

Mating disruption of *Lobesia botrana* (Lepidoptera: Tortricidae) in vineyards with very high population densities

Friedrich Louis and Karl-Josef Schirra

*Staatliche Lehr- und Forschungsanstalt für Landwirtschaft, Weinbau und Gartenbau,
Fachbereich Phytomedizin, 67435 Neustadt/Weinstraße, Germany*

Abstract: Two tortricids, *Lobesia botrana* and *Eupoecilia ambiguella*, are the most important insect pests in German viticulture. Both species are bivoltine and the second generation is the most damaging to grapes. In many German viticultural regions, populations of *Lobesia botrana* have been increasing over the past years, while *Eupoecilia ambiguella* populations have been decreasing. Today, both species can be controlled by mating disruption. Although the mating disruption technique can be used to effectively control *L. botrana* at low population densities, the technique is not as effective at high population densities. An evaluation of the potential for using a combination of insecticide and mating disruption to control *L. botrana* at high densities was begun in Neustadt/Weinstraße during 1999. The objective of the two-year project was to reduce *L. botrana* populations within the trial site to a level where mating disruption could be exclusively used for control. The results obtained in 1999 demonstrated that moth captures in pheromone-baited traps as well as larval densities were significantly reduced, compared to previous years. However, density was not reduced to a level where mating disruption could be used alone for control of the first generation of 2000. Therefore in 2000, a combined treatment of pheromone plus insecticides has to be repeated, in an attempt to reduce population densities to a lower level where mating disruption will perform effectively.

Keywords: sex pheromone, mating disruption, viticulture, *Lobesia botrana*, *Eupoecilia ambiguella*, Lepidoptera, Tortricidae

Introduction

In Germany, viticultural areas cover about 100.000 ha. The main pests are two tortricid species, *Lobesia botrana* Schiff. and *Eupoecilia ambiguella* Hbn. In many of the German vine growing areas a striking shift of the two species has been recorded: *L. botrana* populations increased while *E. ambiguella* populations have been decreasing over the past years. In some areas, for example the Palatinate, there are regions where now only *L. botrana* occurs. This species shows a greater flight activity and reproduction potential, with resultant greater injury to grape clusters than in the case of *E. ambiguella*.

In 1986, the mating disruption technique was officially registered for *E. ambiguella* in Germany. Mating disruption against this species was then used on up to 16.000 ha in some German states, also due to a financial support of the government. In 1994, mating disruption was registered for control of *L. botrana*. Mating disruption is currently used to control both *L. botrana* and *E. ambiguella* on about 4000 ha of German vineyards, where these species occur in sympatry.

Since 1996, the total area treated with pheromone for control of *E. ambiguella* and *L. botrana* has not increased above 20.000 ha, or 20% of the total German vineyard production area. One reason for the lack of increase in the use of this technology could be the high price of the pheromones and therefore the low acceptance of the vinegrowers. Another reason could be the fact that the mating disruption technique is not been efficient in some vineyards with high tortricid densities. Feldhege (1993) found that mating disruption to control *L. botrana* did not work successfully in vineyards with a moth density of more than 4000 females and males per ha.

In 1999, we initiated a two-year investigation to determine if mating disruption could be used in combination with insecticide to control large populations of *L. botrana* and reduce populations to levels where mating disruption alone could be used for control. An additional objective of our work was to demonstrate to grape growers that mating disruption could be used to control large populations of *L. botrana*.

Material and Methods

The 45-ha trial site (site 2) was situated next to the southeastern border of an area of about 60 ha of vineyards (site 1), which had been treated very successfully with pheromones against *L. botrana* since 1992. Between 1992 and 1998, site 2 was used as an untreated control plot for the 60-ha pheromone site and had an extremely high population of *L. botrana*. Average density of first-generation larvae was 50 - 100 individuals per 100 inflorescences. Especially the infestation of the second larval generation caused severe problems in the past: The density of second generation larvae was even greater with from 200 to more than 600 larvae per 100 clusters.

In April 1999, before the beginning of moth flight, the entire site 2 was treated with pheromone dispensers (RAK 1+2; (E)-9-dodecenylacetate and (E,Z)-7,9-dodecadienyl acetate) at the rate of 500 dispensers per ha. In addition, at site 2, the first and second generation of larvae was treated using conventional insecticides (e.g. *Bacillus thuringiensis*, Parathion-ethyl, Parathion-methyl). The efficacy of the pheromone treatment was evaluated by establishing nine control plots distributed at site 2, each consisting of 72 vines which were not treated with insecticide. A total of 9 pheromone traps, one in each control plot, was installed to monitor the flight activity of male moths. Three pheromone traps were deployed within control vineyards located about 2 km from site 2. A hailstorm in June damaged 100% of the crop in this control vineyard. Therefore, the untreated control plots had to be moved to other vineyards situated at the same distance. To compare the efficacy of the pheromone treatment in the trial site with the efficacy within the 60-ha pheromone-treatment, 3 pheromone traps were put into the 60-ha pheromone treatment to monitor the flight activity.

Results and Discussion

Monitoring the flight activity

An average of 2251 males/trap were captured during the first generation within the control plots. The pheromone treatment reduced trap capture in site 2 by about 94%, compared to trap capture in the control plots. At site 1, captures of *L. botrana* males were reduced to about 99%, compared to trap capture I

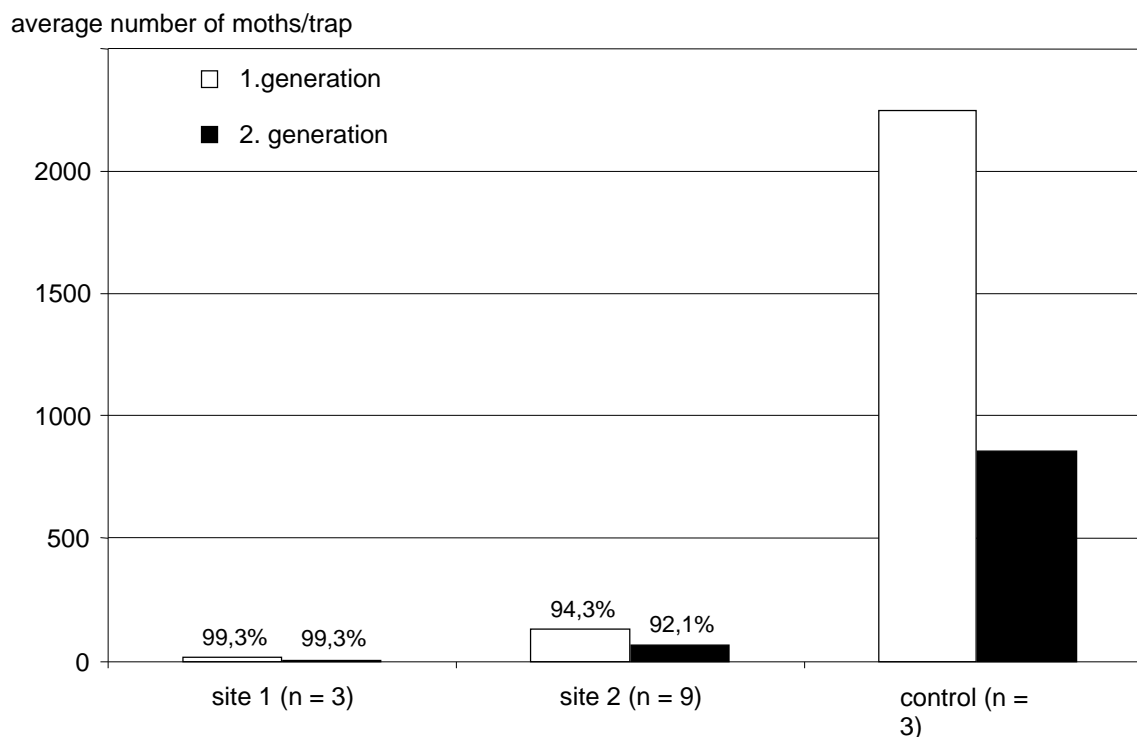


Figure 1. Effect of pheromone treatment on the capture of *Lobesia botrana* males in pheromone traps (Neustadt/Weinstraße, 1999). Reduction of captures compared to control is shown above columns.

The flight activity of the second generation within the new control plots reached an average of 863 male moths/trap. Trap captures were 99% in site 1 and 92% in site 2 when captures were compared to those in the new control plots (Figure 1).

Compared to pheromone treatments in previous years, the larval infestation of the second generation in site 1 was very high (Figure 2). The pheromone treatment reduced larval density by 96% in site 1 and by 39% in site 2. The negative results in site 1 were probably induced by the weather situations mentioned above. The results of mating disruption obtained in the “high density area” of site 2 were not satisfying as well, because the damage threshold for the second generation should not be exceeded 5 to 10%. In comparison to the results of the years before in 1999, a significant reduction could be noticed in site 2, even if the population pressure in general was high (Figure 3).

The investigations in 1999 have demonstrated that in 2000 another combined use of pheromone technique and insecticide applications must be applied at least for the first generation of *L. botrana*. Evaluations of the first generation will show if there are the conditions for exclusive use of the mating disruption against the second generation of *L. botrana*.

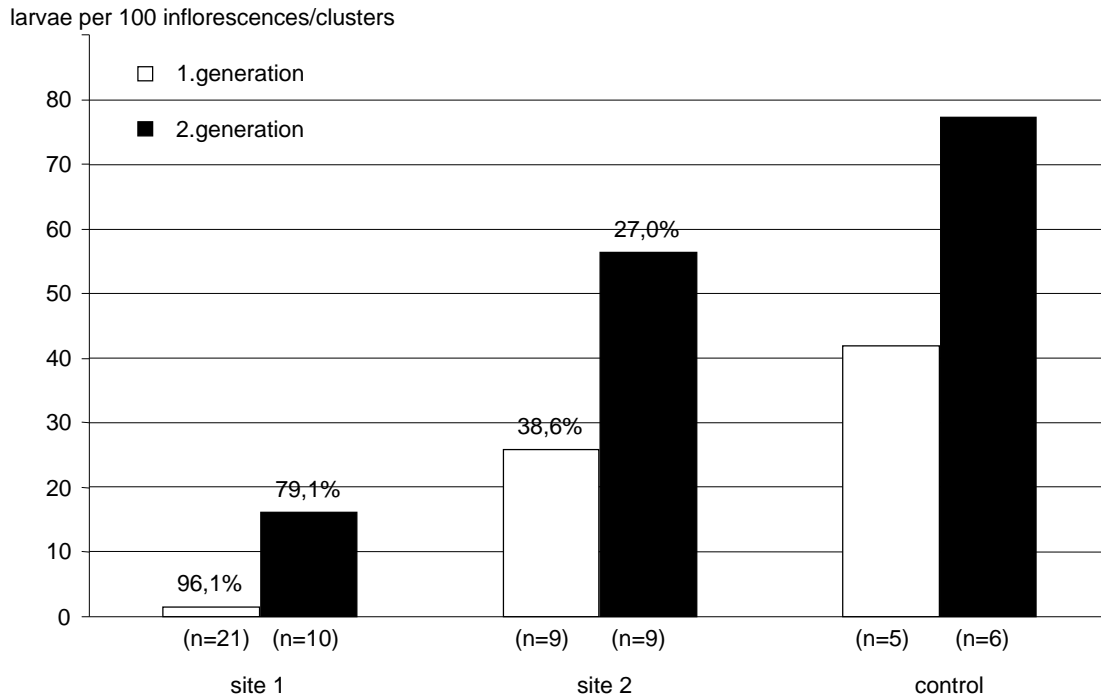


Figure 2. Mating disruption against *Lobesia botrana*. Evaluation of the larval infestation (Neustadt/Weinstraße, 1999). Reduction of larval infestation compared to control is shown above columns.

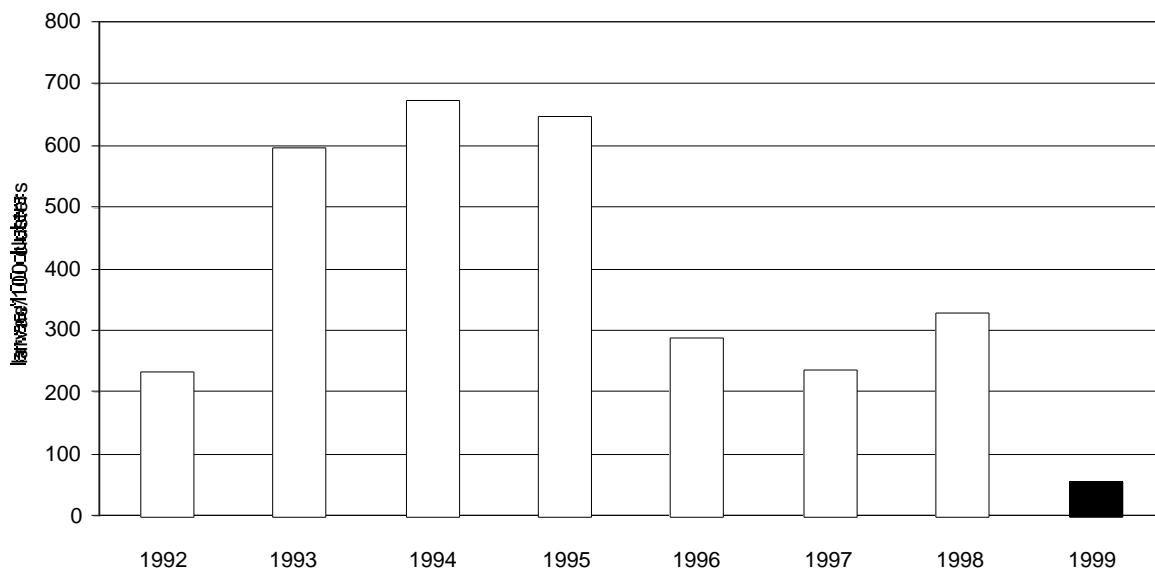


Figure 3. *Lobesia botrana* infestation rates (second generation) in site 2, untreated control plots 1992 to 1998, and first use of pheromone 1999 (RAK 1+2, black column)

Acknowledgements

Investigations were made possible by financial support of the Ministry of Economy, Traffic, Agriculture and Viticulture Rheinland-Pfalz, Mainz, Germany and the BASF AG, Germany providing us with the pheromone dispensers. Special thanks go to the vinegrowers for their cooperation.

References

- Feldhege, M.; Eichhorn, K.W. & Louis, F. 1993: Mating disruption of the European Grapevine moth *Lobesia botrana* Schiff. (Lepidoptera: Tortricidae): Investigations on the temporal and spatial distribution of populations. IOBC wprs Bulletin 16(10): 90-92
- Feldhege, M.; Louis, F. & Schmutterer, H. 1995: Untersuchungen über Falterabundanz des Bekreuzten Traubenwicklers *Lobesia botrana* Schiff. im Weinbau. Anz. Schädlingskde. Pflanzenschutz, Umweltschutz 68: 85-91