



Effectiveness of pheromone for the control Box Tree Moth – *Cydalima perspectalis* in Georgia

A. Supatashvili^a, M. Burjanadze^{a*}, B. Berdzenishvili^b, M. Arjevanidze^a

^aAgricultural University of Georgia; 240, David Agmashenebeli Alley, Tbilisi, 0159, Georgia

^bNational Botanical Garden of Georgia; 1, Botanikuri Str., Tbilisi, 0105, Georgia

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ABSTRACT

The Box Tree Moth (BTM) - *Cydalima perspectalis* (Walker, 1859) (Lepidoptera; Crambidae) was introduced in 2012 in Georgia and in the next year it began to defoliate *Buxus* spp in large quantities. Today the situation is quite alarming in Western Georgia, with BTM damaging *Buxus colchica*, which is an endemic species of the Caucasian flora and is threatened now by habitat loss. The larvae feed on leaves and shoots, causing serious damages, defoliating box trees, leading to economic, social and environment problems. During 2017-2018, a WitaTrap® Funnel trap system, with pheromone CYDAWIT® (Witasek, Pflanzenschutz, GmbH, Austria), was installed for the monitoring and control of BTM. A long term trapping was conducted at two location of boxwood forest in Tsageri - Ambrolauri (South slop of Grate Caucasian mountain range) in West Georgia. In total 450 pheromone traps were set out on the 150 ha at least ten days before the pest was expected to emerge and at the proper height above the ground or in the plant canopy. Three traps per ha were placed, where prevailing winds were carrying the pheromone into the forest area. BTM moths attracted by the pheromone fall into a capture container and cannot fly out anymore. The pheromone traps were emptied and new dispensers were added at two times during the flying period of *C. perspectalis*. The number of captured adults varied from 11 to 176 moths per trap. In total approximately 93000 (2017) and 74000 (2018) *C. perspectalis* were captured in Tsageri – Ambrolauri region during this monitoring period.

Keywords: *Cydalima perspectalis*, Pheromone trap, Monitoring, Number of captured, Box Tree Moth, Caucasian flora.

*Corresponding author: Medea Burjanadze; E-mail address: m.burjanadze@agrundi.edu.ge

Introduction

The Box Tree Moth (BTM) - *Cydalima perspectalis* (Walker, 1859) (Lepidoptera; Crambidae) is an insect of Asian origin [1-3] that recently invaded most of Europe, Turkey [4-6] and the Caucasus, causing serious damage to ornamental box (*Buxus* sp.) shrubs and trees [7, 3].

In Georgia BTM was introduced in 2012. During the preparation to the 2014 Winter Olympics in 2012 it was introduced from Italy to Sochi with the planting stock of *Buxus sempervirens*. It then arrived in Georgia and in the next year it began to defoliate *Buxus colchica* in large quantities [8]. *Buxus colchica* is an endemic species of the Caucasian flora. BTM larvae cause damage not only in native habitats of box trees, also in public and private gar-

dens and parks [9]. The larvae feed on leaves and shoots, causing serious damages, defoliating box trees, leading to economic, social and environment problems (www.tzona.org.ge, 23 April, 2016).

Today the situation is quite alarming in Western Georgia, where *Buxus colchica*, is threatened by habitat loss.

The aim of this research is to test sex pheromone trapping, in order to determine the efficacy of the baits for detecting the male flights of BTM.

Material and methods

Site of Investigation

The study of distribution of BTM - *C. perspectalis* individuals was conducted in the summer of

2016, in *Buxus colchica* occurring in nature in different regions and locations in Georgia: Imereti, Racha, Tsageri, Samegrelo and Adjara

In every location visual assessments are made in at least 50 individuals of box trees and hedges. Doing this, evaluated plants were distributed in 5 different levels of damage, based on the assessment of the degree of defoliation of box trees by pest larvae, using a 5 point scale (Table 1).

Table 1. Injury scale of defoliation of box trees by *Cydalima perspectalis* Walker in percent

#	Defoliation (%)	Damage level	Damage significance
1	0	0	undamaged
2	1-25	1	weak
3	26-50	2	middle
4	51-75	3	strong
5	> 75	4	very strong

Pheromone traps

During 2017-2018, a WitaTrap® Funnel trap system, with pheromone CYDAWIT® (Witasek, Pflanzenschutz, GmbH, Austria), was installed for the monitoring and control of BTM.

A long term trapping was conducted at two locations of boxwood forest in Tsageri - Ambrolauri (South slop of Grate Caucasian mountain range) in West Georgia. In total 450 pheromone traps were set up on the 150 ha, at least ten days before the pest was expected to emerge and at the proper height 2 m above the ground or in the plant canopy. Three traps per ha were placed, where prevailing winds were carrying the pheromone into the forest area.

Results and discussion

This study to establish the degree of damages caused by *C. perspectalis* to *Buxus colchica* was conducted in locations with confirmed presence of this pest in 2016. The results of the research are presented in Table 2.

The results show that *C. perspectalis* is a serious pest on the box trees in the majority of studied localities. The percentages of defoliation ranged from less than 25% to more than 75%. In general it has been observed that the damage level of box tree varied between weak to very strong (15%-100%).

During 2017-2018, a funnel trap system, with pheromone traps, was installed for the monitoring and control of BTM in different regions of Georgia. In Figure 1, the areas (in hectares) with native *Buxus* sp. monitored by pheromone traps in different regions of Georgia is represented.

Table 2. *C. perspectalis* damage level in different locations of Georgia (2016)

#	Region /Area	Defoliation (%)	Damage level	Damage in %	Damage Significance
1.	Imereti	1-25	1	15,7-24,8	weak
2.	Racha	26-50	2	30,5-47,6	middle
3.	Tsageri	51-75	3	65,5-72,3	strong
4.	Samegrelo	51-75	3	52,5-69,5	strong
5.	Adjara	≤ 75	4	75-100	very strong

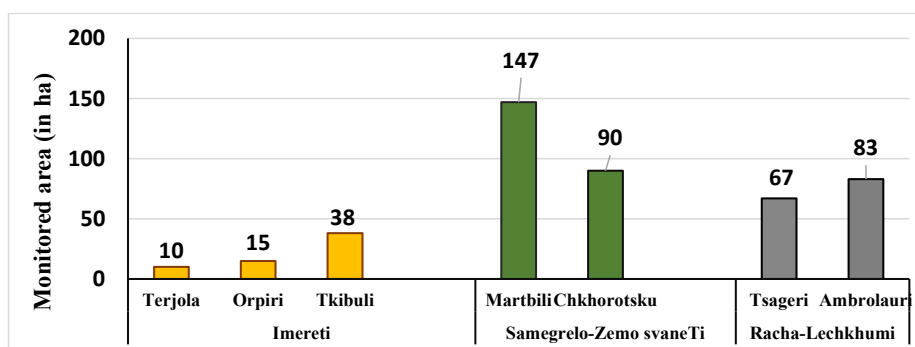


Fig.1. The areas (in ha) in different regions of Georgia with pheromone traps for the monitoring of *C. perspectalis*, 2017-2018.

As described in methods, 450 pheromone traps were installed on 150 ha in Racha-Lechkhumi (Tsageri-Ambrolauri) Region, where we calculated number of baited moth *Moth* attracted by the pheromone fall into the capture container and cannot fly out anymore (Fig.2).

The pheromone traps were emptied and new dispensers were added at two times during the flying period of *C. perspectalis*. The number of captured adults varied from 11 to 176 moths in one trap. In total approximately 93000 (2017) and 74000

(2018) of moths were captured in the Tsageri – Ambrolauri (Racha-Lechkhumi region) (Fig.3).

Analyzing the results of study relating to the aim of this research, to use sex pheromone trapping, in order to determine the efficacy of the baits the male flights of BTM, is effective means for monitoring. Moreover, use pheromone traps for control this insects in the area of South slop of Grate Caucasian mountain range is very important tool, that for its landscape it is difficult to use techniques for insecticides application.

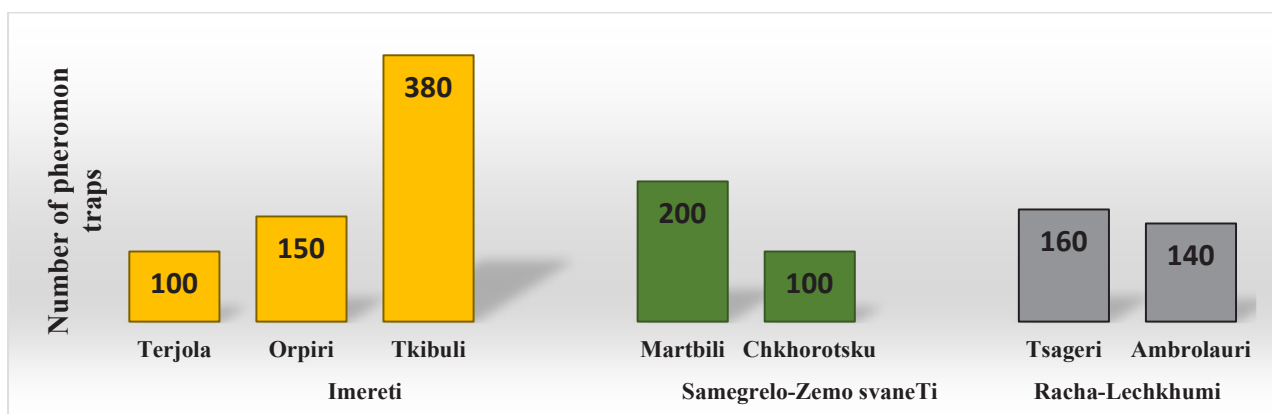


Fig.2. Pheromone traps set up different region of Georgia for monitoring *C.perspectalis*

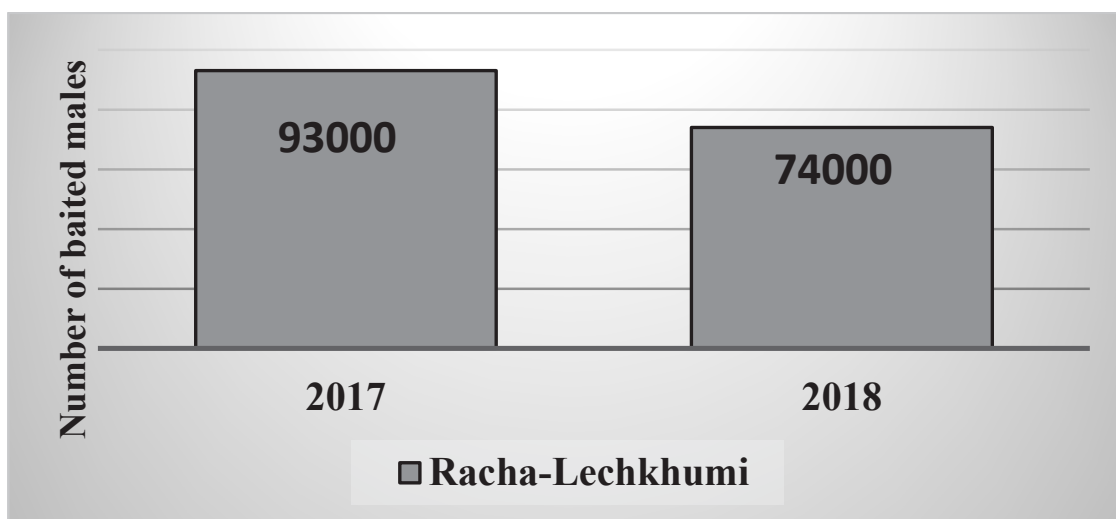


Fig. 3. Total number of *C. perspectalis* captured in the Tsageri – Ambrolauri region 2017-2018

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Georgia, (2016). <http://www.observatree.org.uk/wpcontent/uploads/2016/03/>

References

- [1] W. Haye, T. Kenis, M. Nacambo, S. Xu, H. Zhang, H. Li, Biology and natural enemies of *Cydalima perspectalis* in Asia: Is there biological control potential in Europe? *J. Appl. Entomol.*, 3 (2014) 1-8.
- [2] J. Agius, Pest species *Cydalima perspectalis* (Walker, 1859) new to the Maltese Islands (Lepidoptera: Crambidae), *SHILAP Revista de lepidopterología*, 46 (184), (2018) 577-579.
- [3] EPPO, 2015: European and Mediterranean Plant Protection Organization. Disponible en: <https://www.gd.eppo.int>
- [4] CABI, 2015.- *Cydalima perspectalis* (box tree moth) (LEUTHARDT F., Ed.). In: *Invasive species compendium*.- CAB International, Wallingford, UK. [online] URL: <http://www.cabi.org/isc/datasheet/118433>
- [5] M. Kenis, S. Nacambo, F. Leuthardt, L. Di Domenico, F., Haye, T. The box tree moth, *Cydalima perspectalis*, in Europe: horticultural pest or environmental disaster? *Aliens* 33 [6] (2013), 38–41.
- [6] F. Leuthardt, B. Baur, Oviposition preference and larval development of the invasive moth *Cydalima perspectalis* on five European box-tree varieties. *J. of Applied Entomology*, 137(6), (2013) 437-444.
- [7] I. Matsiakh, V. Kramarets, G. Mamdashvili, Box tree moth *Cydalima perspectalis* as a threat to the native populations of *Buxus colchica* in Republic of Georgia. *J. of the Entomological Research Society*, 20(2) (2018) 29-42.
- [8] Y. Gninenko, N. Shiryaeva, V. Surov, The box tree moth -a new invasive pest in the Caucasian forest, *Plant Health -Research and Practice*, 1(7), Moscow (2014) 36-39.
- [9] I. Matsiakh, V. Kramarets, M. Kavtarishvili, M., G. Mamdashvili, Distribution of invasive species and their threat to natural populations of boxwood (*Buxus colchica* Pojark) in