

Pome Fruits—Biological Control

Pandemis Leafroller and Obliquebanded Leafroller on Apple

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Leafroller larvae were collected from different orchards in spring (late April-early May) and again in summer when mostly late instar larvae were present (late July and early August). The collection sites are given in Table 1 along with a crop description and management type. Pandemis leafroller (PLR), *Pandemis pyrusana* Kearfott, and obliquebanded leafroller (OBLR), *Choristoneura rosaceana* (Harris), larvae were returned to the laboratory, placed on bean diet in individual cups and kept in constant temperature (75°F) and long day photoperiod of 16:8. Cups were examined twice a week and stages and status recorded until all had emerged as adult leafrollers, parasites or died. Parasites were placed in alcohol for later identification.

Table 2 gives the number of leafroller larvae collected at each site, the number that emerged as adult leafrollers, and the number parasitized by different kinds of parasites. The level of parasitism in spring was very low at all locations, 0 to 13%.

In summer parasitism levels were higher at all sites monitored and were especially high at two sites where an ectoparasitic Eulophid was detected for the first time attacking leafroller larvae (Table 2). PLR larvae parasitized by the ectoparasite were found during routine sampling to determine parasitism levels in several apple orchards. The unknown ectoparasitic Eulophid was identified by M.E. Schauff (Systematic Entomology Laboratory, USDA, Beltsville) as *Colpoclypeus florus* (Walker), which represents a new North American record for the genus and species and a new host record for *C. florus*. *C. florus* constituted the majority of parasitism, 74 and 78%, in two orchard blocks at the Washington State University Tree Fruit Research and Extension Center (TFREC).

Colpoclypeus florus (Walker) is a gregarious ectoparasitoid of leafrollers in Europe, often being mentioned as the most common and important natural control in orchards and other crops. In the Netherlands *C. florus* parasitizes larvae of several leafroller species in apple orchards and survives control programs based on insect growth regulators. In Germany *C. florus* along with *Meteorus ictericus* and *Apanteles atar* (Ratz.) parasitized up to 80% of *Adoxophyes orana* in apple orchards treated with the insect growth regulator fenoxycarb.

C. florus seems to be a better biological control agent in warm climates and thus may prove to be very successful in eastern Washington. *C. florus* has a sex ratio in favor of females which can adjust the clutch size depending on host size as well as the sex ratio of a brood. Table 3 gives the number of field-collected PLR larvae from which adult *C. florus* were reared, the percentage of males and females and the average number of adults produced per parasitized PLR larva. The average number of adult *C. florus* per leafroller larva was 13.5±1.02 (mean±SE). The greatest number of *C. florus* reared from a single field-collected leafroller larva was 57, 23

males and 34 females. *C. florus* has been successfully reared in the laboratory on PLR and OBLR larvae.

Another parasite that has been rarely observed in recent years is a species of *Trichogramma*. This egg parasite was observed attacking 17.4% (38 of 219) of egg masses found in an unsprayed apple orchard near Wenatchee. This parasite has not been identified, but a reasonable guess would be *Trichogramma platneri*. It is being reared in the laboratory on PLR and OBLR eggs and eggs of *Trichoplusia ni*.

Table 1. Site descriptions where leafroller larvae were collected for determining parasitism levels.

Site	Location	Crop	Management type
TFREC	Wenatchee	Apple	unsprayed
Birchmont	Wenatchee	Apple	soft pesticide/unsprayed
Marley	Yakima	Apple	conventional
WSU	Pullman	Apple	feral trees
Davis	Milton-Freewater	Apple	conventional/nonbearing
BF	Milton-Freewater	Apple	semi-abandoned
Baneck	Milton-Freewater	Apple	conventional
Wondra	Milton-Freewater	Apple	abandoned

Table 2. Leafroller larvae collected from different sites in 1992 and the results of rearing to determine levels of parasitism.

Locations: Spring 1992		Parasitism					% parasitism
Site ID	No. larvae	PLR	<i>C. florus</i>	<i>Apanteles</i>	Tach.	Other	
PLR sites							
TFREC 21	86	75	0	0	0	0	0.0
TFREC 5	100	74	0	0	0	1	1.3
TFREC 24	87	75	0	0	0	0	0.0
Birchmont 4F east	92	89	0	1	0	0	1.1
Birchmont 4F west	51	47	0	0	0	0	0.0
Birchmont 1A	73	64	0	1	0	0	1.5
Marley	63	48	0	0	0	4	7.7
OBLR sites							
WSU	100	72	0	0	0	0	0.0
Davis	100	84	0	0	0	0	0.0
BF	31	22	0	0	0	3	12.0
Baneck*	100	41	0	0	0	0	0.0
Wondra	37	17	0	0	0	2	10.5

Locations: Summer 1992		Parasitism					% parasitism
Site ID	No. larvae	PLR	<i>C. florus</i>	<i>Apanteles</i>	Tach.	Other	
PLR sites							
TFREC 5	52	11	38	0	0	2	78.4
TFREC 24a	59	9	40	0	2	0	82.3
TFREC 24b	109	32	67	0	2	0	68.3
Birchmont 4F west	78	63	0	0	12	0	16.0
Birchmont 1D1	81	46	3	4	11	1	29.2
Birchmont 1D2	71	42	6	6	12	1	37.3

*low survival level of leafroller larvae probably due to use of *Bt* products in the orchard prior to larval collections.

Table 3. Data on *Colpoclypeus florus* reared from pandemis leafroller larvae collected from two unsprayed apple orchards in Wenatchee.

No. leafroller larvae	<i>Colpoclypeus florus</i>		
	% male	% female	Avg. no. adults
85	28.2	71.8	13.5±1.02