
Cone and Seed Insect Pest Leaflet No. 1

British Columbia Ministry of Forests and Range,
Tree Improvement Branch, Saanichton, BC



REDCEDAR CONE MIDGE *(Mayetiola thujae)*



Mayetiola thujae adult on redcedar foliage

(D. Manastyrski)

TAXONOMY:

Order: Diptera (true flies)

Family: Cecidomyiidae (gall and cone midges)

HOST: Western redcedar, *Thuja plicata*

DISTRIBUTION: Washington, Oregon, and British Columbia;
wherever western redcedar is found.

DAMAGE: Redcedar cone midge larvae feed on scales and seeds
throughout individual cones. Each larva is capable of destroying
more than one seed.



Mayetiola thujae cocoon containing developing pupa (D. Manastyrski)

IMPORTANCE: Redcedar cone midge is the most serious pest of
redcedar cone and seeds in BC and may destroy entire crops.
Mature infested cones are generally smaller than non-infested ones
and cone scale margins may split and turn brown.

Description

LIFE HISTORY: One generation per year.



Mayetiola thujae eggs on a redcedar conelet (D. Manastyrski)

EGG: Orange-red (vermilion) and cylindrical, about 0.8 mm long by 0.2 mm wide. Contrast with green colour of cones makes redcedar cone midge eggs relatively visible without magnification. Eggs are found on or between cone scales either singly or in groups numbering up to 45.



Mayetiola thujae eggs on redcedar cone scale (D. Manastyrski)

LARVA: Eggs hatch in April and developing larvae feed inside cones, each destroying more than one seed. Larvae are shiny orange, segmented maggots, about 3-4 mm long when fully grown. Larvae may be found anywhere within the cone tissue.



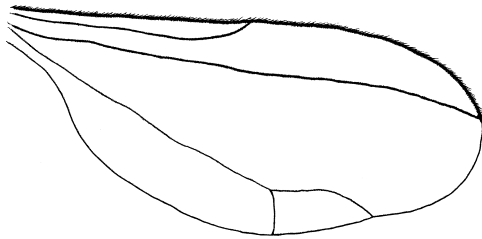
Mayetiola thujae larvae on exposed redcedar cone scale (D. Manastyrski)

PUPA: In late summer / early fall, each larva constructs a thin, white, papery cocoon within which it overwinters. Pupation occurs in the late winter. Pupae that are ready to emerge as adults become darker and some adult features can be seen under the pupal “skin”. Some pupae undergo extended diapause of a year or more.



Mature *Mayetiola thujae* pupa extracted from cocoon. Legs and other features of the adult midge are visible. (D. Manastyrski)

ADULT: Adults emerge from old cones in early spring (March) during redcedar pollination period. After mating, female midges lay eggs on pollen-receptive seed cones. Mosquito-like adults are about 3 mm long, dark grey, and have clear wings with a small number of distinct veins. Many midge species look like this and field identification of redcedar cone midges is difficult unless the adults are reared from redcedar seed cones, captured in traps baited with cone midge sex pheromone, or observed laying eggs on cone scales.



A typical cecidomyiid midge wing. Note that venation is reduced to a couple of strong veins near the leading edge of the wing and a single weaker vein (split near the end) near the back edge.

Detection and Monitoring

Redcedar cone midge populations should be monitored on an annual basis in seed orchards and controlled when necessary. Redcedar conelet surveys should be performed on a weekly basis from immediately after redcedar pollination is finished (March) until midge egg-laying is completed (late March to early April).



Searching for freshly laid *Mayetiola thujae* eggs on western redcedar cone scales. (D. Manastyrski)

Samples should consist of one conelet from each of a minimum of 50 trees. Examine each conelet and record the number of eggs found around and beneath scales. The orange coloured eggs are usually quite visible against the contrasting green cone tissue. A decision to control cone midge populations will depend in part upon the current value of a crop and the immediate need for seed

but generally, control may be warranted if more than 50% of conelets have at least 2-3 eggs each.

A population monitoring program using insect traps baited with redcedar cone midge sex pheromone is in development but is not yet available for operational usage.

Insect stages and monitoring calendar

Feb	Mar	Apr	May to January
Pupae present within cones	Adults emerge from cones	Egg laying	Larvae feed within conelets through late summer. Mature larvae overwinter in cocoons within cones.

Monitoring for *Mayetiola thujae*

Survey for freshly laid eggs on conelets	If warranted, apply foliar spray of systemic insecticides to control larvae
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Control

If populations are deemed unacceptably high, a foliar spray of systemic insecticides applied 1-2 weeks after 10% of the eggs have hatched (usually mid-April in British Columbia) will provide good control. Currently, dimethoate based products are the only insecticides registered in Canada for control of *Mayetiola thujae*.

Hand picking and destroying all non-crop cones have been recommended as a method for reducing redcedar cone midge populations. However, this is only likely to be an effective control measure in seed orchards grown in isolation from other western redcedar trees. Greenhouse, container-grown redcedar seed orchards tend to be unaffected by cone midges. A control option utilizing the redcedar cone midge sex pheromone may be available in the future.

Key References

- Gries, R., G. Khaskin, R.G. Bennett, A. Miroshnychenko, K. Burden, and G. Gries. 2005. (S, S)-2,12-, (S, S)-2,13- and (S, S)-2,14-diacetoxyheptadecanes: Sex pheromone components of redcedar cone midge, *Mayetiola thujae*. *Journal of Chemical Ecology* 31: 2933-2946.
- Gries, R. R.G. Bennett, G. Khaskin, and G. Gries. 2007. Attraction of male *Mayetiola thujae* (Diptera: Cecidomyiidae) to the sex pheromone of (2S, 12S)-, (2S, 13S)-, and (2S, 14S)-diacetoxyheptadecane is reduced in the presence of the SR- or RR-stereoisomers. *The Canadian Entomologist* 139: 685-689.
- Hedlin, A.F. 1974. Cone and seed insects of British Columbia. Canadian Forestry Service, Pacific Forestry Research Centre, Victoria, BC. BC-X-90. 63 pp.