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FLYING CURVE, INCIDENCE AND SEVERITY OF COMMON GRAPEVINE MOTH, *LOBESIA BOTRANA* ON NATIVE CULTIVAR "SHESH I ZI" IN COASTAL AREA OF ALBANIA

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ABSTRACT

Based on Albanian climatic conditions the viticulture it is the most important agricultural sector, with hundreds of grapevine planted each year. Both native species have a high production capacity and they are used for processing to produce a quality black and red wine. Compare with other species, the native cultivar "Shesh i zi" is more attacked by common grapevine moth, causing both type of damages, quantity. Based on the study resulted that common grapevine moth, *Lobesia botraana*, gives three generations per year. The evidence of three generations was concluded by monitoring the grapevine moth population, using sexual pheromones. In the same time, during three years of the study, was estimated the mean incidence and weighted severity on infection by this key pest of grapevine. The controlling of this pest in our experimental conditions on native cultivar "Shesh i zi", is done using *Bacillus thuringiensis*, varieties Kurstaki dhe Aizawai. Time of intervention with bio-insecticides is based on curve flying of *Lobesia botrana* adults.

Keywords: Grapevine, "Shesh i zi", *Lobesia botrana*, population.

INTRODUCTION

Cultivation of grapes in Albania has an ancient tradition and it is advantaged by suitable pedo-climatic conditions for a quality grape production. This fact is testified by its extension over whole territory of the country, as well as by the existence of a great number of autochthon cultivars, which are distinguished for a quantitative productivity and they are well accepted by the market [4]. Albania is divided into four wine regions: The coastal area include to 300 meter upper sea level and include Tirana, Durresi, Shkodra, Lezha, Lushnja, Fier, Vlora, and Delvina. The hilly region varies between 300 and 600 meter per upper sea level and includes Elbasan, Kruje, Gramsh, Berat, Librazhd, and Mirdita. The sub-mountainous region lies between 600 and 800 meter and surrounds the towns of Pogradec, Korca, Leskovik, and Peshkopi. Some cultivars of vine are also grown in the mountains as high as 1.000 meter upper sea level. Soils are generally clay silica of varied depths and exposures [10]. The main indigenous vine varieties for winemaking of red wines: Shesh i zi, Kallmet, Vlosh, Serine, and Debin e zeze, and for white wines: Shesh i bardhe, Debin e bardhe, and Pules. Shesh i zi and Shesh i bardhe are the two most important vine cultivars, accounting for about 35% of the crop, and take their name from the hill village of Shesh 15 kilometers from the capital Tirana. At low yields the former has an attractive floral aroma while the latter is capable of producing wins worthy of ageing [10]. In general, grapes are attacked by numerous pests year by year, but the common grapevine moth, *Lobesia botrana*; it is one of the most important pests, which causes direct and indirect damages.

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Taxonomic tree of common grapevine moth, *Lobesia botrana*, is as follow: Domain: Eukaryota, Kingdom: Metazoa, Phylum: Arthropoda, Subphylum: Uniramia, Class: Insecta, Order: Lepidoptera, Family: Tortricidae, Genus: Lobesia, Species: Lobesia botrana. The EPPO`s code of this pest is POLYBO (Lobesia botrana) [11].

Lobesia botrana, commonly known as the European grapevine moth, is native to southern Italy and is thought to have originated from Austria. It has been introduced to Europe, north and West Africa, the Middle East, eastern Russia, Japan and Chile. The European grapevine moth was first identified in the United States in October of 2009 in Napa County, California [7, 9]. The European grapevine moth most commonly lives on grape plants in agricultural areas. However, it also lives on berries as well as twenty-five other plants. These include carnations, cherries, currants, lilacs, nectarines, and plums. *Lobesia botrana* thrives in somewhat dry climates, such as the areas of California suitable for producing wine [8, 9]. First generation of grapevine moth, it is not harmful and so the chemical treatments are not justified. A lot of studies carried out over the world, have shown a high compensation capacity of grapevine plant. For second and third generation of *Lobesia botrana*, indirect damage it is more important than direct damage, because in the bores made by larvae of *Lobesia botrana* on grapevine grains, may develop a number of fungal rots, including Aspergillus, Alternaria, and especially the grey rot caused by *Botrytis cinera* [3]. Native cultivar “Shesh i zi” being a compact cluster cultivar, it is more exposed by the kind of damage. The most severe infestations generally occur in vineyards with extended training systems and on compact cluster cultivars. Limiting factors are high summer temperatures and mortality with overwintering pupae due to numerous parasites and predators. To find the proper time of intervention for controlling of *Lobesia botrana*, a crucial moment is the attending of curve flying of pest adults. To realize that, sexual pheromone traps were located in non-treated plots of experiment field. *Bacillus thuringiensis* is a spore-forming bacterium that produces crystals with insecticidal action, coded by Cry genes [5, 1, 6]. Such proteins are responsible for the pathogenecity of *Bacillus thuringiensis* against some coleopteran, dipteran and lepidopteron insects. *Bacillus thuringiensis* can potentially contribute to control, limiting the widespread use of toxic chemicals, which are hazardous to the environment and human health [1, 6]. The results of various researchers regarding the efficacy of *Bacillus Thuringiensis* treatments differ significantly, depending of the formulation used (wet table powder or dust), the application frequency, the insect population density, and the application environment (laboratory or field) [2, 1, 6]. Subspecies Kurstaki is better known and wide world used and its formulations are registered in many countires. It has a wide spectrum of action against larval stages of main Lepidoptera insect pests. Subspecies Aizawai is experimented and used to control common grapevine moth, *Lobesai botrana*.

METHODOLOGY

During three years of the study (2011-2013), the experiment was carried out on a surface of 2 hectares planted with grapevine, native cultivar “Shesh i zi” for processing. The cultivar “Shesh i zi” is well adapted in coastal Albanian climatic conditions and it is the most susceptible native cultivar by the common grapevine moth, *Lobesia botrana*. The experimental design was split-plot scheme. The experimental field was divided in two subdivision plots (A and B). For purpose of replication each subdivision was into 8 plots (Fig.1). This experimental design is applied in previous study in Albania [6].

	A		B
A1			**B1**
A2			**B2**
A3			**B3**
A4			**B4**
A5			**B5**
A6			**B6**
A7			**B7**
A8			**B8**

Figure 1. Experimental design

To recognize the flight curve of *Lobesia botrana*, four sexual pheromone traps were placed in non treated plots used as control variants. The pheromone traps were trap test [R] of ISAGRO Italy, ISAGRO S.P.A. Italy. The counting of pest adults caught in sexual pheromone traps was realized weekly in regular intervals. *Bacillus thuringiensis* subspecies Kurstaki and Aizawai were used for treatment to control common grapevine moth, *Lobesia botrana*, based on the monitoring of pest population using sexual pheromones. During the first year of the study (2011) parcels A1 to A4 were treated with subspecies Kurstaki and parcels A5 to A8 were left as control variants, while parcels B1 to B4 were treated with subspecies Aizawai and parcels B5 to B8 were left as control variants. During the first year of the study (2011) parcels A1 to A4 were treated with subspecies Kurstaki and parcels A5 to A8 were left as control variants, while parcels B1 to B4 were treated with subspecies Aizawai and parcels B5 to B8 were left as control variants. During the second year of the study (2012), parcels A1 to A4 were treated with subspecies Aizawai and A5 to A8 were left as control parcels. Parcels B1 to B4 were treated with subspecies Kurstaki and parcels B5 to B8 were left as control parcels. In the last year of the study (2013) parcels A5 to A8 were treated with subspies Kurstaki and A1 to A4 were left as control, while parcels B5 to B8 were treated with subspecies Aizawai and parcels B1 to B4 were left as control variants. For summer generations of the pest, second and third one, were applied two treatments for each one. First treatment was applied 10 days after first caught of pest adults and the second treatment was applied 10 days after first one. To estimate the incidence of *Lobesia botrana*, was taken a sample of 200 bunches (50 bunches for each replication), 10 days after second treatment, chosen randomly following the diagonal direction of the vineyard. Those bunches were controlled carefully for presence of *Lobesia botrana* larvae, recording the number of infected bunches. To assess the severity of damage by *Lobesia botrana*, was used index of McKinney, which categories percentage of bunches attacked into 6 classes (Table 1).

Classes	Percentage of bunches attacked
0	Healthy bunch
1	1 – 5% attacked
2	6 – 10% attacked
3	11 – 15% attacked
4	16 – 30% attacked
5	31 – 50% attacked
6	over 50% attacked

Table 1. Index of McKinney (McKinney HH., 1923)

RESULTS AND DISCUSSION

During three years of the study, based on monitoring by sexual pheromone, the light curve of *Lobesia Botrana* was as following graphs (Fig. 2, Fig. 3, and Fig. 4):

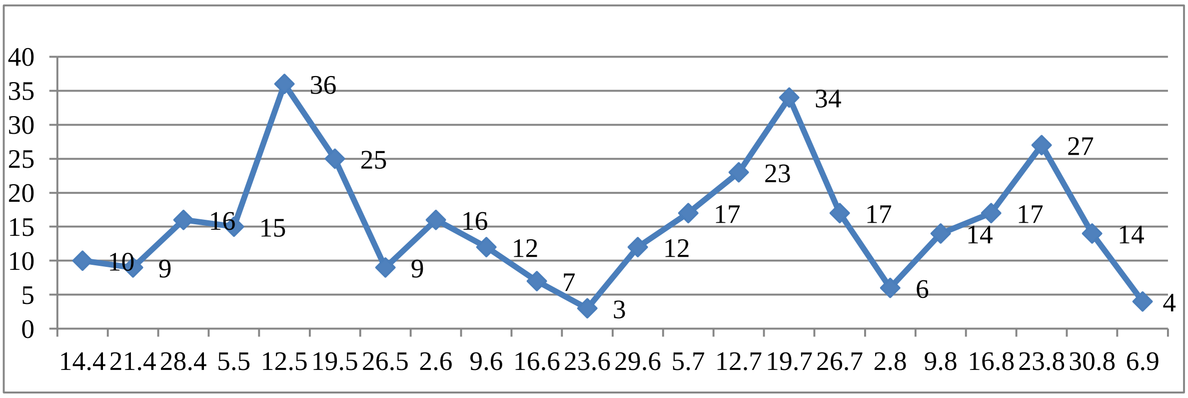

Figure 2. Flight curve of *Lobesia botrana* in year 2011

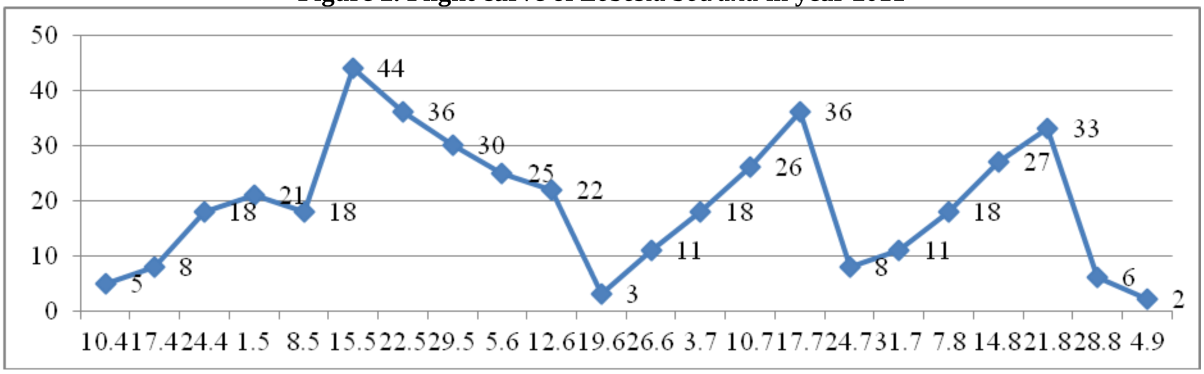

Figure 3. Flight curve of *Lobesia botrana* in year 2012

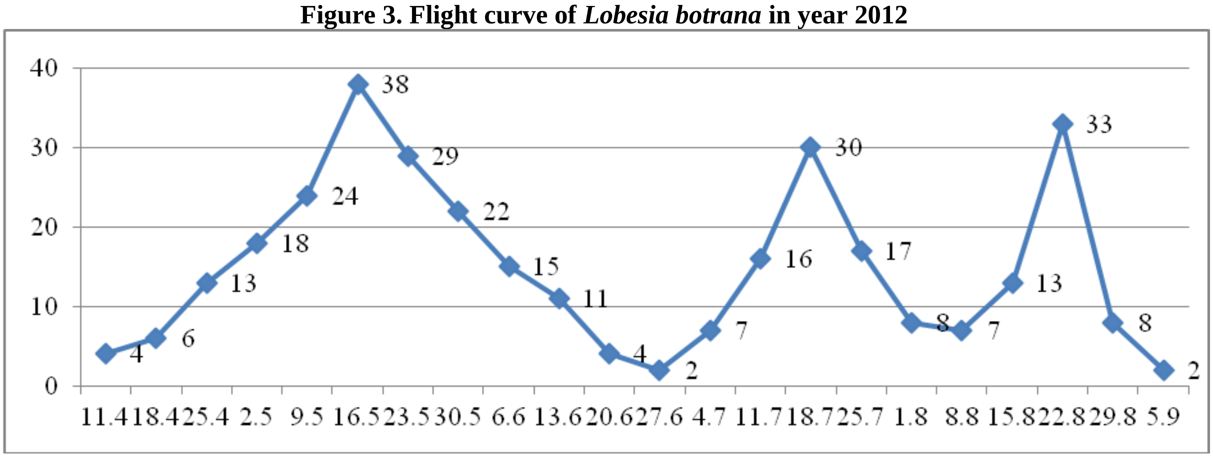

Figure 4. Flight curve of *Lobesia botrana* in year 2013

As are shown at above graphs, first flying *Lobesia botrana* moths are appeared at first ten days of April attending an increasing of population and achieving a maximum in beginning of second ten days of May. This is the high peak point of flying for first generation of pest. After this moment the number of moths caught in sexual pheromone start to decrease. The lowest point of flying curve for first generation achieved at third ten days of June. Second generation starts at the end of June and beginning of July achieving the maximum of population at the end of second ten days of July. The second generation achieves minimum of flying at the end of July until first days of August. Third generation of *Lobesia botrana* starts flying at first ten days of August, achieves its maximum point during last ten days of August and arrives the minimum point during first ten days of September. Based on our study carried out during 2011–2013 on native cultivar “Shesh i zi”, in coastal area of Albania, common grapevine moth, *Lobesia botrana*, gives three generation per year. It is the main pest on grapevine, especially on native cultivar with compact cluster. Also, except the flight curve of grapevine moth, *Lobesia botrana*, another goal of this study was the assessment of mean incidence and weighted severity in treated and non treated variants.

	Second generation		Third generation	
	Control	**Treatment (ssp. Aizawai)**	**Control**	**Treatment (ssp. Aizawai)**
Mean Incidence	72%	45%	82%	39.5%
Weighted Severity	18%	11.8%	22%	9%

Table 1. The incidence and weighted severity for second and third generation of *Lobesia botrana* in year 2011

	Second generation		Third generation	
	Control	**Treatment (ssp. Kurstaki)**	**Control**	**Treatment (ssp. Kurstaki)**
Mean Incidence	78%	44%	78.5%	39.5%
Weighted Severity	22.8%	11%	24.6%	11.3%

Table 2. The incidence and weighted severity for second and third generation of *Lobesia botrana* in year 2011

	Second generation		Third generation	
	Control	**Treatment (ssp. Aizawai)**	**Control**	**Treatment (ssp. Aizawai)**
Mean Incidence	79%	24%	92%	28%
Weighted Severity	25.3%	5.6%	32%	6.6%

Figure. 3 The incidence and weighted severity for second and third generation of *Lobesia botrana* in year 2012

	Second generation		Third generation	
	Control	**Treatment (ssp. Kurstaki)**	**Control**	**Treatment (ssp. Kurstaki)**
Mean Incidence	71%	20%	88%	30%
Weighted Severity	36%	7.4%	31.5%	7.6%

Figure 4. The incidence and weighted severity for second and third generation of *Lobesia botrana* in year 2012

	Second generation		Third generation	
	Control	**Treatment (ssp. Aizawai)**	**Control**	**Treatment (ssp. Aizawai)**
Mean Incidence	81%	34%	81%	32%
Weighted Severity	24.2%	10%	24.6%	6.7%

Figure 5. The idence and weighted severity for second and third generation of *Lobesia botrana* in year 2013

	Second generation		Third generation	
	Control	**Treatment (ssp. Kurstaki)**	**Control**	**Treatment (ssp. Kurstaki)**
Mean Incidence	87.5%	42.5%	82%	46%
Weighted Severity	25%	11.3%	25%	13.5%

Figure 6. The ncidence and weighted severity for second and third generation of *Lobesia botrana* in year 2013

Based on values shown in above tables for both generations of *Lobesia botrana*, second and third one, there is a quite difference between incidence and severity values in treated with Bacillus subspecies Aizawai and Kurstaki and non treated variants.

CONCLUSIONS

Using of both *Bacillus thuringiensis* subspecies, Aizawai and Kurstaki, is effective for controlling of common grapevine moth, *Lobesia botrana*, on native cultivar “Shesh i zi”, in coastal area of Albania. To guarantee a better performance is important to respect the climatic conditions during the using of Bt and in the same time the using of sexual pheromone is a

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crucial element for determination of proper time of intervention, especially on compact cluster cultivars, as “Shesh i zi”.

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