

## Data Sheets on Quarantine Pests

*Acleris variana* and *Acleris gloverana***IDENTITY**

**Taxonomic position:** Insecta: Lepidoptera: Tortricidae

**Notes on taxonomy and nomenclature:** There are two species called the blackheaded budworm: *Acleris variana*, the eastern blackheaded budworm, occurs from eastern Canada to Alberta, while *A. gloverana*, the western blackheaded budworm, occurs from Alberta westward (Powell, 1962). These were previously considered to be the same species and there is, therefore, some confusion in the literature.

- ***Acleris variana***

**Name:** *Acleris variana* (Fernald)

**Synonyms:** *Teras variana* Fernald  
*Peronea variana* (Fernald)  
*Peronea angusana* Fernald

**Common names:** Eastern blackheaded budworm (English)  
Tordeuse à tête noire de l'épinette (French/Canadian)

**Bayer computer code:** PEROVA

**EPP0 A1 list:** No. 32

**EU Annex designation:** I/A1 - as *Acleris* spp. (non-European)

- ***Acleris gloverana***

**Name:** *Acleris gloverana* (Walsingham)

**Common names:** Western blackheaded budworm (English)

**Bayer computer code:** PEROGL

**EPP0 A1 list:** Not listed as such, but in view of notes on taxonomy and nomenclature, implicitly covered within the concept of *A. variana*.

**EU Annex designation:** I/A1 - as *Acleris* spp. (non-European)

**HOSTS**

*A. variana* attacks mainly *Abies balsamea* and to a lesser extent *Picea glauca*. It can also feed on other *Picea* spp., particularly in southern Ontario, Canada.

*A. gloverana*, in British Columbia, Canada, and Alaska, USA, infests mainly *Tsuga heterophylla* and *Abies* spp. *Picea* spp. and *Pseudotsuga menziesii* are also readily attacked.

These species are important forest and amenity trees in the EPP0 region.

**GEOGRAPHICAL DISTRIBUTION**

**EPP0 region:** Absent.

**North America:** In Canada, *A. variana* occurs from Newfoundland and Cape Breton Island (Nova Scotia) across the coniferous forest region, to Saskatchewan and eastern Alberta. In the USA, *A. variana* occurs in north-eastern areas (Connecticut, Maine, New York) and south-eastern areas (Arnett, 1993). *A. gloverana*, on the other hand, occurs in

the boreal forest areas of the western USA from the Sierra Nevada and Cascade ranges in California, northward to coastal British Columbia and Yukon (Canada), eastward to western Alberta, and southward in the Rocky Mountains.

**EU:** Absent.

**Distribution map:** For *A. variana*, see CIE (1989a, No. 506); for *A. gloverana*, see CIE (1989b, No. 507), and also Powell (1962).

## **BIOLOGY**

In eastern Canada, adult moths of *A. variana* appear in August and September and females deposit their eggs singly on the undersides of needles towards the top of the tree (on the outer extremities of the crown in the case of *A. gloverana*). In cage experiments, mean oviposition rates of 53-83 eggs per female *A. variana* have been recorded; it is probable that adult food is critical in egg production. The survival rate in the egg stage is relatively stable and about 89%; egg mortality is largely caused by infertility and failure to hatch. The egg is the overwintering stage; hatching coincides with budbreak the following May (early June in Newfoundland), about 10 days after a slightly translucent area in the yolk, which is the first external evidence of embryonic development, becomes apparent. The emerging larvae bore into new needle bases and feed. The needles of a single shoot are sufficient to maintain one larva during the first three instars. Males and about 50% of females have four instars, while the other 50% of females have five instars. As shoots elongate, the fourth (and fifth) instar larvae web the needles and twigs in a protective shelter in which they continue to feed; ultimate-instar larvae can subsist on old foliage of *Abies balsamea*. Larval survival is a function of parasitism and weather. Pupation, lasting 20 days, occurs in the feeding sites from mid-July (late July in Newfoundland) until late August. Some larvae may drop from the foliage, even though food supply is adequate, and then pupate in the shrub layer. First adults appear in early August. In cages, male budworms lived for about 14 days and females 28 days.

Increases in density of *A. variana* were reported to occur during periods of low rainfall, and vice versa. In the Green River area of north-western New Brunswick (Canada), when accumulated degree-days above 5.5°C exceeded 1169, there was a general increase in populations of this species, and a decrease when temperatures were less favourable (Miller, 1966).

Similarly in British Columbia, Canada, populations of *A. gloverana* were reported to increase greatly after 1 or 2 years of low rainfall during July and August (Silver, 1960; 1963).

For further information, see also Prebble & Graham (1945), Lejeune & Carolin (1957), Miller & McDougall (1966), Schmiege (1966), Werner (1969), Hard (1974).

## **DETECTION AND IDENTIFICATION**

### **Symptoms**

Defoliation occurs, particularly at the tops of trees. The partly eaten foliage remaining attached to the larval webs dies, giving the forest a reddish-brown appearance towards the end of July. This discoloration is particularly marked at the tops of crowns. For additional information, see also Powell (1962).

### **Morphology**

#### **Eggs**

Yellow, oval, 0.9 x 0.5 mm, convex above, flattened below, with a reticulate surface. A tuft of scales from the abdomen of the female normally attached to the upper surface

distinguishes *A. variana* from *A. gloverana*. The egg chorion becomes flattened after hatching and may remain on the needle till late autumn or the following year.

#### **Larva**

Head capsule varying between dark-brown and black; prolegs are dark-brown; body greenish-yellow to light-green. Attains 11-15 mm in length. Anal fork with six to ten prongs, typically seven.

#### **Pupa**

Males 7-8.2 mm, females 8-9 mm long, 1.8-2 mm broad. Dark-brown, shading to green on the wings. Cremaster broad, curved ventrally with a long hooklet on each side; one pair of long hooklets on the dorsal surface and two shorter pairs on the ventral surface.

#### **Adult**

Male: Forewing 7.5-8.4 mm long (in *A. gloverana*, 8.4-9.8 mm); extreme variation in the colour pattern of the wings, colour forms as follows:

(a) ground colour grey with a broad, whitish antemedian band, at times with a second, incomplete band;

(b) outer area of wing concolorous with antemedian band, leaving a large grey or blackish costal triangle which usually encloses one or two whitish costal spots;

(c) basal area and antemedian band white, outer third of wing whitish or blackish;

(d) basal area deep ochreous, whitish antemedian band sometimes evident;

(e) ground colour dark-grey, sometimes finely mottled with black, well defined, ochreous or white (sometimes red-brown, bordered with whitish) longitudinal bands;

(f) wing pattern divided by a transverse line, basal area white with or without an indication of a greyish dorsal triangle, outer area dark grey-blue, with or without scattered whitish scales, whitish spots along the costa;

(g) ground colour uniform blackish-grey, basal area pale-yellowish, diffuse outwardly.

In general, the forewing is darker and more distinctly marked in *A. variana* than *A. gloverana*; the hindwing uniformly dark-grey, darker than in *A. gloverana*.

Abdomen, dorsum grey. The segments are sometimes banded with whitish markings posteriorly, venter whitish; genital tuft not spreading.

Female: Forewing 7.5-9.1 mm (8.0-9.8 mm in *A. gloverana*), essentially as described for male above; genital tuft a huge dense scale brush, usually dark grey-purplish, rarely pale.

### **MEANS OF MOVEMENT AND DISPERSAL**

Adults can fly long distances, but probably not between continents. International movement could occur on host plants. For example, eggs on foliage could go unnoticed; however, since the insect tends to attack mature trees, it is relatively unlikely that entry would occur on planting material.

### **PEST SIGNIFICANCE**

#### **Economic impact**

Serious and recurrent outbreaks of the blackheaded budworm have been recorded in eastern and western Canada since the late 1920s. Data suggest that, locally, population maxima occur every 10-15 years in areas where the forest constitutes a favourable food supply, i.e. a high content of *Abies balsamea*; defoliation tends to be greater in maturing stands about 50 years old.

The impact of *A. variana* on forests in eastern Canada cannot readily be assessed since outbreaks (up to 100% defoliation of the current season's shoots) have been associated with other pests of *Abies balsamea*, such as the balsam woolly aphid, *Dreyfusia piceae* (Miller, 1966). *Abies* spp. can survive even 2 years of severe defoliation without top-killing or a marked reduction in radial increment. Larvae of *A. variana* emerge when the buds of *Abies*

*balsamea* are opening; since there is no damage through bud mining, it can be assumed that some 5 years of attack would be required to kill established trees. Outbreaks of the blackheaded budworm in Canada have always been reported to collapse after 2 years.

In western Canada, *A. gloverana* is a serious menace and causes extensive defoliation leading to loss of wood production and limited top-killing and mortality. Repeated outbreaks may severely deplete mature and near-mature stands of *Tsuga heterophylla*.

### Control

Budworms can be controlled by aerial spraying.

### Phytosanitary risk

*A. variana* is listed as an A1 quarantine pest by EPPO (OEPP/EPPO, 1980), and *A. gloverana* is implicitly covered by this listing. The two species are certainly a serious threat to several important conifer species in the EPPO region, though additional studies are required for a better understanding of the areas where they would present the highest risk.

## PHYTOSANITARY MEASURES

EPPO recommends (OEPP/EPPO, 1990) that countries should prohibit importation of plants for planting (except seeds and tissue cultures) and cut branches of *Abies* and *Picea* from North America. These measures could also apply to the hosts of *A. gloverana*.

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