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THE OCCURRENCE AND CONTROL OF THE BRUCE SPANWORM IN THE OKANAGAN VALLEY, 1972

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ABSTRACT

A minor outbreak of the Bruce spanworm, **Operophtera bruceata** (Hulst), occurred in fruit orchards of the Okanagan Valley in 1972. The heaviest infestations were limited to orchards where prebloom sprays for the fruittree leafroller, **Archips argyrospilus** (Walker), were neglected for two or more seasons. Prebloom applications of azinphosmethyl, diazinon or endosulfan at tight cluster bud to pink bud stage on apple gave good control. Apple, pear, cherry, apricot and plum were attacked.

INTRODUCTION

The Bruce spanworm, *Operophtera bruceata* (Hulst), occurs in the southern parts of Canada from Newfoundland to British Columbia and across the northern U.S.A. Brown (1962) described the developmental stages, life history, and mode of dispersal and listed a wide range of host plants amongst spp. of: *Populus*, *Acer*, *Salix*, *Betula*, *Alnus*, *Prunus*, *Malus*, *Rosa*, *Ribes*, *Lonicera*, and *Amelanchier alnifolia* Nutt.

In British Columbia, Treherne (1921) stated that the larvae may cause surface injury to young apple fruitlets but indicated that it was less important than other species of lepidopterous larvae that regularly injure apple fruits. Eastham and Ruhmann (1932) noted that the Bruce spanworm had become a troublesome pest in apple orchards and that, in cases of heavy infestations, trees were kept defoliated until the end of May when larval development is completed. Twinn (1934, 1935, 1936) reported unusually heavy infestations in various parts of the Okanagan Valley. Control recommendations for the Bruce spanworm were a regular feature on the annual fruit tree pest spray calendars for British Columbia fruit growing districts from 1928 to 1943. Later, control recommendations were dropped from the spray calendars, and Neilson (1957) stated that the Bruce spanworm had not been a serious pest for the past 20 years. Downing *et al.* (1956) listed the Bruce spanworm as a sporadic pest of apple. None of the above articles mentioned infestations of fruit species other than apple.

During the past decade research has resulted in significant reductions in the amounts of pesticides required for control of major pest species, particularly on apple (Arrand and Downing, 1970), and in the future novel approaches to pest control, such as the sterile male release technique for codling moth control (Proverbs, 1971), may result in even further reductions. Concern has been expressed (Madsen, 1969) about possible increases in abundance of minor or secondary pests that in the past generally have been suppressed by control measures for major pests. Therefore, the opportunity to observe a minor outbreak of the Bruce spanworm in 1972 was of particular interest. In addition it

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was felt possible that the outbreak could be an indication that the Bruce spanworm had developed resistance to the organophosphorous insecticides currently recommended for control of early season major pests such as the fruittree leafroller, *Archips argyrospilus* (Walker). Control experiments were conducted to test whether a significant degree of resistance to azinphosmethyl or diazinon had evolved, and to provide information for control recommendations.

GENERAL OBSERVATIONS

The first indication of a Bruce spanworm outbreak was noted in a large cherry orchard at Naramata in the second week of April. Small, newly hatched larvae were noted burrowing into cherry buds. At the time cherry buds were about ready to break and apples were in the green tip stage. In one 2.0 ha block of cherries the infestation was particularly severe, with up to 50% of the buds damaged. In adjoining blocks of cherries and apples the infestation was much lighter, ranging from 1 to 2% buds attacked. Four other sites with high infestation levels, 10 to 60% buds damaged, were found. These comprised 4.5 ha of apples on the east bench in Penticton, 1.2 ha of apples in Summerland, 2.0 ha of mixed apple, pear, apricot, cherry and plum, south of Oliver and 4.1 ha of apples and cherries at Cawston. Otherwise, the Bruce spanworm was distributed widely in orchards throughout the Okanagan region, but at low levels of infestation with only 1% or less buds injured. No Bruce spanworm was found on peach. In orchards moderately to severely infested, it was determined that early season control treatments for leaf-feeding lepidoptera had not been applied for 2 or more years.

The damage caused by 1st and 2nd instar larvae is mainly reduction of bloom. Feeding by 1st instar larvae when they burrow into unopened buds results in destruction of embryonic blossom tissue. Later, when the buds have opened and immature blossoms are exposed, the 2nd instar and to a lesser extent early 3rd instar larvae prefer to feed on the immature flowers. During this period they still exhibit a strong tendency toward a mining habit. Most of the feeding occurs within the protection of the tightly closed sepals and petals or within clusters of flowers. The damage caused by 3rd and 4th instar larvae is primarily defoliation. These feed openly on leaves or within the shelter of leaves that have been loosely webbed together.

Two of the severely infested orchards, at Oliver and Summerland, were not sprayed for control of the Bruce spanworm until the pink bud stage of apple. At Oliver, approximately 0.8 ha of apples and pears were 75 to 90% defoliated by this stage and in the remainder of the orchard (1.2 ha of mixed fruits) 10 to 50% were defoliated. At Summerland, 1.2 ha of apples were 25 to 30% defoliated. Within 3 weeks after treatment the general appearance of the trees was normal due to growth of new foliage. In both orchards, even though there was extensive damage to flower buds, thinning of apple and pear fruitlets was required and the trees bore a normal crop. No fruit injury was found. This was probably due to the application of control treatments prior to fruit set.

CONTROL EXPERIMENTS

At the tight cluster bud stage the treatments listed in Table 1 were applied to 0.12 ha plots in an orchard consisting of alternate rows of Red Delicious and Spartan apples on semi-dwarfing rootstocks, planted 6.1 x 4.6 m. Each treatment was replicated twice. The sprays were applied with a low-volume, air-blast type sprayer set to deliver 673.8 liter per ha. Effect of the treatments was assessed 6 days after the sprays were applied by randomly collecting 25 spurs with flower bud clusters from each plot. These were examined for live and dead larvae, and also for feeding injury where no larvae were present. The latter instance was considered to indicate larval mortality. Per cent mortality in the treatments was corrected for natural mortality in the control by Abbotts' formula. The results shown in Table 1 indicate that all treatments gave good to excellent control of 2nd and 3rd instar larvae.

In another orchard of mature McIntosh apple trees planted 7.6 x 7.6 m the following treatments were applied in the same manner as above to single 0.30 ha plots at the pink bud stage: azinphosmethyl 50% W.P. at 2.80 and 1.40 kg per ha and diazinon 50% W.P. at 4.48 and 2.24 kg per ha. No nontreated control plot was used. At the time of treatment most of the larvae were 3rd and 4th instars. Pre- and post-treatment samples were taken by the limb-jarring method (Lord, 1949) using a 46 x 46 cm beating tray. Fifty samples taken at random throughout the 4 plots before treatment indicated a fairly even distribution of larvae. The numbers knocked down per sample ranged from 0 to 12 with a mean of 4.4 ± 1.4 s.d. Thirty samples from each plot taken 48 hours after treatment indicated all treatments gave 100% control.

DISCUSSION

This investigation suggests that the Bruce

Table 1. Mortality of the Bruce spanworm on apple treated with azinphosmethyl, diazinon or endosulfan at the tight cluster bud stage.

Insecticide	Kilograms applied per hectare	Per cent mortality[1, 2]
Azinphosmethyl 25% W.P.	2.80	100.0
" "	1.40	90.5
Diazinon 50% W.P.	4.48	100.0
" "	2.24	91.6
Endosulfan 50% W.P.	3.36	100.0
" "	1.68	100.0
Control	-	30.4

[1]Corrected for per cent mortality in control using Abbotts' formula.
[2]Average of 2 replicates.

spanworm might become more than an occasional pest if recommendations for reduced pesticide treatments or non-chemical control techniques are developed and adopted for the fruittree leafroller, which is the main early season lepidopterous pest of most orchard fruit species. The chemical control experiments show that the Bruce spanworm is readily controlled by prebloom treatments with azinphosmethyl or diazinon which are currently recommended for control of the fruittree leafroller. There is no evidence that the Bruce spanworm has developed resistance to the currently recommended organophosphate insecticides. The reason for the mild outbreak in 1972 of Bruce spanworm is most likely neglect of early season pest control.

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