

PROJECT NO: 3092 Summary Report

TITLE: Biological control of leafminers and leafrollers

PERSONNEL: Jay F. Brunner, WSU Tree Fruit Research and Extension Center, Wenatchee, WA;
Lynell Tanigoshi, WSU Department of Entomology, Pullman, WA

COOPERATOR: Tom Unruh, USDA-ARS, Yakima, WA

REPORTING PERIOD: 1993, FINAL YEAR SUMMARY REPORT

ACCOMPLISHMENTS:

The biological control of the western tentiform leafminer will be enhanced by growers avoiding insecticides that are detrimental to parasites providing control. Samples of leafminer in Milton-Freewater may have resulted in the discovery of a new parasite of leafminers.

The parasite species attacking leafrollers in Washington has been expanded. The role of native parasites in commercial orchards has been ineffective in controlling leafroller populations. *Trichogramma* sp. (*platneri*) was reported attacking leafroller eggs for the first time in Washington. A parasite native to Europe, *Colpoclypeus florus*, was discovered attacking leafroller larvae for the first time in North America. Techniques for *C. florus* on leafroller larvae have been worked out. Releases of *C. florus* gave levels of pandemic leafroller larval parasitism ranging from 70 to 100%. *C. florus* appears to be the most important biological control agent reported attacking leafrollers anywhere in the US or Canada.

RESULTS:

The native parasite, *Pnigalio flavipes*, was shown to be highly susceptible to certain conventional insecticides used for control of fruit pests. The most toxic of the conventional insecticides were generally used for control of leafrollers during summer. A summary of the research on the effect of insecticides on *P. flavipes* is included in the just published book, *Orchard Pest Management: a resource book for the Pacific Northwest*. Avoiding insecticides highly toxic to *P. flavipes* will improve biological control of the western tentiform leafminer, reducing the need for additional chemical controls.

The importation and release of *Pholetesor* (= *Apanteles*) *ornigis* was made on 1992 but it was not recovered in 1993. The importation of *Holcothorax testacipes* planned for 1993 was delayed because leafminer populations were considered too low to achieve establishment. A parasite resembling *Pholetesor* (= *Apanteles*) *ornigis* was found parasitizing leafminers in Milton-Freewater, OR. This parasite has been sent off for identification. If it turns out to be *Pholetesor* (= *Apanteles*) *ornigis*, or a closely related species, it will be brought to the central Washington area to determine if it will establish in orchards. *Holcothorax testacipes* will be introduced in 1994 if leafminer densities recover as expected. *Pholetesor* (= *Apanteles*) *ornigis* will be reintroduced if the parasite found in Milton-Freewater is identified as a different species.

A number of parasites have been reared from leafroller larvae (see table below). Most of these parasites are found in relatively low levels in commercial orchards, their densities probably limited by the use of insecticides. Attempts to rear *Apanteles* sp. and *Enytus* sp. were not successful.

Parasite species reared from leafrollers in Washington.

| | |
|---|-------------------------------------|
| Ichneumonidae | Trichogrammidae |
| <i>Enytus</i> sp. | <i>Trichogramma</i> sp (platneri) |
| <i>Tramsonema</i> sp. | Eulophidae |
| <i>Glypta</i> sp. | <i>Colpoclypeus florus</i> (Walker) |
| <i>Campoplex</i> sp. | Tachinidae |
| Braconidae | <i>Aplomya caesar</i> (Aldrich) |
| <i>Apanteles</i> sp. | |
| <i>Apanteles ater</i> Ratz. | |
| <i>Dolichoenidae cacociae</i> (Riley) | |
| <i>Onocophanes americanus</i> (Weed) | |
| <i>Chelonus</i> sp. or <i>Microchelonus</i> sp. | |
| <i>Microgaster</i> sp. | |
| <i>Charmon extensor</i> (L.) | |
| <i>Macrocentrus irridescens</i> (French) | |
| <i>Macrocentrus nigridorsis</i> (Vier.) | |
| <i>Itoplectis quadricingulata</i> (Prov.) | |

Naturally occurring parasitism in commercial orchards is typically low, 0 to 20%. After four years of leafroller mating disruption as the only control in one orchard parasitism levels increased to >50%, mostly by parasitic flies in the family Tachinidae. However, fruit damage in this orchard averaged about 35%.

The longevity of *C. florus* females was increased 2.3 times when provided honey and water (20.9 days) compared to water only (8.9 days). The fourth instar pandemic leafroller larvae produced the most *C. florus* offspring. The third instar larva produced less than half as many offspring and fifth instar larva produced almost no *C. florus*. The average number of *C. florus* produced from a field collected pandemic leafroller larva was 13.5 (1992) and 17.4 (1993) with about 70% being females. Laboratory rearing of *C. florus* produces about 12 offspring per leafroller larva with 73% females. Unmated female *C. florus* produced only male offspring, an average of 14 per leafroller larva while mated females produced both males and females; an average of 8.8 and 73% females.

C. florus was reared on pandemic and obliquebanded leafroller larvae. Approximately 10,000 *C. florus* were reared for augmentative release studies. Spring release of *C. florus* gave 20-75% parasitism of leafroller larvae on release trees, less on trees within the same row (13-30%) and very low (3%) on trees in the adjacent row. Summer releases of *C. florus* resulted in leafroller parasitism levels of 70 to 100%. Release ratios of 1:10, leafroller larvae to *C. florus* adults, gave parasitism levels of 95-100%. In an orchard where no release of *C. florus* had been made parasitism of 95% was recorded in late summer of 1993. However, fruit injury in the orchard was about 15%.

PUBLICATIONS:

Brunner, J. F. 1991. Leafroller pests of fruit crops in Washington state pp. 185-197. *In New Direction in Tree Fruit Pest Management* [ed.] K. Williams. Good Fruit Grower, Yakima, Washington.

Brunner, J. F. 1993. Leafroller biological control: promising new parasites discovered in 1992. *Proc. Wash. St. Hort. Assoc.* 88: 169-175.