Data Sheets on Quarantine Pests

Orgyia pseudotsugata

IDENTITY

Name: *Orgyia pseudotsugata* (McDunnough)
Taxonomic position: Insecta: Lepidoptera: Lymantriidae
Common names: Douglas-fir tussock moth (English)
Chenille à houppes du sapin Douglas (French)
Bayer computer code: ORGYPS
EPPO A1 list: No. 218

HOSTS

O. pseudotsugata occurs mainly on *Abies concolor*, *A. grandis* and *Pseudotsuga menziesii*. However, during outbreaks it also feeds on other conifers such as *A. lasiocarpa*, *A. magnifica*, *Larix occidentalis*, *Picea engelmannii*, *P. pungens*, *Pinus contorta*, *P. flexilis*, *P. jeffreyi*, *P. lambertiana*, *P. ponderosa* and *Tsuga heterophylla*, or even on undergrowth of, for instance, *Vaccinium* spp., *Purshia tridentata* or *Pachystima myrsinites*.

GEOGRAPHICAL DISTRIBUTION

O. pseudotsuga occurs along the Pacific coast of North America from British Columbia to New Mexico.
EPPO region: Absent.
North America: Canada (Alberta, British Columbia), USA (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming).
EU: Absent.

BIOLOGY

The eggs are laid in clusters of 150-200 eggs. Adults appear in one yearly generation from August until November. The male flies around during the day, searching for the flightless females. The latter stay on their cocoons, on which the egg clusters are deposited. Egg clusters are covered by the female with a dense protective layer of body hairs. Normally egg clusters are deposited in the higher parts of the trees, but when these are severely infested, the lower parts of the trees are also used for oviposition. Eggs overwinter and hatch in late spring. The young larvae move to the outer parts of the crowns of the threes and may be dispersed passively by the wind across long distances by means of spun threads, which can be several metres long. Young larvae prefer fresh growth, but from the second larval stage also older needles are consumed. In late summer pupation starts, usually among some older needles, and requires 1 to 2 weeks.

O. pseudotsugata characteristically causes damage in outbreaks occurring at several years' intervals, more or less synchronized over its whole area of occurrence, and breaking down as a result of nuclear polyhedrosis virus infection (Shepherd *et al*., 1988). Non-outbreak populations are kept in check by parasitoids and predators (Mason & Torgersen,

1987). Host preference of *O. pseudotsugata* differs between outbreaks: sometimes Douglas fir has been preferred, sometimes other species. Both environmental factors and the possible existence of different biotypes of *O. pseudotsugata* have been discussed as possible causes of this phenomenon. General accounts of the species have been given by Prentice (1962), Brooke *et al.* (1978) and Johnson & Lyon (1988).

DETECTION AND IDENTIFICATION

Symptoms

The larvae feed on the leaves, but at low densities they are hard to find. During infestations, the higher parts of the tree are consumed first, but finally whole trees can be defoliated. Young larvae move to other trees by means of aerial dispersal, for which they spin long silk threads, which may cover the surrounding trees and shrubs.

Morphology

Eggs

The eggs are deposited as a cluster on the female cocoon and the clusters are covered with a dense, protective layer of dark body hairs of the female. The eggs are white, nearly spherical, with a flattened area at the cephalic end.

Larva

The larval stages differ considerably in general appearance. Young larvae lack the characteristic body tufts and are yellow-white and hairy. Older larvae gradually develop two prothoracic horns, tufts on abdominal segments 14, and auxiliary and anal tufts on abdominal segment 8. In full-grown larvae the prothoracic horns and the anal tuft are large and black, the auxiliary tuft is much shorter, brown and full, and the tufts on segments 14 are short, uniform in shape and coloured whitish with a black tip. However, the colour of body and tufts may vary considerably within and between populations. The abdominal glands are red to deep-red.

Pupa

The pupa is light-brown to dark and covered with a long straw-coloured pubescence. It is enclosed by a greyish-brown spindle-shaped silken cocoon, which incorporates larval hairs.

Adult

The adult male is a charcoal-greyish moth with feathery antennae and a wingspan of 34 mm. The forewings are grey-brown to black-brown with dark transverse markings that are sometimes indistinct, and some inconspicuous white markings. The hindwings are brown, sometimes with darker areas on the wing borders. The greyish flightless female has tiny rudimentary wings, small thread-like antennae, and a large abdomen.

MEANS OF MOVEMENT AND DISPERSAL

Because the female is flightless, local dispersal depends mainly on the activity of first and second-instar larvae. Newly hatched larvae aggregate at the top of defoliated trees and drop from these sites on silken threads, which may be 3 m or more in length. Under suitable weather conditions they can be blown away and 'balloon' to new hosts over short distances. Passive transport with plant material, however, is supposed to be the only way to bridge long distances. Transport by international trade would be mainly in the egg stage.

PEST SIGNIFICANCE

Economic impact

O. pseudotsugata is considered one of the most serious defoliators of North American forests. Repeated infestations may cause top-killing of the trees and tree mortality. Between

1947 and 1974 more than 500 000 ha of forest have been treated with DDT against *O. pseudotsugata* in the USA (Brookes *et al*., 1978). Intensive monitoring programs are carried out to detect possible outbreaks in an early stage, and to enable control by preventive spraying. Furthermore, stinging hairs of the larvae may cause allergic reactions of the skin and respiratory organs in man.

Control

Mason & Wickman (1991) review the elements of integrated control of *O. pseudotsugata* in Oregon (USA): monitoring, computer-based decision aids, environmentally safe treatments. Synthetic implants of the insecticide acephate have been used to protect scionwood of *Abies concolor* in California (USA) (Stein & Mori, 1994). More than sixty different parasites can attack the different stages of *O. pseudotsugata*. *Telenomus californicus* is a very effective egg parasite. The tachinid fly *Carcelia yalensis* attacks full-grown larvae by depositing an egg on the back and causing mortality of the pupae. However, the reduction of populations of *O. pseudotsugata* is most frequently caused by a polyhedrosis virus. In the USA, large-scale chemical control of outbreaks of *O. pseudotsugata* has frequently been applied. Use of *Bacillus thuringiensis* and a polyhedrosis virus (Otvos *et al*., 1987a, b; Otvos & Shepherd, 1991) has also been rather successful. A synthetic sex pheromone has been shown to be usable in field conditions to block mate location and reproduction (Hulme & Gray, 1994).

Phytosanitary risk

O. pseudotsugata has recently been added to the EPPO A1 quarantine list. Both *Abies grandis* and *Pseudotsuga menziensii* are frequently grown in forests in Europe and the number of pest species of these important timber trees is still relatively low. Introduction of *O. pseudotsugata* into the region could cause severe large-scale outbreaks, especially because of the lack of suitable natural enemies. In any case, tree mortality may cause great losses, not only in timber production areas, but also in nature reserves.

PHYTOSANITARY MEASURES

In countries where *O. pseudotsugata* occurs, nursery inspections should be carried out during the growing season prior to dispatch. The consignment should come from a place of production that has been found free from *O. pseudotsugata* during the last growing season (OEPP/EPPO, 1990).

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