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OBSERVATIONS ON *RHAGOLETIS INDIFFERENS* AND RELATED SPECIES IN THE OKANAGAN VALLEY OF BRITISH COLUMBIA

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ABSTRACT

The western cherry fruit fly, **Rhagoletis indifferens** Curran was first recorded in the Okanagan Valley of British Columbia in 1968, and trapping during 1969 established the presence of this species in most of the cherry growing district in the region. **R. indifferens** emerges as an adult in early June, and flies continue to appear until mid-July. The principal host of this species, **Prunus emarginata,** Dough. was not found in the Okanagan, and no flies were found on **Prunus virginiana demissa** (Nutt.) which has been reported as a host.

A comparison of lures to trap the flies showed that ammonium carbonate traps were more efficient than yellow sticky boards or glycine-lye bait pans. The sticky boards, however, seem to be adequate for determining the presence of cherry fruit flies.

In addition to **R. indifferens,** 5 other **Rhagoletis** were trapped in commercial cherry orchards. The common species were **R. zephyria** Snow, **R. ribicola** Doane, and **R. berberis** Curran. R. **fausta** (Osten Sacken) and **R. tabellaria** (Fitch) were trapped in very low numbers in a relatively few locations.

INTRODUCTION

The western cherry fruit fly, *Rhagoletis indifferens* Curran was recorded for the first time in the Okanagan Valley of British Columbia during the summer of 1968. This species has been present for several years on Vancouver Island and in the Kootenay district (Madsen and Arrand 1966). The black cherry fruit fly *Rhagoletis fausta* (Osten Sacken) is present in the Shuswap Lake area near Salmon Arm and was recorded in the Okanagan Valley during 1951 and 1965. These two infestations did not spread from the original source and only an occasional fly was found in subsequent seasons. A survey in 1969 established that *R. indifferens* was present in the Okanagan Valley from Vernon to Okanagan Falls, but no flies were found in the Oliver-Osoyoos district or in the Similkameen Valley.

The native host of the western cherry fruit fly is bitter cherry, *Prunus emarginata* Dough. and flies have also been reared from choke cherry, *Prunus virginiana demissa* (Nutt.) (Frick 1954). The presence of native hosts complicates the problem of controlling cherry fruit flies in commercial orchards because they provide a source of flies for reinfestation (Peters and Arrand 1968). Consequently, a research program was initiated in 1969 to determine if wild hosts supported cherry fruit flies in the Okanagan. In addition, data were obtained on the emergence of the western cherry fruit fly in infested orchards and a comparison of various lures for trapping the flies was made.

MATERIALS AND METHODS

Wild hosts were surveyed for the presence of fruit fly larvae and collections from all suspect hosts were

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[1] Report on the cherry fruit fly survey in the Okanagan Valley 1969. Canada Department of Agriculture, Plant Protection Division, September 4, 1969. Mimeograph.

brought into the laboratory for rearing. Fruit from these hosts was placed on sandy soil, and the sand sifted for fruit fly pupae at a later date. Pupae were placed in containers with moist soil and held in cold storage (1.1°C) for 150 days. The containers were then brought into the laboratory and held at room temperature until the fruit flies emerged.

Fruit flies were trapped in the field with yellow sticky boards of a similar design to that described by Wilde (1962). These boards were compared with two other traps, an ammonium carbonate trap described by Frick (1954) and glycine-lye bait pans which have been used to trap the walnut husk fly, *Rhagoletis completa* Cresson (Barnes and Madsen 1963). The traps were observed at weekly intervals to determine when flies first emerged and the peaks of activity during the season. Traps were installed in two areas, one at Westbank and the other at Okanagan Mission where the original infestations were found in 1968. A number of *Rhagoletis* species were captured on the traps, and they were identified by wing patterns illustrated in the comprehensive paper on the Genus *Rhagoletis* by Bush (1966). All identifications were confirmed by the Insect Taxonomy Section, Entomology Research Institute, Ottawa.

RESULTS

Native Hosts: An extensive survey was made, but *P. emarginata*, the principal host of the western cherry fruit fly was not found in the Okanagan Valley. No fruit fly larvae were found in collections of berries from *R. virgiana demissa* and none were reared in the laboratory from the host. No adult fruit flies were trapped on yellow sticky boards hung in locations where this shrub was abundant. Indications are that the western cherry fruit fly does not occur on native hosts in the Okanagan Valley.

Fruit Fly Emergence: The first *R. indifferens* was trapped on June 4, and the peak of emergence was between June 13 and June 24. The last fly was taken on July 28. A comparison of *R. indifferens* emergence at two localities is illustrated in Figure 1.

There was little difference in emergence time at the two orchards, and the long emergence period indicates that commercial cherry orchards will need chemical protection for a minimum of 6 weeks. A total of 74 properties were trapped in the two areas, and *R. indifferens* was taken in 16 properties. Of these, 9 were commercial orchards and the others neglected or backyard trees.

Trap Comparisons: A trap consisting of a

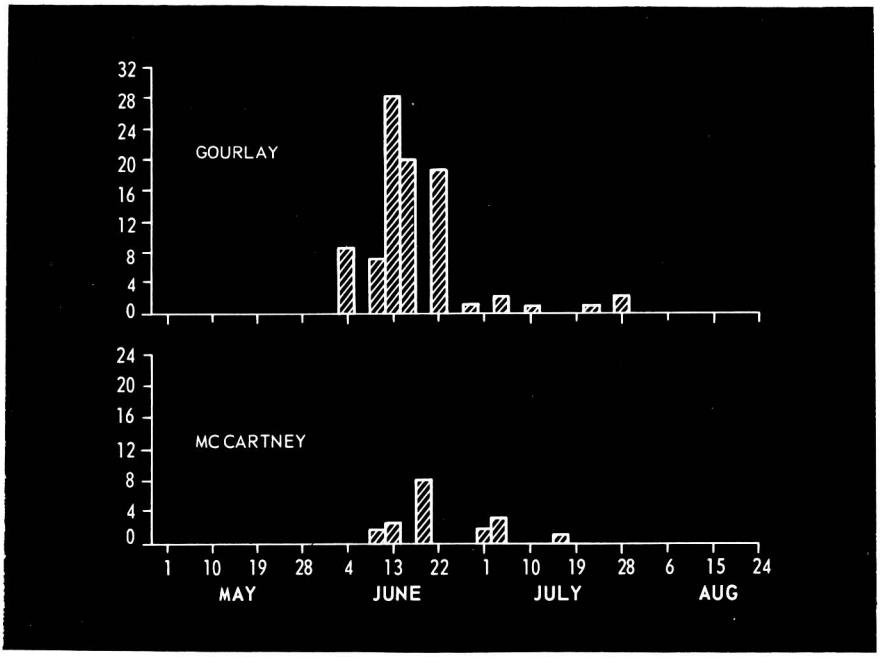

Fig. 1. The emergence of R. **indifferens** at two localities, Okanagan Mission (Gourlay) and Westbank (McCartney)

standard yellow sticky board with a wide mouth pint jar containing ammonium carbonate suspended underneath caught the most fruit flies. There was no difference in the catch between yellow sticky boards alone and the glycine-lye bait pans. These preliminary evaluations indicate that the ammonium carbonate traps might be useful in detecting very low fruit fly populations. The yellow sticky boards seem adequate for survey purposes and are easier to install and maintain than ammonium carbonate traps or glycine-lye bait pans.

Other Rhagoletis Species: In addition to *R. indiffrens*, 5 other *Rhagoletis* species were trapped during the season. The black cherry fruit fly, *R. fausta* was trapped in one locality, and only 4 specimens were taken. This species does not seem to compete with *R. indifferens* and this may explain the low population. *R. zephyria* Snow was common throughout the study area, and this species attacks snowberry, *Symphoricarpus albus* Blake, which is a common shrub in the Okanagan. Larvae were found in the berries and this species was reared from snowberry in the laboratory. *R. ribicola* Doane was trapped in most areas, with the majority of the flies from traps in backyard trees. The hosts of this species are currant and gooseberry, but no larvae were found in collections from these hosts. *R. tabellaria* (Fitch) was taken in a few localities and was the least common of the 6 species of fruit flies. The species is reported to attack the fruits of *Vac-*

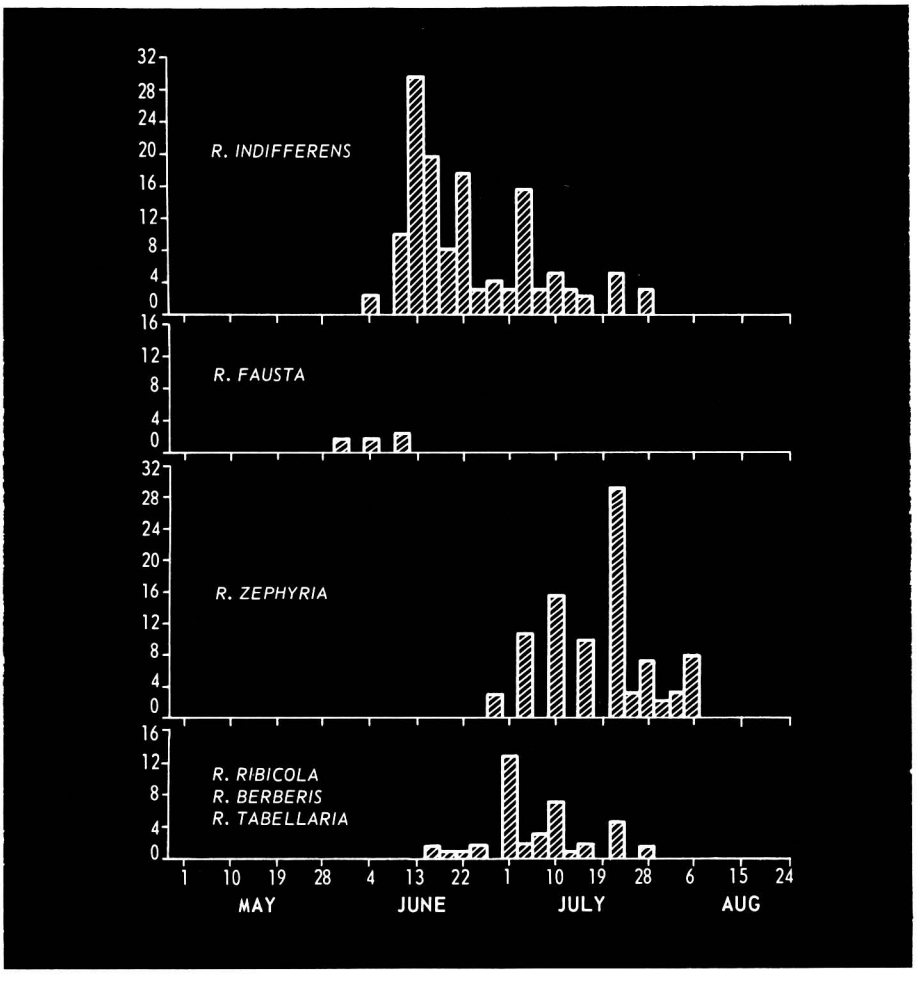

Fig. 2. Emergence of six species of **Rhagoletis** trapped on yellow sticky boards in the Okanagan Valley.

cinium, but no larvae were collected on this host in the Okanagan. *R. berberis* Curran was commonly encountered on traps and was recorded from nearly all the areas under study. *R. berberis* attacks the fruit of Oregon grape. *Mahonia nervosa* pursh, and larvae were found in large numbers in the berries. Although pupae were readily obtained in the laboratory, adults did not emerge under laboratory conditions.

The emergence period of the six species of *Rhagoletis* trapped on yellow sticky boards is shown in Figure 2. *R. ribicola*, *R. berberis*, and *R. tabellaria* emerge at about the same period as *R. indifferens*, but the peak of emergence is about two weeks later. *R. zephyria* emerges later than the other species with peak emergence in mid-July. This adult activity coincides with the development of fruit on the snowberry plants. There were too few *R. fausta* taken to draw conclusions on adult emergence. In other areas, it appears earlier than *R. indifferens* and the emergence period is shorter.

DISCUSSION

The lack of wild hosts for the western cherry fruit fly in the Okanagan Valley may mean that control of this major pest of cherries will be easier than in other areas. Trapping has shown that most of the flies occur in neglected trees, and the spraying or removal of these trees should significantly reduce fruit fly populations. Indications are that *R. indifferens* has been in the Okanagan for some time, since it is distributed over most of the cherry growing area. Yellow sticky boards seem to be reliable traps for determining whether chemical treatment is necessary. The presence of 6 species of *Rhagoletis* in the Okanagan indicates that the area is favorable for fruit fly development. Whether *R. indifferens* can become a serious pest in the Okanagan may depend on its ability to survive on cultivated cherries in the absence of a native host.

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NOTES ON DIAPAUSE IN THE TOMATO HORNWORM (LEPIDOPTERA: SPHINGIDAE), IN BRITISH COLUMBIA

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INTRODUCTION

The tomato hornworm, *Manduca quinquemaculata* (Haworth), is a sporadic economic pest in commercial and home garden plantings of tomatoes in the southern dry-belt regions of British Columbia, particularly, in the Thompson, Okanagan and Similkameen Valleys (Banham and Arrand 1970). It also occurs on related Solanaceous plants, including egg plant, pepper and potato.

At Summerland, B.C., in 1968 and 1969, there were up to 2 generations of hornworms each year. First generation moths emerged about mid-June and second-generation moths about mid-August. As in southern Ontario (McClanahan 1955), some moths did not emerge from first generation pupae until the following year. In the laboratory, 1 of 12 pupae and 2 of 17, respectively, diapaused from larvae collected in the field in late June or July in 1968 and 1969. Both years, moths emerged from the remainder of the non-diapausing pupae after about 3 weeks. Insufficient numbers of tomato hornworm larvae were collected and reared to indicate the actual incidence of faculative diapause in the pupal stage. In North Carolina, Rabb (1966), reported a faculative diapause in the pupal stage of the closely related tobacco hornworm, *Manduca sexta* (Johannson), with the incidence of diapause increasing from less than 5% in June to more than 95%

[1] Contribution No. 288, Research Station, Canada Department of Agriculture, Summerland, British Columbia.