The Great Lakes Entomologist

Volume 14
Number 4 - Winter 1981 *Number 4 - Winter 1981*

Article 2

December 1981

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FIELD RELEASE OF VIRUS-SPRAYED ADULT PARASITOIDS OF THE EUROPEAN PINE SAWFLY (HYMENOPTERA: DIPRIONIDAE) IN WISCONSIN[1]

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ABSTRACT

Rapid field release of adult parasitoids sprayed with the nucleopolyhedrosis virus of the European pine sawfly successfully transferred the virus to feeding larval colonies.

Laboratory studies by Thompson and Steinhaus (1950) showed that the parasitoid *Apanteles medicaginis* (Muesebeck) could mechanically vector the virus of the alfalfa caterpillar *Colias eurytheme* Boisduval. Infection occurred primarily as a result of stinging with the contaminated ovipositor; however it was also suggested that body contamination of the parasitoids could spread the virus over the food plant of the pest. These same authors showed that when ants were fed on virus-filled larval cadavers and allowed to walk over uncontaminated plants, the latter became infectious when fed to healthy larvae. Stairs (1976) reported on virus dispersion and indicated that certain parasitoids play a key role in the development of epizootics because they vector the virus efficiently. He used the sarcophagid parasitoid, *Sarcophaga aldrichi* (Parker) to illustrate his point. These adult parasitoids are attracted to recently virus-killed larvae of the forest tent caterpillar, *Malacosoma disstria* (Hübner) and feed on them. Their bodies become contaminated and the virus is transferred to foliage later consumed by the host larvae. The intensity of the epizootics varied directly with the population levels of the adult parasites. Our field study is corroborative with the observations of Stairs (1976) except that we used the ichneumonid parasitoid, *Lophyroplectus oblongopunctatus* (Hartig), recently introduced and established in Wisconsin against the European pine sawfly, *Neodiprion sertifer* (Geoffroy) (Kraemer et al. 1979). We herein report the experimental manipulation of virus-sprayed parasitoids for pest suppression.

MATERIALS AND METHODS

Larvae of the European pine sawfly were collected in 1980 from the site where *L. oblongopunctatus* was released in 1977 (Kraemer et al. 1979). These were reared by Hall to the cocoon stage in 10# paper bags provided with foliage. Adult sawflies emerged in the fall of 1980 and those cocoons from which no sawflies emerged were stored at refrigerator temperature (4°C) during the winter months. The overwintered cocoons were placed in incubation (room temperature 21°C) during mid-April. Male and female parasitoids were observed mating in the cages. We divided the parasitoids into two groups, each consisting of ca 100 individuals in a 2:1 ratio of females to males. One group was left untreated whereas the

[1] Research supported by the College of Agricultural and Life Sciences, University of Wisconsin, Madison, in part by the Wisconsin Department of Natural Resources through the School of Natural Resources, and in part through a cooperative study (#4500-FS-NE-2202.77) with the Forest Service of the USDA.

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second group was treated with virus while in the emergence cage. The parasitoids were sprayed with 10 ml aliquots of an aqueous suspension of the nucleopolyhedrosis virus at a concentration of 2.6×10^7 polyhedral inclusion bodies (PIB) per millilitre. A chromist atomizer was utilized. The adults were sprayed three times with a 15 min drying period between sprays. The two groups were then transferred for release in the field.

We selected two plantations of red pine, *Pinus resinosa* Ait., where second instar *N. sertifer* larvae predominated. The densities were relatively high at 3–10 colonies per tree. Both plantations were monitored one week prior to parasitoid release. This consisted of searching for visual evidence of virus infected larvae as well as sampling apparently healthy larvae. Healthy larvae were macerated in the laboratory and examined for PIB by brightfield microscopy at 600X. After parasitoid release the plantations were monitored weekly for three weeks to detect diseased or dead larvae. Approximately 50 trees within a 90-m radius from the point of parasitoid release were examined in each plot.

Dead larvae, suspected of being virus-killed, were stored singly in sterile plastic disposable test tubes and examined in the laboratory as previously described. Two subsamples were taken at random from each larval colony which showed some mortality.

RESULTS AND DISCUSSION

We found no evidence of virus presence in either plantation prior to parasitoid release. Direct observations immediately following field releases showed considerable activity by the female parasitoids in and around the larval colonies. The larvae in the plantation where virus-free parasitoids were released gave no indication of nucleopolyhedrosis infection up to 21 days whereas the plantation where virus-sprayed adults were released showed 0.4% mortality from virus infection after 14 days. After 21 days the mortality rose to 2%. Dead larvae were in instars 4 to 6 and upon examination for PIB had an average of 5×10^4 PIB/larva after 14 days and 2.13×10^6 PIB/larva after 21 days.

Though the percentage mortality was low, the numbers of virus-sprayed adults released was also low. Thus the idea of introducing a virus by means of a parasitoid vector was amply demonstrated. Such a strategy does not entail large investments and ensures some measure of dispersal with the potential of reaching locations inaccessible to mist blowers or other power equipment (Franz 1964). Because the parasitoid's presence is marked by diseased colonies one could use such data to measure its dispersal capacity as well as its microhabitat preference. Such information would be of considerable value in a classical biological control program.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the technical assistance of Odette Mohamed.

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