Efficacy of several "BT'S" in control of fruit tree leafroller in walnut

G. S. Sibbett, S. Whiteside

Abstract

Fruit tree leafroller, Archips argyrospila, is an emerging spring pest in some Southern San Joaquin Valley walnut orchards. A control strategy that includes "hard" pesticides is not desirable. "BT's" were found effective in controlling fruit tree leafroller in infested orchards.
EFFICACY OF SEVERAL "BT'S" IN CONTROL OF FRUIT TREE LEAFROLLER IN WALNUT

G. S. Sibbett, S. Whiteside

INTRODUCTION:

Fruit tree leafroller, Archips argyrospila, has been found on English walnut in the Southern San Joaquin Valley for many years. Its presence has been sporadic and its feeding on emerging leaves and nuts, in Spring, has been only a curiosity to growers and pest control advisors; damage has been very minor and not worthy of treatment. It is generally believed this insect has been controlled biologically in most walnut orchards. Within the past two years, fruit tree leafroller populations have developed to economic importance in certain orchards; orchards having had intense chemical treatment programs for the codling moth seem to be more prone to economic fruit tree leafroller infestation.

Fruit tree leafroller has one generation per year. The insect over-winters as an egg. Eggs hatch in spring, coincident with bud swell and emergence of new walnut growth (about mid-March), and the first instars immediately begin feeding on the young walnut leaves and "web" and roll them together for protection. Subsequent instars feed extensively on developing leaves and nuts, often denuding fruiting shoots of leaves. Nut feeding can cause abortion. In those problem orchards, a large percentage of the tree can be infested which reduces the current season's crop and probably reduces the subsequent one too due to current season leaf damage. By mid-May, pupation occurs ending tree damage that season.

In problem orchards, those where economic damage occurred in previous seasons, chemical control is required to minimize damage from this pest. Chemical controls needs to be applied once hatching is complete but before extensive damage develops. Unfortunately, this suggested spray timing for fruit tree leafroller does not coincide with other insect control chemical applications; an additional pesticide is required.

Application of "hard" pesticides in early spring is not desirable. Pest upsets (e.g. walnut aphid) can occur. Further, growers do not want to "use up" their annual legal quota of an insecticide that may be required for a serious pest later in the season, e.g. Lorsban for codling moth. Bacillus thuringiensis, "BT", would be a preferred material for control of fruit tree leafroller in spring. It is non-disruptive, non-toxic, and does not have limited use restrictions. Our work reported here compares efficacy of several "BT" products with Diazinon for fruit tree leafroller control.

METHODS

The experiment was conducted in a mature, 28" x 28" (56 trees per acre) Ashley walnut orchard in Visalia, California having had a previous history of economic fruit tree leafroller
damage. In 1993, heavy populations of this pest were again developing on the new foliage and 1st instar feeding was being initiated.

Efficacy of three "BT" products and Diazinon were compared to an untreated treatment for control of fruit tree leafroller. The following products and rates were evaluated: five rates of Cutlass WP (.50, .75, 1.00, 1.25, and 1.50 lb/ac), two rates of Javelin WG (.50, and 1.00 lb/ac), Dipel 2X WP @ 1.00 lb/ac, and Diazinon 50 wp@ 2 lbs ai/ac. These treatments were configured into a randomized complete block design consisting of five plots of single tree replicates.

Treatments were applied with a high pressure, hand-gun, 100 gallon capacity, FMC Bean sprayer on 31 March 1993 when the insects were primarily in their 2nd instar of development (California Department of Food and Agriculture, Report # 981175) and just beginning to "roll" leaves. Seven to eight gallons of spray solution per tree were applied (approximately 400 gallons of solution per acre). Seven days following treatment, five fruit tree leafroller "nests" per tree (where leaves had been folded and webbed together with insects present) were examined to determine insect mortality. In each nest the insect was rated as either dead (#1), lethargic (#2), or active (#3). Following the seven day rating, on 6 April, all experimental trees, except those treated with Diazinon, were re-treated with the high pressure sprayer at the same rates of BT and gallonage as treated previously. Seven days following that treatment, 10 nests per tree were examined and insect status determined according to the previously designated rating.

RESULTS

Seven days following the first application, all fruit tree leafrollers were dead in the Diazinon treatment. Fruit tree leafrollers in all BT treatments were generally more lethargic than those untreated (see table 1). Many of the insects treated with higher rates of Cutlass WP appeared to have generally stopped feeding; at lower rates many insects were still quite active. Activity in the Javelin and Dipel treatments was similar to the lower rates of Cutlass.

Seven days following the second treatment considerably more lethargy and insect death had occurred in the BT treatments when compared to the untreated control (see table 1). At the higher rates of Cutlass and Javelin, fruit tree leafroller mortality approached that of Diazinon.

DISCUSSION

Seven days following BT treatment, fruit tree leafrollers became lethargic, the degree being dependent on BT rate. At fourteen days, following a second application of BT, considerably more lethargy and insect death developed. This time course development of insect mortality demonstrates known activity of BT.

Depending on the rate used, BT was effective in controlling fruit tree leafroller in this experiment. Cutlass WP at 1.25 and 1.50 lb/ac and Javelin WG at 1.00 lb/ac provided best control. Low rates of Cutlass WP (.50 - 1.00 lb/ac) and Javelin WG (.50 lb/ac) may not provide adequate control of this pest. Dipel 2X WP @ 1.00 lb/ac provided control similar to
the low rates of Cutlass WP and Javelin WG.

Because our experiment was designed to determine efficacy of BT in control of fruit tree leafroller, we included two treatments at weekly intervals. It is unknown if a single treatment of BT would have been effective in controlling this insect. Future experiments need to determine efficacy of one treatment of BT for control of fruit tree leafroller control in English walnut.
Table 1. Fruit tree leaf-roller mortality.
Ashley Walnut
Blain Farming Co., Visalia 1993

<table>
<thead>
<tr>
<th>Treatment 2/</th>
<th>7 Day avg.</th>
<th>14 Day avg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Untreated)</td>
<td>2.80</td>
<td>2.86</td>
</tr>
<tr>
<td>Cutlass WP .50 lb/ac</td>
<td>2.64</td>
<td>2.02</td>
</tr>
<tr>
<td>Cutlass WP .75 lb/ac</td>
<td>2.52</td>
<td>1.58</td>
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<tr>
<td>Cutlass WP 1.00 lb/ac</td>
<td>2.48</td>
<td>1.72</td>
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<tr>
<td>Cutlass WP 1.25 lb/ac</td>
<td>2.12</td>
<td>1.20</td>
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<tr>
<td>Cutlass WP 1.50 lb/ac</td>
<td>2.32</td>
<td>1.26</td>
</tr>
<tr>
<td>Javelin WG .50 lb/ac</td>
<td>2.56</td>
<td>1.38</td>
</tr>
<tr>
<td>Javelin WG 1.00 lb/ac</td>
<td>2.48</td>
<td>1.26</td>
</tr>
<tr>
<td>Dipel 2X WP 1.00 lb/ac</td>
<td>2.44</td>
<td>1.42</td>
</tr>
<tr>
<td>Diazinon 50 WP 2 lb ai/ac</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

1/ 5 nests evaluated per rep 1st rating, 10 nests evaluated 2nd rating.
Ratings: 1 = dead, 2 = lethargic, 3 = alive
Data are averages of five or ten observations per replica

2/ Treated with high pressure hand gun @ 8 gal soln. per tre
Treated - 3/31/93, ratings made 4/6/93 (7 days)
Retreated 4/7/93 (except Diazinon), rerated 4/14/93
(14 days since first treatment)