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Trapping *Lobesia botrana* females with apple juice: a valuable tool to predict oviposition ?

Denis Thiéry [1], Patrice Rétaud [2], Lionel Dumas-Lattaque [3], Romaric Féru [1], Anne Xuéreb [1], Francis Bourriau [4]

[1] *UMR INRA ENITAB Santé Végétale, BP 81, 33883 Villenave d'Ornon Cedex, France;*
[2] *Service de protection des végétaux, Cognac, France;* [3] *Chambre d'Agriculture de Charente maritime, Saint Jean d'Angely , France;* [4] *Cooperative Agricole, Ile de Ré, France.*

Abstract: We evaluate through a cooperative work between INRA (Bordeaux), Plant protection service (Cognac), 'Chambre d'Agriculture' (Saint Jean d'Angely) and the vinegrowers cooperative of the Ré Island, the efficiency of trapping *Lobesia botrana* females. The objective is to gain accuracy in the prediction of the oviposition dates and the level of damages. Our results indicate that food traps containing apple juice are efficient in order to trap adults *L. botrana.* We could describe quite efficiently the dynamics of the 2nd flight and first captures of females which occurred in the 2 vineyards surveyed few days before the first eggs observed. Food traps may represent a valuable tool in order to predict the onset of oviposition occurrence. The validity of this method is studied and discussed.

Key words: *Lobesia botrana*, European grapevine moth, Food traps, attraction, olfaction, oviposition, population dynamics.

Introduction

Oviposition and thus damage by the European grapevine moth *Lobesia botrana* are often difficult to predict. Most of the methods of control present an optimal efficiency when applied before oviposition or before the black head stage of the egg. Thus, predicting the oviposition dates is of primary importance against this pest. The technique of sexual trapping is currently used for this purpose but in several vineyards this technique lacked accuracy in predicting the dates of oviposition. In this respect many vinegrowers expect complementary tools to improve these predictions. The objective of that research project is to gain accuracy in the prediction of the oviposition dates and the level of damage. For this purpose, we improved the ancient technique of food trap which has been early described by Marchal (1912) and Feytaud (1913), and extensively used in the Bordeaux vineyards during the beginning of the 20th century.

L. botrana is a well known pest of European vineyards. This species has a polyphagous larva which can accept very different plants than grapes to develop (Balachowsky & Mesnil, 1935; Maher, 2002; Stoeva, 1982; Roditakis & Roditakis, 2003; Thiéry, 2005; Thiéry & Moreau 2005). On grapes, females almost exclusively oviposit on fructiferous organs at any of their development stages and *L. botrana* can accomplish several reproductive cycles (called generations) according to the latitude in the year. In our study area usually 2 or 3 generation occur.

The principle of this trapping technique is based on the hypothesis that baits producing a contrasting signal in the agrosystem could represent efficient tools to capture female pests. Also we hypothesize that moth female may search for food sources before mating or ovipositing, and

that such a behaviour may lead to the development of trapping techniques. Therefore we used the juice of apple (a non host plant) to attract females. We present here our first results using the technique of food trap.

Material and methods

Study design and trapping procedure

Pots made for tapping pine tree resin were used for this study. Each trap was filled with 400 ml of concentrated apple juice (apple must purchased by a Cider producer) diluted 20% in water. One ml of wetting agent was added to each trap in order to improve the sticky effect of the liquid. The traps were arranged as shown in figure 1 and located in vineyards which received no insecticide application during the 1st and 2nd generation. Traps were surveyed every 2 days all along the 2nd generation of *L. botrana*. Two experimental vineyards were surveyed during the 2nd generation of *L. botrana*. The Ste Marie en Ré (Ré Island) is planted with Chardonnay and the Ste Foy de Pérignac (close to Cognac) is planted with Ugni blanc. Ovipositions were visually checked on 20 bunches checked around each trap (total = 100 bunches).

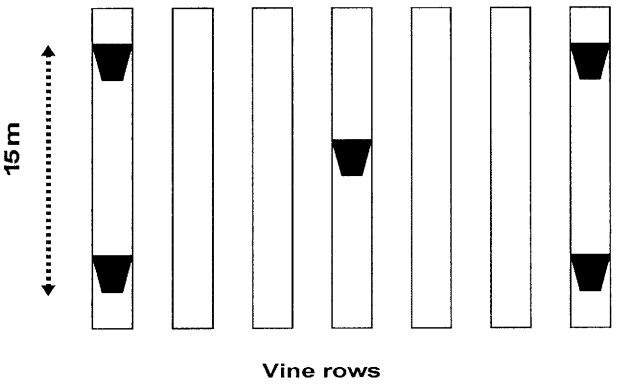


Figure 1. Spatial arrangement of the food traps (in black) in the experimental plots.

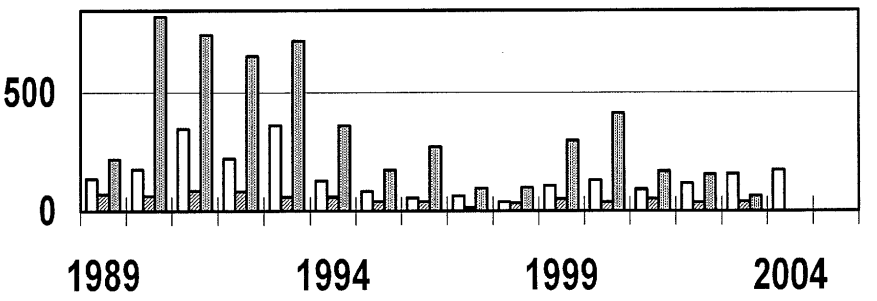


Figure 2. Average number of individuals *L. botrana* captured per trap and per year over the Cognac vineyard area. White = pheromone traps 1st generation, White striped = pheromone traps 2nd generation, grey bars = food trap with apple juice 2nd generation (males and females together).

Results and discussion

1- Use of the food trap during successive years

A network of food traps was used during 15 years by the french plant protection services (Service de protection des végétaux de Cognac, P. Rétaud and Chambre d'Agriculture de Saintes, L. Dumas Lattaque) in order to monitor the population dynamics of *L. botrana* (Figure 2). Data from Figure 2 illustrate that in 2nd generation the number of individuals caught in food traps is always higher than in the pheromone traps. Food traps reveals itself an excellent complementary tool to the pheromone traps, especially in 2nd generation and in vineyards where the pheromone trap monitoring is unsatisfactory. A fairly high proportion of this network is controlled by the vinegrowers themselves.

2- Trap efficiency.

A first comparison of the 5 traps in each experimental set up revealed rather homogeneous rates of capture, each trap collecting from 12 to 31 % of the cohort of adults captured in total by the 5 traps network (Figure 3). The captures were less homogeneous in Ste Marie en Ré, this being explained by the fact that 2 traps (P4 & P5) were less exposed to wind. Because females can oviposit close to the traps before being caught, we scored In Ste Foy de Pérignac the numbers of eggs on bunches located around each trap (total = 25 eggs / 100 bunches) and compared them to numbers scored on bunches located 50m away (35 eggs / 100 bunches) (No significant difference, Chi^2). Therefore no concentration effect was found in this study area.

No *Eupoecilia ambiguella* were collected in the traps even if it was noticed in St Foy de Pérignac. This observation is rather classical and match earlier ones which mention that food traps filled with apple juice attract only few *E. ambiguella.*

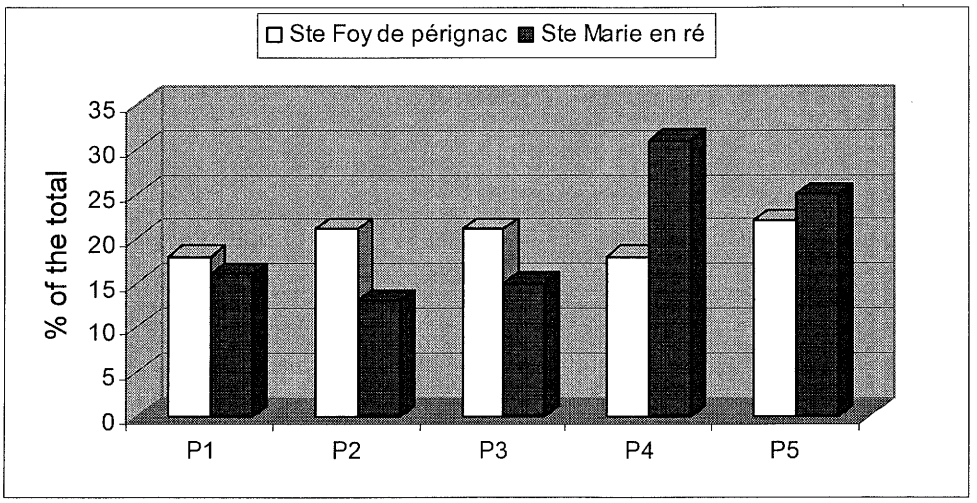
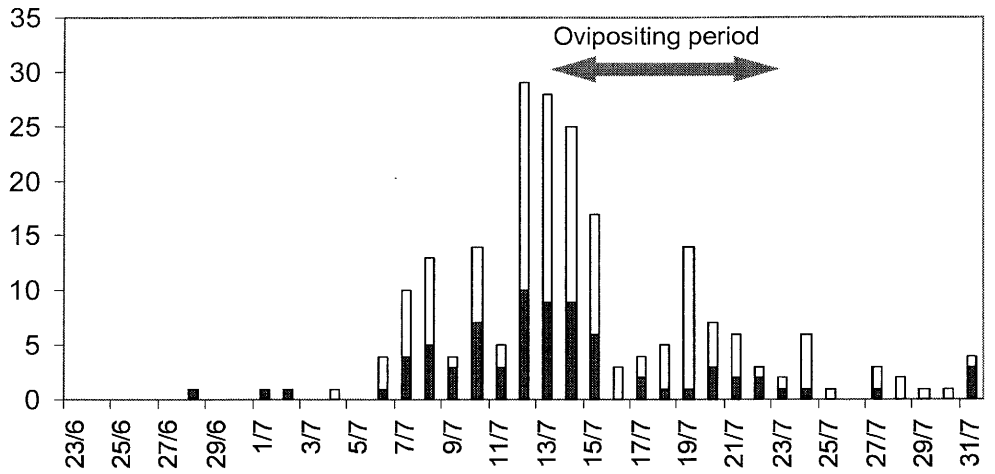


Figure 3. Relative proportion of the total number of *L. botrana* captured over the 2nd generation in our 2 experimental vineyards in each of the 5 traps arranged as shown in figure 1

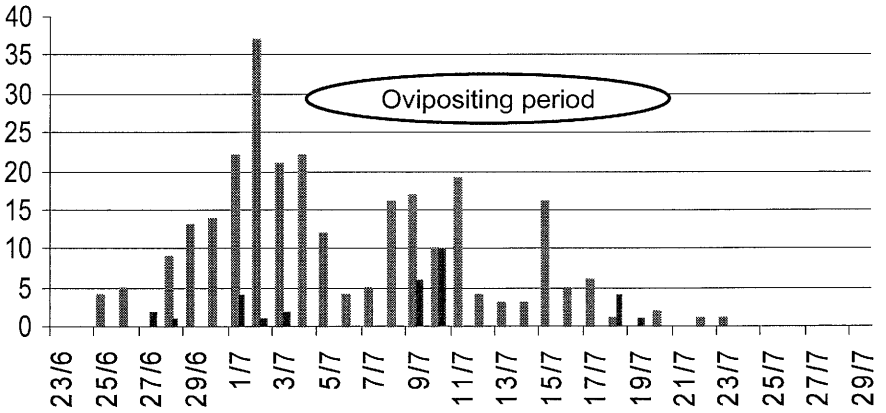
3- Proportion of females and males collected in the traps.

A majority of females was always observed in the traps. In Ste Foy de Pérignac, 66% of the adults collected were females (Figure 4) and 60% in Ste Marie en Ré (Figure 5). These ratios



are in agreement with previous observation and with ancient literature (Marchal, 1912; Feytaud, 1913).

Figure 4. Dynamics of captures in St Foy de Pérignac and oviposition period (grey arrows).



Values are numbers of individuals per 5 traps (white bars = females and black bars = males).

Figure 5. Dynamics of captures in St Marié en Ré and oviposition period figured by the elips. Values in grey are numbers of individuals (both sexes). Black bars indicate the dynamic of the pheromone trap placed on the experimental plot.

4- Trap dynamics and oviposition periods.

In Ste Marie en Ré, we observed the first captures of females on the 25th of June, while the first male capture in the sexual trap occurred 4 days latter (Figure 5). Peak of female captures occurred on the 1st of July, while no peak of male capture could be identified at this date which illustrates the failure of the sexual trapping in this location. First eggs were observed the 4th -5th of July (no egg found on the previous monitoring on the 1st of July). Therefore a

delay of at least 7 days occurred between the first captured female EGVM and the first eggs observed on the yard.

An identical delay was observed in Ste Foy de Pérignac, the first female being captured on the 4th of July when the first eggs were observed on the 14-15th of July (Figure 4).

5- Attempt to relate the number of individuals captured and the damage.

In Ste Marie en Ré in total 274 adults (164 females) were captured over the 2nd generation. 160 bunches were harvested with 93 larvae in total (.58 larvae/ bunch).

In Ste Foy de Pérignac, 162 females were captured over the 2nd generation. 31 eggs were observed on 100 sampled bunches, leading to 2 larvae. This is explained by an almost 100% mortality which occurred at hatching, this mortality being attributed to the hot and very dry climatic conditions recorded during the first 2 weeks of July.

	Ste Foy de Pérignac	Ste Marie en Ré
Ratio	0.033	0.913

Table 1. Number of *L. botrana* larvae found on 100 bunches per female captured in the food traps.

Table 1 reports a number of larvae per 100 bunches and per female captured. Such an index was very different in the 2 locations. We believe that mortality in Ste Foy de Pérignac can explain such a difference. This result limited to only 2 locations illustrates that the relation capture/damage is always problematic in *L. botrana* , which is also the case in *E. ambiguella.*

Conclusion

We conclude that food traps may represent efficient tools to survey the population dynamics of *L. botrana* and that it allows for predicting the first eggs laid by this pest with a fair delay of time between the first female captured and the first egg observed (around a large week) which is compatible with the control strategies currently used. The fact that unmated females were efficiently captured, reinforces the potential of this surveying tool. It was believed that only old females were attracted by food traps, and previous studies have showed that mated *L. botrana* females are more attracted to plant odours than unmated ones (Hurtrel & Thiéry, 1999). However our recent data indicates that unmated young females are we also attracted by the food traps (Our unpublished data). We conducted larger surveys based on this technique in 2004 and 2005 and results (not presented here) are globally in agreement with the present findings.

Acknowledgements

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References

Balachowsky, A. & Mesnil, L. 1935: Insectes nuisibles à la vigne. *Polychrosis botrana* Schiff. (Lep. Tortricidae). – In: Les insectes nuisibles aux plantes cultivées, leur mœurs, leur destruction: 677-686.

Feytaud, J. 1913: Cochylis et Eudémis, procédés de capture des papillons. – Bull. Soc. Etude vulg. Zool. Agric. Bordeaux: 33-41.

Hurtrel, B. & Thiéry, D. 1999: Modulation of flight activity in *Lobesia botrana* Den. & Schiff. (Lepidoptera Tortricidae) females studied in a wind tunnel. – J. Ins. Behave. 12: 199-211.

Maher, N. 2002: Sélection du site de ponte chez *Lobesia botrana* (Lepidoptera: Tortricidae): influence de l'information chimique non-volatile présente sur les fruits de plantes hôtes. – Thèse Doctorat en Sciences Biologiques et Médicales option Œnologie n° 968. Université de Bordeaux 2.

Marchal, P. 1912: Rapports sur les travaux accomplis par la mission d'étude de la cochylis et de l'eudémis pendant l'année 1911. – Librairie Polytechnique.

Roditakis, N.E. & Roditakis, N. 2003: Host plants of grape berry moth *Lobesia botrana* Den. & Schiff. (Lepidoptera: Tortricidae) in Crete. – Abstracts of IOBC/WPRS Working Group 'Integrated protection and production in viticulture'. Volos, Greece, March 2003 Abstract: 59.

Stoeva, R. 1982: Food-plants of the grape moth (*Lobesia botrana* Schiff.) in Bulgaria. – [Bulgarian]. Gradin. Lozar. Nauka 19: 83-90.

Thiéry, D. & Moreau, J. 2005: Relative performance of European grapevine moth (*Lobesia botrana*) on grapes and other hosts. – Oecologia 143: 548-557.

Thiéry, D. 2005: Vers de la grappe, les connaître pour s'en protéger. – Vigne et vin Intl. Publ., Bordeaux, France.