

Biological Control

Apple Ermine Moth and Its Biological Control in Oregon

Barry Bai

Oregon Department of Agriculture Plant Division, Salem, OR

Keywords: apple ermine moth, *Yponomeuta malinellus*, *Ageniaspis fuscicollis*, apple

The apple ermine moth (AEM), *Yponomeuta malinellus* Zeller (Lepidoptera: Yponomeutidae), was first detected in 1985 in British Columbia. The insect quickly spread southward throughout Washington and reached Oregon in 1991. Now 15 counties in Oregon are infested. A biological control agent, a parasitoid, was introduced in Oregon between 1992-95 to battle the ermine moth. This paper presents results of a study on AEM biology and the effectiveness of the biological control agent in Oregon.

Materials and Methods

The study was conducted in an apple orchard in Multnomah County, OR, during 1997 and 1998. A polyembryonic parasitoid, *Ageniaspis fuscicollis* (AF) (Hymenoptera: Encyrtidae) was introduced and released in the orchard during 1992-95. To assess the AEM population and cluster size, the orchard was visited 3-4 times in the spring. Five trees were sampled to estimate the AEM populations. AEM cocoon clusters were also collected randomly and taken to the laboratory to count the number of individuals in each cluster. To evaluate the parasitism by AF, the field collected AEM cocoons were carefully examined. Parasitized AEM can be easily recognized by the mummified larvae inside cocoons. The number of these parasitized AEM was counted. Mummies were put individually in vials before the parasitoid adults emerged. After emergence, the parasitoids in each vial were counted.

Results

AEM eggs were laid in a cluster. The larvae from the same egg cluster feed and pupate together as a group. The number AEM contained in a cocoon cluster varied from 1 to 86. The majority of cocoon clusters contained 10-40 AEM individuals (mean = 25). This contrasts to the mean egg cluster size of 63 eggs per egg cluster. AEM adult population was lower in 1998 than in 1997, at least partially due to predation and parasitism (Table 1). Field parasitism varied between two years. A mean of 2.5% AEM was parasitized in 1997 whereas about 10 times (23.2%) were parasitized in 1998 (Fig. 1). Percent parasitism tends to decrease with the AEM cluster size. The polyembryonic parasitoid can produce 20-160 individuals in a single brood. Majority of the brood contained 60-120 offspring, with a mean of 81 progeny per brood.

Discussion

AEM is an exotic pest newly introduced in the Pacific Northwest. The pest poses a threat to fruit tree and nursery industries because of its direct damage and its significance in quarantine. Oregon is the frontier of AEM's southward spread. Only parts of the state are now infested. AEM lay eggs in clusters. Larvae feed and pupate in clusters too. Although an egg cluster contains an average of 63 individuals, by cocoon stage a cocoon cluster has only 25 AEM on average. The polyembryonic parasitoid, *Ageniaspis fuscicollis*, has exerted some effect on AEM since the

biocontrol agent was introduced and released in Oregon. Parasitism and predation contributed to the population fluctuations of AEM in the field. Field parasitism can be as high as 100% on some AEM clusters and average parasitism can reach 23%. However, variations between years are considerable.

Table 1. Survey of AEM populations in the Bybee Howell Apple Orchard, Sauvie Island, OR. Five trees were surveyed in total. One cubic foliage was selected from each directional position of a tree and the number of AEM webbing and cocoon clusters was counted.

Tree Side	1997		1998	
	Webbing	Clusters	Webbing	Clusters
North	0.8	0.4	2.2	0.8
West	1.8	1.2	2.4	0.6
South	3.4	2.2	2.8	1.2
East	1.2	1.6	2.0	0.6
Total	7.2	5.4	9.4	3.2

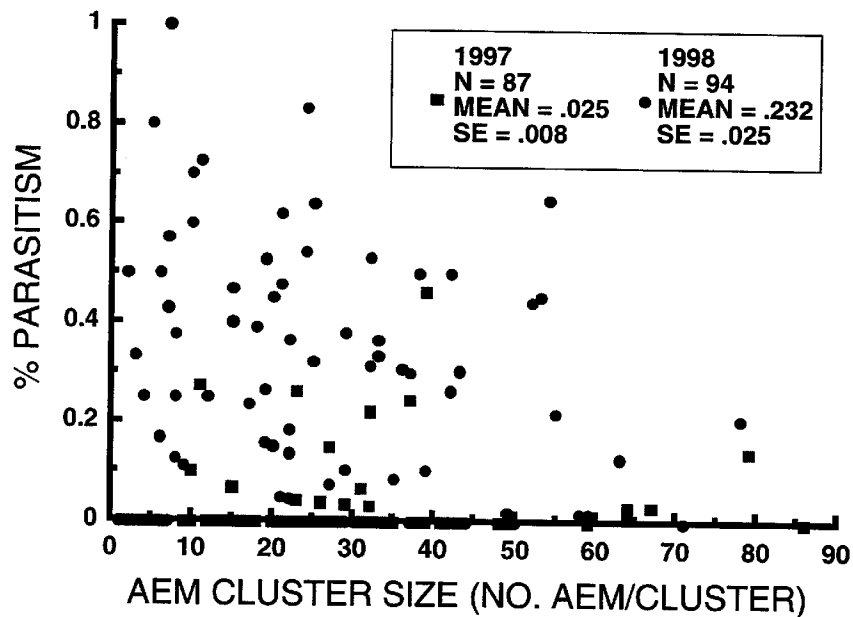


Figure 1. Parasitism of AEM as influenced by the cocoon cluster size.