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Data Sheets on Quarantine Pests

Choristoneura occidentalis

IDENTITY

Name: *Choristoneura occidentalis* Freeman
Taxonomic position: Insecta: Lepidoptera: Tortricidae
Common names: Western spruce budworm (English)
Bayer computer code: ARCHOC
EPPO A1 list: No. 207
EU Annex designation: I/A1

HOSTS

Choristoneura occidentalis occurs principally on *Pseudotsuga menziesii* and also on other forest trees such as *Abies concolor*, *A. grandis*, *A. lasiocarpa*, *Larix occidentalis*, *Picea engelmannii*, *P. glauca* and *P. pungens*. In the EPPO region these host plants can be found in Northern and Central European forests.

GEOGRAPHICAL DISTRIBUTION

C. occidentalis is confined to North America, where outbreaks were first recorded in 1909 in Vancouver Island (British Columbia), and in Idaho (USA) in 1922. *C. occidentalis* then established itself as a serious pest throughout the Pacific Coast States, British Columbia and Rocky Mountain States.
EPPO region: Absent.
North America: Canada (British Columbia), USA (Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington and Wyoming).
EU: Absent.

BIOLOGY

Eggs are laid in summer (July and August) and hatch in about 10 days. The newly hatched larvae do not feed but spin silken shelters among lichens and under bark scales in which they hibernate. In the following spring, they mine old needles until bud swelling, and then bore into the buds and feed upon the growing needles. Later they loosely web the growing tips and feed upon new needles. Pupation takes place after six larval instars. Predictive models of insect phenology for use in integrated pest management have been described (Dennis *et al*., 1986; Kemp *et al*., 1986).

DETECTION AND IDENTIFICATION

Symptoms

The larvae of *C. occidentalis* feed principally in buds and on foliage of forest trees and heavy attacks can cause complete defoliation in 4-5 years. Infested trees can show a growth

reduction, deformity, top killing and may die. Damage to cones and seeds has also been observed on *Pseudotsuga menziesii* and *Larix occidentalis* in the Rocky Mountains.

Morphology

Eggs

The eggs are light-green and are laid in masses (like shingles) on the underside of needles.

Larva

Newly hatched larvae are light-green with brown heads. Full-grown larvae are 25-32 mm long with brownish head and body and prominent ivory spots.

Pupae are 12-16 mm long, broad at the head end but tapering rapidly toward the tail.

Adult

Generally, the adults are mottled orange-brown in colour, approximately 11 mm long with a wing-span of 22-28 mm.

MEANS OF MOVEMENT AND DISPERSAL

Passive wind dispersal can occur as larvae spin down on long silken threads, and spread is also ensured by moth flight. In international trade, *C. occidentalis* is liable to be carried by plants and cut foliage of conifer host plants as first-instar hibernating larvae.

PEST SIGNIFICANCE

Economic impact

C. occidentalis is one of the most destructive forest defoliators in Western North America. Heavy and repeated attacks can lead to top-killing of the trees and tree mortality.

Control

Chemical control is achieved by aerial spraying or implantation of capsules containing insecticides in the trunk. The use of *Bacillus thuringiensis* subsp. *kurstaki* is also under study (Bousfield *et al.*, 1987). Applications of baculoviruses against *C. occidentalis* do not appear sufficiently effective (Otvos *et al*., 1989). Natural enemies such as the parasitoids *Glypta fumiferanae*, *Apanteles fumiferanae* and *Phytodietus fumiferanae* can affect populations of *C. occidentalis* (Furniss & Carolin, 1977). Silvicultural methods, such as thinning and nitrogen fertilization, may have an influence on pest populations, though they do not appear as predominant environmental factors (Mason *et al*., 1992).

Phytosanitary risk

C. occidentalis was recently added to the A1 list of EPPO, but is not regarded as a quarantine pest by any other regional plant protection organization. This serious pest of forest trees presents a definite risk for northern and central European forests.

PHYTOSANITARY MEASURES

Prohibition of the import of plants and cut foliage of *Abies*, *Larix*, *Picea* and *Pseudotsuga* from infested countries, as recommended by EPPO (OEPP/EPPO, 1990) for other North American insect pests of conifers, is the appropriate measure to prevent introduction of *C. occidentalis*.

BIBLIOGRAPHY

Bousfield, W.; Cifala, F.; Kracht, R. (1987) Western spruce budworm control project on the Big Timber Ranger District, Gallatin National Forest, Montana. *Report Northern Region, USDA Forest Service*, No. 87-8, 5 pp.

Dennis, B.; Kemp, W.P.; Beckwith, R.C. (1986) Stochastic model of insect phenology: estimation and testing. *Environmental Entomology* **15**, 540-546.

Furniss, R.L.; Carolin, V.M. (1977) *Western forest insects*, pp. 168-173. Miscellaneous Publication No. 1339, USDA Forest Service, Washington, USA.

Kemp, W.P.; Dennis, B.; Beckwith, R.C. (1986) Stochastic phenology model for the western spruce budworm (Lepidoptera: Tortricidae). *Environmental Entomology* **15**, 547-554.

Mason, R.R.; Wickman, B.E.; Beckwith, R.C.; Paul, H.G. (1992) Thinning and nitrogen fertilization in a grand fir stand infested with western spruce budworm. Part I. Insect response. *Forest Science* **38**, 235-251.

OEPP/EPPO (1990) Specific quarantine requirements. *EPPO Technical Documents* No. 1008.

Otvos, I.S.; Cunningham, J.C.; Kaupp, W.P. (1989) Aerial application of two baculoviruses against the western spruce budworm *Choristoneura occidentalis* Freeman (Lepidoptera: Tortricidae) in British Columbia. *Canadian Entomologist* **121**, 209-217.