Monitoring and control of the olive moth *Prays oleae* in the prefecture of Evros

Stefanos S. Andreadis, Dimitrios G. Raptis, Grigoris A. Konstantinou and Matilda Savopoulou-Soultani

Abstract: The aim of the present study was to determine the optimum time for spraying against the olive moth, *Prays oleae*, in olive orchards in the prefecture of Evros. This involved placing of pheromone traps as well as sampling in commercial olive orchards. Data collected by captures in pheromone traps as well as sampling revealed that the population of the olive moth decreased gradually over time. More specifically, the population of the olive moth declined after the first spraying, which reached up to 66% of the original population of the first generation. Population continued to decline in the next generation in conjunction with the second spraying against the second generation.

Keywords: *Prays oleae*, pheromone trap, captures, monitoring, control

Introduction

Prays oleae (Bernard) Lesne (Lepidoptera: Yponomeutidae) is an important pest of olives in all the olive-growing countries of the Mediterranean basin, the Black Sea, the Middle East, and the Canary Islands [1]. *P. oleae* develops three generations per year. Each one is associated during the larval stage to different parts of the host. The first generation (leaf generation) occurs in April, and the females lay eggs on the calyx and less often on the corolla of the closed flowers. The newly hatched larvae live and feed within the buds and at a later stage of their development, on the flowers. The second generation (flower generation), emerges in early June, and it is the most destructive generation. Females of the second generation oviposit on the small fruit close to the stem, and the hatched larvae bore into the endosperm of the olive fruit and devour it. Larvae of this generation cause a spectacular fruit drop, at the early fruit stage in July when the first instars bore into the small fruits or late in September, when the fully grown larvae exit the fruits to pupate in the soil. The emerged adults of the third generation (fruit generation) oviposit on the olive leaves and the newly hatched larvae produce mines inside the olive leaves in autumn, hibernate as larvae, and complete their development early in the next spring [5] [8].

In this study pheromone trap catch data along with sampling methods are used to determine the optimum time for spraying against *P. oleae*.

Materials and methods

Field trials were conducted from late March to late October in 2010 in six commercial olive orchards located in the prefecture of Evros, Thrace, in northern Greece (Table 1). Wing traps (Pherocon 1C, Trécé, Adair, OK) baited with synthetic sex pheromone (*Z*)-7-tetradecenal [(Z)-7-14:Ald], were placed in olive trees to monitor the flight activity of male *P. oleae*. Traps included white sticky bottoms. The total area of the sticky surface of the adhesive traps was 401cm^2. On each trap, one pheromone dispenser loaded with 1 mg of [(Z)-7П14:Ald] was placed at the center of the sticky surface at the internal bottom (Fig. 1). Sticky bottoms were changed as needed, and lures were changed at least every 4 weeks. All traps were placed on the external part of the tree canopy at a height of 1-1.5-m from the ground, in a completely randomized block arrangement. All traps were installed on 25 March 2010. The date of trap installation corresponded to the start of the male moth flight, which occurred in mid-April. Male catches were calculated for each olive grove, defined as the number of moths per trap on each sampling date.

Results and Discussion

As seen in Fig. 2, males of the leaf generation were captured from mid April to mid

May, while the flower generation flight was observed in late May–mid July. Similarly, Tzanakakis [10] reported that adults of the leaf generation flight appeared, depending on the region and year, in late March or April–May, when the inflorescences of the olive tree

Table 1. Location of pheromone traps for monitoring the population of *Prays oleae* in the Prefecture of Evros.

Trap	Location	Latitude	Longitude	Altitude (m)
1	Dikella	40°51'52.14''N	25°41'44.41''E	38
2	Dikella – Olive press	40°51'43.66''N	25°41'56.79''E	32
3	Makri - «St George»	40°51'23.66''N	25°45'15.32''E	57
4	Olive press «Cyclops»	40°51'35.01''N	25°45'52.01''E	50
5	University hospital	40°52'16.02''N	25°48'09.25''E	91
6	Avas	40°54'01.60''N	25°53'52.33''E	42

are at a certain stage of development, well before bloom, while adults of the flower generation appeared from May to July, but in most regions during June, when the young fruits were formed. Moreover, males of the fruit generation emerged at early September, fluctuating until late October; the male emergence generally occurred when the olives were at harvest size (Fig. 2). According to Arambourg and Pralavorio [2], the adults of fruit generation emerge mostly in September–October and in some groves until late November, and lay the eggs of the leaf generation. Larval stage of the fruit generation lasted longer than that of leaf and flower generation, which is in agreement with previous work [6].

Fig. 1. Pheromone dispenser placed at the center of the sticky surface at the internal bottom of a wing trap.

Determination of the time for spraying was based on the captures of the males of the olive moth in the traps. In total 2 spraying dates were determined. The first one was defined approximately 10 days after the first pick of the population density of *P. oleae* that we observed, which corresponds from 18-20 May 2010 according to the area. Spraying, as shown in Fig. 2, was in conjunction with an abrupt decrease of the density of the males of the flower generation from 36-66%. Similarly, a second spraying date was defined for the second generation too. Depending on the microclimate of each area spraying was decided to be applied from 22-26 May 2010. Once again, population densities continued to drop. However, this time decrease of the population density of the moths of the fruit generation was less obvious compared to the previous application.

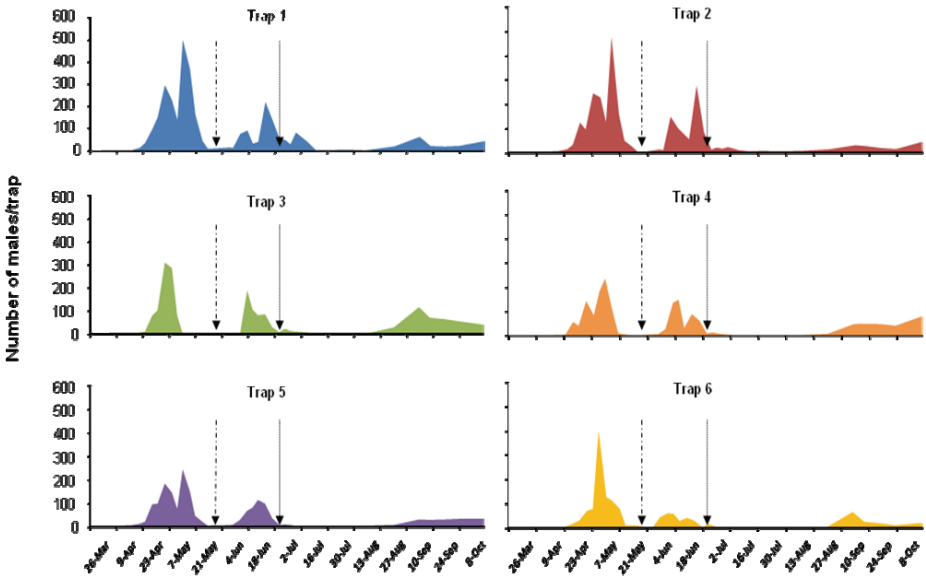

Fig. 2. Mean number of *P. oleae* males captured in each trap during 2010. Dotted line indicates date of first spraying and solid line date of second spraying.

Thus, we conclude that pheromone-based monitoring system developed for the control of *P. oleae,* would help growers, trap inspectors, and managers to obtain more accurate data. Especially in areas where olive tree cultivation is dominant, as in the under study area, such data would encourage control of this pest. However, further experiments are needed to be done in order to develop a day-degree model for control decisions and thus to achieve an even better timing of spraying against *P. oleae*. It is known that together with the method of temperature summation, trap samples are important components of phenological models [4]. Such models are used to predict developmental events of insects and other poikilothermic organisms [3] [7] [9].

References

[1] Arambourg, Y. 1966. La teigne de l'olivier. *In:* Balachowsky, A.S. (ed.), Entomologie applique´e a` lY agriculture, tome 2, vol 2. Masson et Cie, Paris, France, pp. 181-193.

[2] Arambourg, Y. and R. Pralavorio. 1986. Hyponomeutidae. *In:* Arambourg, Y. (ed.), Traité d'Entomologie Oléicole, Conseil Oléicole International, Madrid, Spain, pp. 47–70.

[3] Damos, P.T. and M. Savopoulou-Soultani. 2010. Development and statistical evaluation of models in forecasting moth phenology of major lepidopterous peach pest complex for Integrated Pest Management programs. Crop. Prot. 29: 1190-1199.
[4] Higley, L.G., L.P. Pedigo and K.R. Ostlie. 1986. DEGDAY: a program for calculating degree-days and assumptions behind the degree-day approach. Environ. Entomol. 15: 999–1016.
[5] Kavallieratos, N.G., C.G. Athanassiou, G.N. Balotis, G.Th. Tatsi and B.E. Mazomenos. 2005. Factors Affecting Male *Prays oleae* (Lepidoptera: Yponomeutidae) Captures in Pheromone-Baited Traps in Olive Orchards. J. Econ. Entomol. 98: 1499–1505.
[6] Kumral, N.A., B. Kovanci and B. Akbudak. 2005. Pheromone trap catches of the olive moth, *Prays oleae* (Bern.) (Lep., Plutellidae) in relation to olive phenology and degree-day models. J. Appl. Entomol. 129: 375:381.
[7] Milonas, P.G., M. Savopoulou-Soultani and D.G. Stavridis. 2001. Day-degree models for predicting the generation time and flight activity of local populations of *Lobesia botrana* (Den. & Schiff. (Lep., Tortricidae) in Greece. J. Appl.Ent. 125: 515-518.
[8] Pelekassis, C.E. 1962. A contribution to the study of nomenclature, taxonomy, biology and natural parasitization of the olive kernel borer *Prays oleae* (Bernard) Lesne (Lepidoptera: Yponomeutidae). Ann. Inst. Phytopathol. Benaki N.S. 4: 180–308.
[9] Riedl, H., B.A. Croft and A.J. Howitt. 1976. Forecasting codling moth phenology based on pheromone trap catches and physiological time models. Can. Entomol. 108: 449–460.
[10] Tzanakakis, M.E. 2003. Seasonal development and dormancy of insects and mites feeding on olive: a review. Netherlands J. Zool. 52: 87–224.

Contact address:

Dr. Stefanos S. Andreadis, Laboratory of Applied Zoology and Parasitology, Department of Plant Protection, Faculty of Agriculture, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece, email: stefandr@agro.auth.gr

Dr. Dimitrios G. Raptis, Region of East Macedonia Thrace, 68100 Alexandroupoli, Greece, email: bioampelos@gmail.com

Grigoris A. Konstantinou, Msc, Hellenic Agricultural Insurances, Department of Alexandroupoli, 68100 Alexandroupoli, Greece, gregkn73@yahoo.gr

Prof. Matilda Savopoulou-Soultani, Laboratory of Applied Zoology and Parasitology, Department of Plant Protection, Faculty of Agriculture, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece, email: matilda@agro.auth.gr, tel: 00302310998853

Corresponding author: Prof. M. Savopoulou-Soultani

The paper is reviewed.