Lobesia botrana, European Grapevine Moth

Recommendations for Sustainable Resistance Management

Insecticide Resistance Action Committee

www.irac-online.org

Lobesia botrana - Background

Lobesia (=Polychrosis) botrana **(Denis et Schiffermuller) (Lepidoptera: Tortricidae)** also known as the European grapevine moth (EGVM) is traditionally a major vineyard pest throughout Europe, the Middle East, North and West Africa, North and West Africa, Chile Argentina, US (eradicated 2016) and Southern Russia. *L. botrana* is a major cause of economic damage to grape for its direct damage to the berries and for providing entry sites to fungal infections.

Grape (*Vitis vinifera*) and spurge laurel (*Daphne gnidium*) are preferred hosts, but it has also been reported on blackberry (*Rubus fruticosus*), gooseberry (*Ribes* sp.), black and red currant (*Ribes nigurm*), olive (*Olea europaea*), cherry (*Prunus avium*), prune (*Prunus domestica*), persimmon (*Diospyrus kakis*), kiwi (*Actinidia chinensis*), pomegranate (*Punica granatum*), carnation (*Dianthus* spp.), and a number of other wild hosts.

Life Cycle

Lobesia botrana can have several generations per season, depending on local conditions such as climate, altitude or light intensity, from only two in the northern part of its range up to four around the Mediterranean, or (seldom) even five. Eggs (40-60 per female) are mostly laid singly, preferably in sun-protected places in inflorescences or in bunches of grapes, in the folds of dry leaves, under the bark or the straw mulch, or in cracks in support-stakes or under earth mounds. The larvae hatch after 4-15 days, and are initially very active, dispersing rapidly. Over a period of 3-4 weeks, they pass through five instars. In non-diapausing individuals (i.e. during the summer), the adult moth emerges 8-14 days after pupation. Towards the end of the season, mature larvae of the last generation leave the plant in search of a hibernation site, mostly under bark, in cracks of wooden support stakes or similar places. There, they build an especially strong cocoon that protects them during diapause and pupation. The first adults appear in the spring when the vines develop their first leaves. Two or three days after mating, oviposition begins.

Damage and Symptoms

In spring, the 1st generation *Lobesia botrana* larvae web and feed on the flower clusters whilst the subsequent generations bore and feed on berries.

Larval feeding can lead to desiccation of significant bunch portions and, under wet seasons, actively favors the establishment of fungal infections (*e.g. Botrytis* and other secondary *fungi*). Losses up to 40% in the harvest can occur as a result of direct damage to the fruit and subsequent fungal infections.

Key Management Strategy: Integration of Control Measures

The basis for effective and sustainable management of *Lobesia botrana* is the integration of effective pest management practices. Some examples are shown below:

Cultural
- Varietal susceptibility
- Fertilizing practice
- Quality spray equipment
- Harvest date

Biological and behavioural
- Preservation of predators and parasitoids
- Pheromone-baited traps
- Mating disruption technique
- Organic insecticides

Mechanical
- Removal of the bark and old leaves during winter

Chemical
- Adopt insecticides compatible with natural enemies
- Avoid exposing two subsequent generations to the same MoA
- Applications on risk thresholds, based on local advisory tools
- Prefer ovicidal timing to prevent larval penetrations

Insecticide Resistance Management

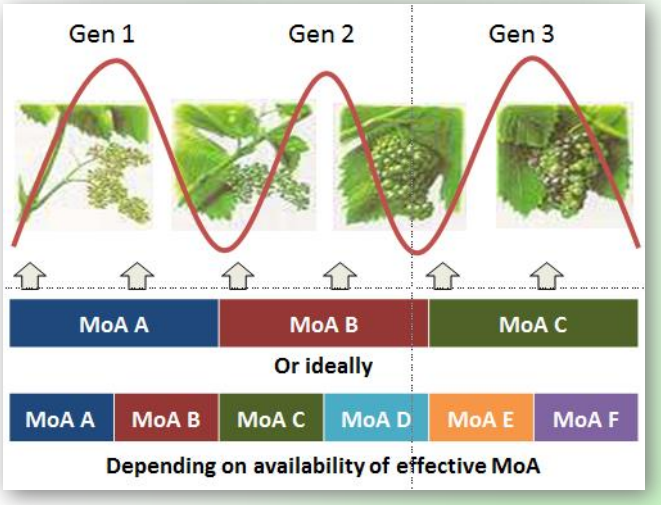
Control of *Lobesia botrana* may require multiple insecticide applications in one season. Foliar sprays are mostly targeted to the control of the 2nd generation in wine grapes, and the 2nd and 3rd generations in table grapes. Normally 1 to 3 applications are needed in wine grapes and up to 6 in late-maturing table grapes.

- Apply insecticides only when needed by monitoring insect pest pressure and using economic thresholds.

Safeguard predators and parasitoids and/or release natural enemies

The adoption of all applicable control measures (including mating disruption) together with MoA group alternation remains best IRM strategy, as it minimizes the selection pressure for resistance.

Insecticide Mode of Action (MoA) Window Approach



The basic rule for adequate rotation of insecticides by MoA is to avoid treating consecutive generations of the target pest with insecticides in the same MoA group, by using a scheme of " MoA treatment windows" in which every single *Lobesia botrana* generation is regarded as a "window" where an insecticide MoA could be applied once or twice. There are very few insecticide resistance reports for EGVM, including indoxacarb resistance in Italy and Turkey, and pyrethroid and spinosad resistance in EGVM populations from Greece, and recently from Turkey.

Note: For a comprehensive list of existing insecticides classified by MoA group visit the IRAC website (http://www.irac-online.org/teams/mode-of-action). In the "window rotation scheme", use as many effective MoA groups as locally registered/available and always follow product labels for specific directions of use.

Designed & produced by the IRAC Chewing Pests Working Group

June 2025, Poster Version 1.7 Photographs courtesy: DuPont Crop Protection
For further information visit the IRAC website: www.irac-online.org

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