PARASITISM OF ORANGE TORTRIX ON CANEBERRY, *RUBUS* SPP. IN WESTERN OREGON AND WASHINGTON

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ABSTRACT

Larvae and pupae of *Argyrotaenia citrana* (Fernald), were collected from commercial caneberry fields, *Rubus* spp., in western Oregon and Washington from 1981 to 1984 and reared in the laboratory to identify parasitoid species and determine levels of parasitism. Twelve species of Hymenoptera (Braconidae, Eulophidae, and Ichneumonidae) and one species of Diptera (Tachinidae) were identified. Over 80% of total parasitism was by the braconids, *Apanteles aristoteliae* Viereck and *Meteorus argyrotaeniae* Johansen. *M. argyrotaeniae* was also reared successfully from several other leafroller hosts: *Choristoneura rosaceana* (Harris), *Archips rosana* L., and *Cnephasia longana* (Haworth). No other hosts of *A. aristoteliae* were collected in caneberries.

Key Words: *Argyrotaenia citrana*, caneberry, *Rubus*, parasitoids

INTRODUCTION

The orange tortrix, *Argyrotaenia citrana* (Fernald), (Lepidoptera: Tortricidae), is an occasional pest of a wide variety of fruit crops along the Pacific coast of North America (Powell 1964). In the Pacific Northwest orange tortrix can be an important pest of red raspberry, *Rubus idaeus* L. and other *Rubus* cane fruits (Breakey & Batchelor 1948, Rosenstiel 1949, LaLone 1980, Knight *et al.* 1988). Larvae generally do not feed directly on fruit, but contaminate harvested fruit, especially that which is machine harvested (Kieffer *et al.* 1983). Recent biological studies of orange tortrix have reported on overwintering mortality factors (Knight & Croft 1986), phenology (Coop 1983, Knight & Croft 1987a), and regional population dynamics (Knight & Croft 1987b). These studies have led to the development of an effective management program using sex pheromone traps to monitor populations that has reduced unnecessary early season applications of insecticides (Knight et al. 1988).

This reduction of insecticide usage in caneberry may prove to be very important in enhancing biological control of orange tortrix. Although parasitoids have been given credit for reducing orange tortrix abundance on a number of crops (Anonymous 1926, Basinger 1935, Rosenstiel 1949, Breakey 1951, Madsen & McNelly 1961, Kido *et al.* 1981), very little biological or host information is recorded for most of the complex (Krombein *et al.* 1979). Therefore, a study was initiated to identify larval and pupal parasitoid species and record levels of parasitism in commercial caneberry fields. Data were also collected on the parasitism of alternate lepidopterous hosts within caneberry.

MATERIALS AND METHODS

Commercial fields of red raspberry, *R. idaeus* L.; marionberry, *R. ursinus* Cham. & Schlecht; and evergreen blackberry, *R. laciniatus* Willd. located in W Oregon and SW Washington were sampled from 1981 through early 1984. Each field was sampled several times from April through October, except for 1983 and 1984 when fields were sampled biweekly from April through May. During early spring, leafroller larvae and pupae were collected from dead leaves tied along the wire trellises. In summer and fall, leafroller larvae were collected primarily from terminal leaf clusters along canes. All larvae and pupae were reared in 28 ml plastic cups with artificial diet (Lyon *et al.* 1972) at 20 ± 1°C, >70% RH, and a photoperiod of L:D 16:8 h.

RESULTS AND DISCUSSION

Thirteen primary and two secondary parasitoid species were identified from over 2000 orange tortrix larvae and pupae that were field collected (Table 1). Parasitism in the samples ranged from 0 to 56% and averaged 27.5%. The braconids, *Apanteles aristoteliae* Viereck and *Meteorus argyrotaeniae* Johansen, were the most commonly and widely collected species in our samples, accounting for > 80% of the parasitoids reared. The ichneumonids, *Enytus eureka* (Ashmead) and several unidentified species of *Diadegma*, were also commonly collected though parasitism levels were generally very low, *i.e.* < 5%. The two ectoparasitoids, *Phytodietus vulgaris* Cresson and *Oncophanes americanus* (Weed), were collected from only a few sites during late summer and early fall. Yet, levels of parasitism averaged 9 and 14% for these two species, respectively, when they were present in collections. Seven additional parasitoid species were also collected, but only occasionally (Table 1). Of these, *Parania geniculata* (Holmgren), *Meteorus dimidiatus* (Cresson), and *Elachertus* sp. are new host parasitoid records (Krombein et al. 1979). *Itoplectis quadricingulata* (Provancher), the only pupal parasitoid collected, was widely distributed among fields. A few specimens of the hyperparasitoids, *Stictopisthus* sp. and *Spilochalcis* sp. were reared from *A. aristoteliae* cocoons.

TABLE 1

Summary of parasitoid species reared from orange tortrix larvae and papae collected from commercial caneberry *Rubus* ssp. fields in western Oregon and Washington, 1981-1984.

Species	Family	Mode[a]	Other hosts[b] Cr	Ar	Cl
Apanteles aristoteliae Viereck	Braconidae	larval endo solitary	no	no	no
Meteorus argyrotaeniae Johansen	Braconidae	larval endo solitary	yes*	yes*	yes*
Phytodietus vulgaris Cresson	Ichneumonidae	larval ecto solitary	no	no	yes*
Enytus eureka (Ashmead)	Ichneumonidae	larval endo solitary	yes	yes	yes
Diadegma ssp.	Ichneumonidae	larval endo solitary	yes	no	yes
Oncophanes americanus (Weed)	Braconidae	larval ecto greg	yes	no	yes*
*Meteorus dimidiatus** (Cresson)	Braconidae	larval endo solitary	yes	no	no
Meloboris sp	Ichneumonidae	larval endo solitary	no	yes	no
Meteorus trachynotus Viereck	Braconidae	larval endo solitary	no	no	no
*Parania geniculata** (Holmgren)	Ichneumonidae	larval-pupal endo solitary	no	no	no
Pseudoperichaeta erecta (Coquillet)	Tachinidae	larval-pupal endo solitary	yes	no	no
*Elachertus** sp	Eulophidae	larval ecto solitary	yes	no	no
Itoplectis quadricingulata (Prov)	Ichneumonidae	pupal endo solitary	no	no	no
Stictopisthus sp	Ichneumonidae	hyper on *A. aristoteliae*	no	no	no
*Spilochalcis** sp	Chalcididae	hyper on *A. aristoteliae*	no	no	no

[a] Mode of parasitism is categorized as either **larval, larval-pupal** or **hyper**parasitism; **endo**parastitism or **ecto**parasitism; and **solitary** or **greg**arious parasitism.
[b] Other hosts include: *Choristoneura rosaceana, Archips rosanus,* and *Cnephasia longana.*
* Represents a new host record.

Parasitoids were also reared from larvae of three other leafroller species occasionally found in caneberry: *Choristoneura rosaceana* (Harris), *Archips rosana* (L.), and *Cnephasia longana* (Haworth). Seven species reared from *C. rosaceana*, two species reared from *A. rosana*, and five species reared from *C. longana* were also collected from orange tortrix (Table 1). Interestingly, *M. argyrotaeniae* was collected from all four hosts, but *A. aristoteliae* was restricted to orange tortrix.

These other three leafrollers are polyphagous (Powell 1964) and are common pests of filberts, *Corylus avellana* L. (AliNiazee 1980). The proximity of caneberry fields and filbert orchards to one another and the dispersal capacity of both hosts and parasitoids may be important in maintaining this complex of parasitoid species in the geographical region studied during periods when suitable stages of orange tortrix are not available. In contrast, it is not clear what importance temporal asynchrony of *A. aristoteliae* and orange tortrix populations in the spring and the apparent lack of alternative hosts has in reducing populations of this important parasitoid species in caneberry during the summer.

No attempt was made in our study to correlate spray practices or host densities with levels of parasitism or the presence of individual species. However, these relations are of importance in more fully assessing the role of parasitoids in management of orange tortrix populations. Further investigations should determine the effects of early season insecticide applications, cultural practices, and surrounding habitat on the performance of these species.

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