Аграрен университет – Пловдив, Научни трудове, т. LXI, кн. 1, 2018 г.
Втора студентска научна конференция
Agricultural University – Plovdiv, Scientific Works, vol. LXI, issue 1, 2018
Second Students' Scientific Session

DOI: 10.22620/sciworks.2018.01.009

СЕЗОНЕН МОНИТОРИНГ НА ЛОЗОВАТА ПЪСТРЯНКА *THERESIMIMA AMPELLOPHAGA* (BAYLE-BARELLE, 1808) С ФЕРОМОНОВИ УЛОВКИ В РАЙОНА НА КЪРДЖАЛИ

SEASONAL MONITORING OF THE VINE BUD MOTH *THERESIMIMA AMPELLOPHAGA* (BAYLE-BARELLE, 1808) BY PHEROMONE TRAPS IN THE REGION OF KARDZHALI

Нурджан Мюмюн[1], Даниела Атанасова[1]*, Теодора Тошова[2]
Nurdzhan Mumun[1], Daniela Atanasova[1]*, Teodora Toshova[2]

[1]Аграрен университет – Пловдив
[2]Институт по биоразнообразие и екосистемни изследвания,
Българска академия на науките – София

[1]Agricultural University – Plovdiv
[2]Institute of Biodiversity and Ecosystem Research,
Bulgarian Academy of Sciences – Sofia

***E-mail: daniat88@abv.bg**

Abstract

The vine bud moth, *Theresimima ampellophaga* (Bayle-Barelle, 1808) is a pest on a grapevine, that can cause serious damage in vineyards in some regions in Bulgaria.

Delta sticky traps baited with the main synthetic sex pheromone compound, (2*R*)-butyl (7*Z*)-tetradecenoate, of *Th. ampellophaga* females were used for detection and seasonal monitoring of this species in vineyards in the region of Kardzhali (southern Bulgaria).

During the period of 2017–2018, two generations of this species were recorded in the region of Kardzhali. The flight period of the moths of the first generation was from the middle of June to the middle of July with a peak of flight in the second half of June.

The moths of the second generation occur from the middle of August until the first half of September. This is a new distributional record for this species in Bulgaria.

Keywords: *Theresimima ampellophaga*, vine bud moth, pheromone traps.

INTRODUCTION

The vine bud moth, *Theresimima ampellophaga* (Bayle-Barelle, 1808) (Lepidoptera: Zygaenidae; Procridinae), is a pest on the grapevine, *Vitis vinifera* (L.), and on the ornamental vine *Parthenocissus* spp. (Vitaceae). The pest is distributed in south eastern France, Italy, Vatican, Slovenia, Hungary, Croatia, Serbia, Albania, Macedonia, Romania, Moldova, Bulgaria, Greece (including islands), Cyprus, Ukraine (region of Odessa), South Russia, Georgia, Azerbaijan, Turkey, Cyprus, Syria, Lebanon, Israel and Algeria (Tarmann, 1998; 2003).

The species is well known in Bulgaria as a pest of the grapevine since 1905-1910 (Dospevski, 1910). In this country, different economic thresholds have been determined depending on type of grape (table or wine) and the stage of development of the buds: 1) for table grape varieties: before the stage of bud burst – one larva per two vines; after bud burst – one larva per vine and 2) for wine grape varieties: before the stage of bud burst – one larva per vine; after bud burst – two larvae per vine. Chemical control is recommended only after the population the pest has reached the economic threshold (Harizanov et al., 2006).

Pheromone trap catches can serve as an indicator of adult moth activity. Subchev et al. (1998) identified the main sex pheromone component of the female vine bud moth as (2*R*)-butyl (7*Z*)-tetradecenoate. Later, the synthetic sex pheromone was used for detection and monitoring of the seasonal flight of this species in several European countries and in Asiatic part of Turkey (reviewed in Subchev, 2014; Razov et al., 2017; Vrenozi et al., 2018). Attraction of conspecific males to other substances has been also documented: the opposite enantiomer of the main pheromone compound, (2*S*)-butyl (7*Z*)-tetradecenoate, 2-butyl 2-dodecenoate and (2*R*)-butyl 2-dodecenoate (Efetov et al., 2010; 2014; Can Cengiz et al., 2018; Micevski et al., 2018; Vrenozi et al., 2018).

The aim of the current study was to establish the presence and to monitor the seasonal flight of *Th. ampellophaga* in the region of Kardzhali (southern Bulgaria) by pheromone-baited traps.

MATERIALS AND METHODS

To prepare the lures, the synthetic pheromone, (2*R*)-butyl (7*Z*)-tetradecenoate, was applied onto serum bottle caps of grey rubber as a hexane solution in a dose of 100 µg. Pheromone caps were wrapped singly in aluminum foil. They were prepared in May, 1997 at Institute of Zoology, Bulgarian Academy of Sciences, Sofia and stored in a refrigerator at Agricultural University, Plovdiv until use. The pheromone trap was set up in a private vineyard (0.6 ha) in Shiroko pole village (41°37’44.11’’ N; 25°28’00.69’’ E), near the town of Kardzhali with table grape varieties Velika, Paliery, Brestovitza and Black pearl. Sticky Delta trap of transparent PVC foil was used for field investigations (Fig. 1).

Pheromone trap was installed before the start of the expected flight season and kept in the field until the beginning of October. The trap was inspected once per week and the sticky layer with insects caught were collected and replaced with clear ones. During the monitoring periods, lure was replaced with fresh one at 6–8 weeks.

Fig. 1. *Pheromone-baited trap of Th. ampellophaga*

RESULTS AND DISCUSSION

In the current study, the presence of *Th. ampellophaga* was newly recorded in Shiroko pole village by pheromone traps (Fig. 2).

Fig. 2. *Catches of Th. ampellophaga males in pheromone-baited trap in Shiroko pole village in 2017*

There are numerous records about the distribution of *Th. ampellophaga* in Bulgaria and a map summarizing the localities of this species was presented by Toshova et al. (2017). The closest localities with published records for this species are Dolno Cherkovishte (Haskovo region), above Dishlik-Dere Valley below Oreshari village (Kardzhali region) and near Mazdarovo (Haskovo region) (Beshkov and Langourov 2004; Nahirnić, personal communication).

The patterns of the seasonal flight of this species in 2017 and 2018 are presented on Fig. 3.

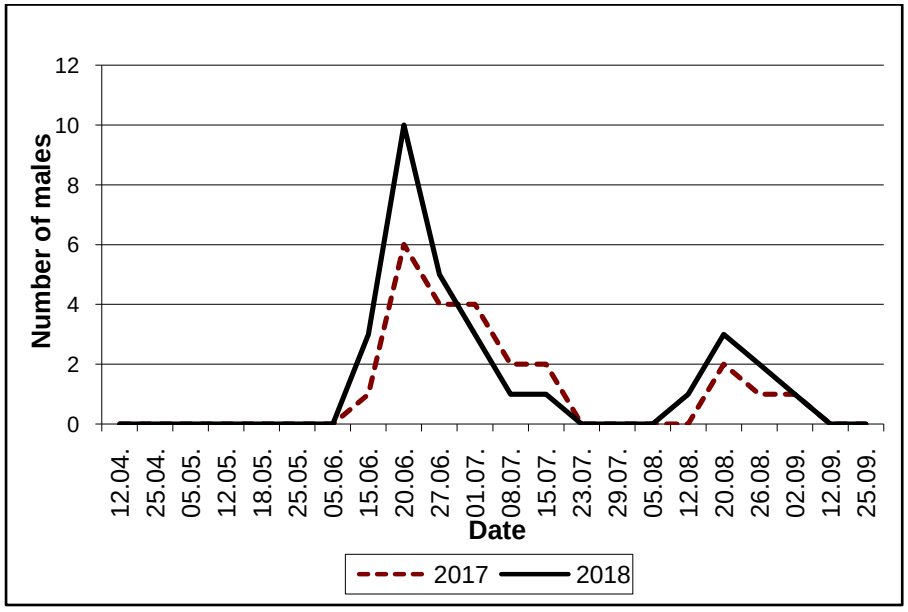

Fig. 3. *Seasonal flight patterns of Th. ampellophaga males in pheromone-baited traps in Shiroko pole village during 2017–2018*

In the both years of study the first catches of male moths were registered at the middle of June and the last ones at the middle of July. The maximum of the flight was at the second half of June.

Catches indicating the presence of a second generation of the pest were found in the period of the middle of August until first half of September, and the total catch of the second generation was lower than the first one.

Th. ampellophaga is a univoltine species in France (Drouet and Lambert, 2010), Italy (Umbria) (Pucci and Dominici, 1986), Hungary (Voigt et al., 2000), Serbia (Nahirnić et al., 2015), Romania (Subchev et al., 2008), Southern Russia (Crimean Peninsula) (Efetov, 2005), Central Greece (Subchev et al., 2006) and bivoltine in the southern parts of its distribution – southern Greece (Rhodes Island) (Subchev et al., 2006), Aegean Turkey (Can Cengiz et al., 2012), Syria and Lebanon (Talhouk, 1969). Recent studies in Macedonia and Albania indicated that

the vine bud moth develops one and two generations in the respective country (Micevski et al., 2018; Vrenozi et al., 2018). In Bulgaria, according to climatic and some other factors this species can develop one generation (Toshova & Subchev, 2002; Toshova et al., 2017; Toshova and Nahirnić, unpublished data), one complete and a partial second generation per year (Harizanova and Harizanov, 1996) or two generations (Anastasova and Georgieva; 1975; Toshova et al., 2017; current study). Similarly, *Th. ampellophaga* produces one or two generations per year in the eastern Mediterranean region of Turkey (Can et al., 2010).

The effectiveness of a lure can be influenced by parameters such as lure composition and application dose , type of dispenser used , lure age , storage, and environmental factors (Allison and Cardé, 2016; Burks and Wilk, 2017). Subchev et al. (2004) studied the effect of purity and age of the lures of the vine bud moth but the effect of storage of pheromone lures of this species on their activity in the field has not been studied. Our results showed that *Th. ampellophaga* lures stored for a prolonged period of time (more than 20 years) in proper conditions can be used for detection and monitoring of this pest.

CONCLUSIONS

1. The presence and seasonal flight of *Theresimima ampellophaga* (Bayle-Barelle, 1808) in the region of Kardzhali was estimated by sex pheromone traps.

2. The flight period of the moths of the first generation was from the middle of June to the middle of July with peak of flight in the second half of June.

3. The moths of the second generation occur from the middle of August until the first half of September.

REFERENCES

Allison, J. D., R. T. Cardé, 2016. Pheromone communication in moths: evolution, behavior, and application. University of California Press, USA.

Anastasova, K., A. Georgieva, 1975. A new pest of a grapevine. – *Rastitelna Zashtita*, 3: 31–33. (In Bulgarian).

Beshkov, S., M. Langourov, 2004. Butterflies and Moths (Insecta: Lepidoptera) of the Bulgarian part of Eastern Rhodopes. – In: Beron, P., A. Popov (Eds): *Biodiversity of Bulgaria. 2. Biodiversity of Eastern Rhodopes (Bulgaria and Greece).* Sofia, Pensoft & National Museum of Natural History, pp. 525–676.

Burks, C. S., C. Wilk, 2017. Effect of storage of pheromone lures for *Amyelois transitella*: field performance and compound ratios. - Florida Entomologist, 100(4):820-822.

Can Cengiz, F., F. Özsemerci, Y. Karsavuran, M. A. Subchev, 2012. *Theresimima ampellophaga* (Bayle-Barelle, 1808) (Zygaenidae: Procridinae) in the Aegean Region of Turkey. – In: Tarmann, G. M., W. G. Tremewan and M. R. Young (Eds), Abstracts of the XIII. International Symposium on Zygaenidae, 16–23 September 2012, 11. Innsbrucker Lepidopterologen-spräch, Innsbruck, Tirol, Austria, 3.

Can Cengiz, F., K. A. Efetov, K. Kaya, E. E. Kucherenko, Z. Okyar, G. M. Tarmann, 2018. Zygaenidae (Lepidoptera) of Thrace Region of Turkey. – Nota Lepidopterologica, 41(1): 23–36.

Can, F., N. Demirel, E. I. Sağiroğlu, T. Toshova, M. Subchev, 2010. Employing pheromone traps to establish the distribution and seasonal activity of *Theresimima ampellophaga* in Turkey. - Phytoparasitica, 38(3): 217–222.

Dospevski, S., 1910. Bolesti I neprjateli po kulturnite rastenija-nasekomi, koito povrezdat lozata, Sadovo, T XI, 9-10.

Drouet, E., B. Lambert, 2010. Trois ans de recherches de *Theresimima ampellophaga* (Bayle-Barelle, 1808) en France (Lep. Zygaenidae). – Oreina, 11: 5–7.

Efetov, K. A., 2005. The Zygaenidae (Lepidoptera) of the Crimea and other regions of Eurasia. Simferopol. CSMU Press, 420 p.

Efetov, K. A., E. V. Parshkova, M. Y. Baevsky, A. I. Poddubov, 2014. Sec-butyl ester of dodecenoate: synthesis and attractive properties. – Ukrainian Biochemical Journal, 86(6): 175–182. (In Russian, English summary).

Efetov, K. A., F. Can, T. B. Toshova, M. Subchev, 2010. New sex attractant for *Jordanita anatolica* (Naufock) (Lepidoptera: Zygaenidae: Procridinae). - Acta Zoologica Bulgarica, 62(2): 315–319.

Harizanov, A., M. Todorova, S. Kalinova, A. Stoeva, P. Nikolov, C. Liubenova, M. Tsenova, 2006. Good plant protection practice in the agriculture. *Vine*. 447-467. Ministry of Agriculture and Forestry. (In Bulgarian) http://www. nsrz.government. bg/fi les/9-lozja.pdf (Accessed: 7 September, 2018).

Harizanova, V., A. Harizanov, 1996. Biological peculiarities of *Ino ampellophaga* Bayle (Lepidoptera, Zygaenidae) – a pest of grapes in Bulgaria. - Scientific Works, AU – Plovdiv, XLI: 171–174.

Micevski, N., A. Nahirnić, S. Beshkov, E. E. Kucherenko, K. A. Efetov, 2018. *Theresimima ampellophaga* (Bayle-Barelle, 1808) (Zygaenidae, Procridinae) rediscovered in the Republic of Macedonia by applying attractant traps. – In: Can, F. And Okyar, Z. (Eds). Abstracts of the XVI. International Symposium on Zygaenidae, İzmir, Turkey, 1–5 May 2018, p. 19.

Nahirnić, A., S. Petrović, Z. Krivošej, P. Jakšić, T. Toshova, 2015. Using pheromone traps for the detection and monitoring of the seasonal flight of the vine bud moth *Theresimima ampellophaga* (Bayle-Barelle, 1808) (Lepidoptera: Zygaenidae) in Serbia. - Entomologist's Gazette, 66(3): 175–181.

Pucci, C., M. Dominici, 1986. Biological notes and cyclical outbreaks of *Theresimima ampelophaga* Bayle-Barelle (Lep., Zygaenidae). - Journal of Applied Entomology, 101(1-5): 479–491.

Razov, J., K. A. Efetov, K. Franin, T. B. Toshova, M. A. Subchev, 2017. The application of sex pheromone traps for recording the Procridinae fauna (Lepidoptera: Zygaenidae) in Croatia. - Entomologist's Gazette, 68(1): 49–53.

Subchev, M., 2014. Sex pheromone communication in the family zygaenidae (insecta: Lepidoptera): a review. – Acta Zoologica Bulgarica, 66(2): 147–158.

Subchev, M., A. Harizanov, W. Francke, S. Francke, E. Plass, A. Reckziegel, F. Schröder, J. A. Pickett, L. J. Wadhams, C. M. Woodcock, 1998. Sex pheromone of the female vine bud moth, *Theresimima ampellophaga* Bayle-Barelle (Lepidoptera: Zygaenidae), comprises (2*S*)-butyl (7*Z*)-tetradecenoate. – Journal of Chemical Ecology, 24: 1141-1151. [DOI]. Erratum: Journal of Chemical Ecology, 25: 1203.

Subchev, M., T. B. Toshova, J. A. Tsitsipis, K. D. Zarpas, J. T. Margaritopoulos, 2006. Distribution and seasonal flight of *Theresimima amphellophaga* (Bayle-Barelle, 1808) in Greece estimated by pheromone traps. - Acta zoologica bulgarica, 58: 345–354.

Subchev, M., T. Toshova, M. Tóth, E. Voigt, J. Mikulás, W. Francke, 2004. Catches of vine bud moth *Theresimima ampellophaga* (Lep., Zygaenidae: Procridinae) males in pheromone traps: effect of the purity and age of baits, design, colour and height of the traps, and daily sexual activity of males. – Journal of Applied Entomology, 128(1): 44–50.

Subchev, M., T. Toshova, S. Drosu, S. Cazacu, K. Efetov, 2008. Recent records of *Theresimima ampellophaga* Bayle-Barelle in Romania. - Les cahiers du Musée des conflrences 2: L'expérimentation. Annexes: *Actes du X^e^ Symposium international sur les Zygaenidae*: 59–63.

Talhouk, A. M. S., 1969. Insects and mites injurious to crops in Middle Eastern countries. Berlin, Verlaq Paul Parey, 239 p.

Tarmann, G. M., 1998. Die Weinzygaene *Theresimima ampellophaga* (Bayle-Barelle, 1808) (Lepidoptera, Zygaenidae, Procridinae). Kehrt einverschwundener Weinschädling zurück? - Stapfia, 55: 57–84.

Tarmann, G. M., 2003. Zygaenidae as pest species. – In: Efetov K. A., W. G. Tremewan, G. M. Tarmann. (Eds), Proceedings of the 7th International Symposium on Zygaenidae. pp. 151–229.

Toshova, T. B., D. Atanasova, B. S. Stalev, A. Nahirnić, 2017. New data on the distribution and seasonal flight of the vine bud moth *Theresimima ampellophaga* (Bayle-Barelle, 1808) in Bulgaria - investigations by pheromone-baited traps. - Ecologia Balkanica, 9(1): 79–89

Toshova, T., M. Subchev, 2002. Seasonal monitoring of the Vine bud moth *Theresimima ampellophaga* (Bayle-Barelle) (Lepidoptera: Zygaenidae) by pheromone traps. – Acta entomologica bulgarica, 1–2: 5–9. (In Bulgarian, English summary).

Voigt, E., J. Mikulás, M. Subchev, M. Tóth, 2000. Flight phenology of *Theresimima ampellophaga* (Bayle-Barelle) (Lepidoptera: Zygaenidae) based on pheromone trap catches: contributions to occurrence of the pest in Hungary. – *IOBC/WPRS Bulletin*, 23: 167–170.

Vrenozi, B., T. B. Toshova, K. A. Efetov, G. M. Tarmann, 2018. The first discovery of the vine bud moth *Theresimima ampellophaga* (Lepidoptera: Zygaenidae) in Albania by the use of sex pheromone/ attractant traps. - In: Can, F. and Okyar, Z. (Eds). Abstracts of the XVI. International Symposium on Zygaenidae, İzmir, Turkey, 1–5 May 2018, p. 18.