Chamaesphecia crassicornis

Classification

Phylum: Arthropoda
Class: Insecta
Subclass: Pterygota
Division: Exopterygota
Order: Lepidoptera
Suborder: Ditrysia
Superfamily: Sesioidea
Family: Sesiidae
Subfamily: Sesiinae
Tribe: Aegeriini
Genus: *Chamaesphecia*
Species: *C. crassicornis* Bartel

General Life History

Adults of *Chamaesphecia crassicornis* which had originated from larvae collected on leafy spurge in Romania, emerged at the Rome Laboratory from the end of May until the end of July. Before emergence, the mature larvae moved from the root to the lower part of the stem, where they made an exit hole, covered it with frass, and pupated. The adult emerged through the exit hole prepared by the mature larva. During emergence, the chrysalid skin was dragged outside of the stem for 3/4 of its length and held in place by anal hooks while the moth freed itself.

About 80% of the population of *C. crassicornis* kept under study emerged during the first year, where as the remainder had a bienniel life cycle. Females that emerged during 1985 had a pre-oviposition period of 1-3 days and an oviposition period of 1-5 days. Females lived 5.15 +/-2.12 days, while males lived 7.05 +/- 1.96 days (Pecora *et al.*, 1989).

The mean number of eggs per female of *Chamaesphecia crassicornis* was 29 to 33 +/- 27.85 (n=9), (range = 3-68). The egg hatching period was 11-16 days. Of a sample of 357 eggs, 61.7% were fertile. The average length and width of the eggs was 0.68 +/- 0.007 mm and 0.43 +/- 0.004 mm, respectively (Pecora *et al.*, 1989). The eggs were oval in shape and flattened. They were dark brown when laid, and then they generally became light brown after the emergence of the larvae. The external surface was provided with a network of slightly raised veins forming pentagonal and hexagonal shapes (Pecora *et al*., 1989).

The neonate larvae of *C. crassicornis* were observed either crawling down along the stem or dropping to the ground before penetrating the plants. The number of instars was not determined in the laboratory. However, for the closely related species, *C. empiformis*, which is associated with *E. cyparissias*, five instars have been determined (Pecora *et al.*, 1989).

Young instars of *C. crassicornis* were found under the cortex, just below the crown of potted plants or in mature plants. Third instar larvae generally started to penetrate the central part of the root. Until the last instar, the larvae made tunnels 10-20 cm long in the root. These tunnels were tightly filled with larval excrement. From the repeated collections made in Romania during the second half of October, 50-60% of the larvae were mature, while the others were in earlier stages (Pecora *et al*., 1989).

Host Range in the Field and Greenhouse Testing

According to Pecora *et al*. (1989), the host plant range of *C. crassicornis* was investigated by testing 12 plant species of the family Euphorbiaceae, plus the control plant (*E. virgata* from Romania). Eleven of these test plants are in the genus *Euphorbia* (seven in the subgenus *Esula*, two in the subgenus *Agaloma*, one in the subgenus *Poinsettia*, and one in the subgenus *Euphorbium*), and one in the genus *Ricinus* (Pecora *et al*., 1989). A larval survival test was carried out with neonate larvae and mature eggs (*op. cit.*). The eggs used in this experiment were laid by females kept in cages.

Pecora *et al.* (1989) stated that four populations of leafy spurge of North American origin (Nebraska (n=22), Montana (n=35), Wyoming (n=6), and Oregon (n=6)) were tested during 1985. Three neonate larvae or three mature larvae were placed between the stem and the basal part of the leaves on each plant using a find brush (Pecora *et al.*, 1989). The first plant was infested on July 10 and the last one on August 17, 1985. On October 8, 1985, several test and control plants were dissected and the number of larvae found were recorded. The rest of the infested plants were placed in a nylon organdy screen cage at the end of April, 1986, and the number of adults that emerged was recorded (*op. cit.)*.

Pecora *et al*. (1989) stated that among the plants of the genus *Euphorbia* tested, the larvae of *C. crassicornis* were able to develop only on those of the subgenus *Esula*. The test conducted during 1985 demonstrated the ability of *C. crassicornis* to develop on different populations of leafy spurge of North American origin (*op. cit.)*. The experiment made during 1988 indicated that larvae of *C. crassicornis* were able to develop on species of the subgenus *Esula*.

Impact of *Chamaesphecia crassicornis* on Leafy Spurge

Leafy spurge is sensitive to root damage and is therefore susceptible to *C. crassicornis* as the larvae feed on the roots of spurge. The feeding activates the spurge's defense mechanisms and makes it more vulnerable to native plant diseases. *C. crassicornis* should be an effective biocontrol agent as it causes considerable damage to the growth and flowering of attacked shoots.

The direct effect of the root-boring moth *Chamaesphecia crassicornis* on leafy spurge will be the reduction of the weed density and the return of a wide variety of native herbaceous plants. The feeding behavior of the larval stage can do severe damage to the root cortex below the crown of the plant. Late instar larvae can penetrate the central part of roots. This feeding opens the root to invasion of soil-borne pathogens further reducing plant vigor.

Chamaesphecia crassicornis could play an important role in the biological control of leafy spurge in the United States. It will help to increase the stress on the spurge and poses little threat to any economic or endangered native plants.

Location where the *C. crassicornis* was originally collected

Insects originally released in the United States were collected in Romania. *C. crassicornis* was approved for release in October of 1994. The native origin of *Chamaesphecia crassicornis* includes Eastern Austria, Southern Czechoslovakia and Southern Romania.

Current North American Distribution

Although *C. crassicornus* has been approved for release in the United States for several years, release into the field has been difficult due to the low numbers of organisms collectable from foreign sources. Recently efforts to develop artificial diets, for the purpose of rearing these insects have been initiated. To date these efforts appear promising, but are not in the implementation phase.

Specific References on *Chamaesphecia crassicornis*

Spencer, N.R. and A. D. Prevost. 1992. An Environmental Assessment of *Chamaesphecia crassicornis* USDA/ARS Biological Control of Weeds Research Unit, P. O. Box 1109, Sidney, MT 59270. Unpublished Report: 20.

Pecora, P.M., M. Cristofaro and M. Stazi. 1990. A European clear wing moth, *Chamaesphecia crassicornis* Bartel (Lepidoptera: Sesiidae), a candidate for biological control of leafy spurge (Euphorbia esula L.) 'complex' in the United States. *In* Casida, J.E. (Ed) Proceedings of the Pesticides and Alternatives Symposium, Crete, 1989. Elsevier Science Publishers, Amsterdam: 531-540.