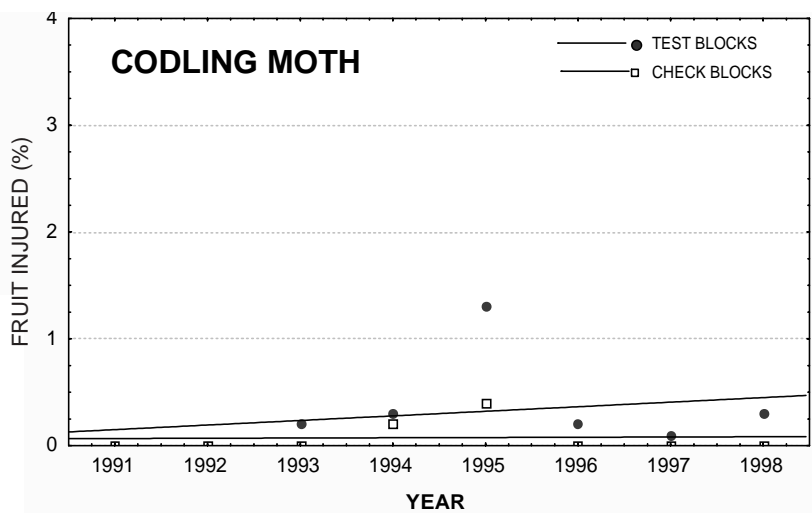


Figure 1. Regression lines showing percent fruit injured by lepidopteran pests from 1991-1998 in advanced-level IPM (test) blocks that received no summer insecticide spray and first-level IPM (check) blocks that received two or three organophosphate insecticide sprays during July and August.

an increase, a decrease, or no change in pest incidence across the 8 years of study.

For codling moth, injury across the 8 years averaged 0.3% in test blocks vs. 0.1% in check blocks (not a significant difference). The slope of the regression line indicated a slight, nonsignificant tendency toward an increase in injury by codling moth in test blocks across years, but no such tendency in check blocks.

For lesser appleworm, injury across the 8 years averaged 1.4% in test blocks vs. 0.2% in check blocks (not a significant difference). As with codling moth, the slope of the regression line indicated a slight, nonsignificant tendency toward an increase in injury by lesser appleworm in test blocks across years but no such tendency in check blocks.

For leafrollers (combined obliquebanded and redbanded), injury across the 8 years averaged 1.3% in test blocks vs. 0.5% in check blocks (not a significant difference). The slope of the regression line indicated a moderate and significant tendency toward an increase in injury by leafrollers in test blocks across years compared with only a very slight, nonsignificant tendency toward an increase in injury in check blocks across years.

### ***Conclusion***

Findings showed no increase or only a very slight

increase in injury of lepidopteran pests to apples across years in check blocks to which two or three insecticide sprays were applied in July and August. In test blocks that received traps to control apple maggot but no insecticide after mid-June, injury to fruit by codling moth and lesser appleworm tended to increase slightly but nonsignificantly across years compared with a more substantial and significant tendency toward increased injury by leafrollers across years.

These findings demonstrate the value of long-term studies and suggest that among lepidopteran pests of apples in Massachusetts, leafrollers are the most likely, over several successive years, to cause increasing damage to fruit in the absence of insecticide sprays after mid-June. Fortunately, new materials such as spinosad and tefubenzide are comparatively safe insecticides that can effectively control leafrollers while inflicting relatively little harm on beneficials. Apple growers who practice advanced-level IPM should pay close attention to possible buildup of leafrollers in the absence of summer organophosphate insecticide sprays and control leafrollers with alternative measures.

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