

Hyles euphorbiae



Classification

Phylum: Arthropoda

Class: Insecta

Subclass: Pterygota

Division: Exopterygota

Order: Lepidoptera

Suborder: Ditrysia

Superfamily: Sphingoidea

Family: Sphingidae

Genus: *Hyles*

Species: *Hyles euphorbiae* (L.)

General Life History

The leafy spurge hawkmoth, *Hyles euphorbiae* (L.), completes one and sometimes two generations per year and requires 42-72 days to complete development. This is dependent on temperature and food source. There are five life stages: egg, larva, pre-pupa, pupa and adult. Adults, with a wing span of 5 cm., are strong fliers and are active nocturnally. Adults emerge from the pupal stage in the soil early in the spring and live for two to three weeks. During this time adults mate and females oviposit eggs on leaves and bracts of the spurge plants. The larvae develop into pre-pupal and finally pupal stage. Pupation is completed in the soil where they overwinter, emerging as adults in the spring (Poritz, 1988).

Host Range in the Field and Greenhouse Testing

Laboratory studies of *Hyles euphorbiae* revealed that relatively warm temperatures were required for eclosion and larval development. The calculated minimum thresholds for egg and larval development were 6.5 and 12.8 C, respectively. The cumulative duration of larval development in the laboratory ranged from 33.2 (+/- 0.41), 21.5 days (+/- 0.35), and 14.3 days (+/- 0.11) at 20, 25, and 30 C, respectively. These characteristics suggest that this agent may have a poor temporal synchrony with its cold hardy, early-season-developing host, leafy spurge. For defoliation to provide the most effective sexual reproductive stress on leafy spurge it should occur early in the season (Poritz, 1988).

Field population studies near the first releases of the moth showed a well-established population. Larval densities in leafy spurge patches ranged from 0.01 larvae/m² to 1.04 larvae/m². Only the highest larval densities were able to completely defoliate the host. At most densities, larvae caused minimal defoliation. Larval density and spurge clone size were weakly correlated ($r = -0.197$, $P = 0.029$), which implied that adult hawkmoth oviposition was not influenced by the size of the spurge clone. Hawkmoth foliage feeding in the field began after the initiation of seed production. This poor timing with the weed's sexual reproductive phenology was expected, based on laboratory developmental studies (Poritz, 1988).

List of Known Predators of *Hyles euphorbiae*

Predation on pupae appear to be the most important source of hawkmoth mortality. Field observations suggest that predators such as ants, grasshoppers, birds and mice were responsible for pupal mortality. Exclusion cages which selectively eliminated these predators made significant reductions in pupal mortality, while unprotected pupae on the open range were subjected to extreme mortality. Overwintering mortality was 44 percent (Poritz, 1988).

Impact of *Hyles euphorbiae* on Leafy Spurge

Examination of former hawkmoth release sites throughout Montana revealed established populations at a number of sites (Poritz, 1988). Unfortunately, it appears that the population levels attained by this species have had little impact on leafy spurge stem densities and may fit the model proposed by Briese (1985) in which a biocontrol agent's population density stabilizes below that which impacts the target weed.

Location where *Hyles euphorbiae* was originally collected

Insects initially released in the United States were collected in Canada. Approval for release was granted in May of 1965. *Hyles euphorbiae* native range includes Southern and Central Europe, Northern India and Central Asia.

Current North American Distribution

Although *Hyles euphorbiae* has been approved for release in the United States since 1965, and has been redistributed and released in several states, populations have failed to consistently develop sufficient numbers to impact spurge over large areas. *Hyles euphorbiae* continues to be represented in local populations where insects have been released in the past. The appearance of a virus in the larval population, along with severe predation on the pupae, have inhibited this organism's development.

Specific Reference on *Hyles euphorbiae*

Poritz, N. H. 1988. Laboratory fecundity and development, field population dynamics, pupal predation and the history of releases of the spurge hawkmoth, *Hyles euphorbiae* (L.), a biological control agent of leafy spurge, *Euphorbia esula* L., in Montana. MS Thesis, Dept. of Entomology, Montana State Univ., Bozeman, MT: 92.

