**International Refereed Journal of Engineering and Science (IRJES)**
*ISSN (Online) 2319-183X, (Print) 2319-1821*
*Volume 6, Issue 2 (February 2017), PP. 70-77*

# Incidence and Severity of Common Grapevine Moth, Lobesia Botrana, on Native Grape Cultivar "Shesh I Zi" in Albania

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**Abstract**: Cultivation of grape 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 quantitative productivity and they are well accepted by market. Lobesia botrana is the main pest which attack native grape cultivars, causing a considerable damage. To find a proper time of intervention is the crucial moment for realizing the treatments. For that reason, attending of flying curve of Lobesia botrana, four pheromone traps were located in the non treated plots. The counting of the adults caught in pheromone traps is done weekly. According to climatic conditions of Albania, Lobesia botrana gives three generations per year. The most harmful generations are second and third one. Using Bt varieties for controlling of L. botrana provide biological effectiveness, so it is an alternative for controlling of the pest in native cultivars. During the experiment is shown a difference between incidence and severity in treated plots and non treated plots.

**Keywords :** Lobesia botrana, pheromones, Bt varieties, Shesh i zi, native cultivar.

## I. INTRODUCTION

Viticulture is the most important agricultural sector in Albania with hundreds of hectares grapevine planted each year and millions of Euros invested. Most of the new plantings (80%) are for vine: the most frequent plantings of well-known varieties are, in order of importance: "Merlot" and "Cabernet sauvignon"; while among the local varieties "Shesh i zi" is the most frequent due to its adaptability followed by "Kallmet" and "Puls" in particular traditional areas (Sh. Shahini et. al. 2010).

Albanian farmers know well enough traditional technique of grape cultivation, which is different from one area to another, based on generation experience and area's specificities. Last years, after agriculture privatization, farmers are going gradually through from agro technique and traditional means at cultivating systems based on modern and rational criteria. To achieve that, it is needed continuously introduction of new technology and its divulgation for cultivation methods as well as for plant protection technologies. A special importance in grape seedlings production has preparation and application of scientific protocols on production of propagating material, which is a necessary condition for realization of a qualitative production in hygienic aspect as well as phytosanitary one.

Cultivation of grape 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 quantitative productivity and they are well accepted by market. Those objectives can be achieved using integrated protection which consists in well recognition of phytosanitary problems of grape, in rational evaluation of every chemical intervention, directing farmers towards methods which respect environment and which are in accordance with community normative. Only some of the species could be considered as main pests of grapevine, which could infect plants during the year in a high level, with such a population density that could caused damages continuously and primary treatments are needed, which are based on grape protection programs. We consider as main pest of grapevine in Albania, the common grapevine moth, Lobesia botrana. (D. Boscia, et. al, 2001). The common grapevine moth, Lobesia botrana, in coastal area of Albania, gives three generations per year. (A. Kapedani, 1988)

Many pests are uncontrolled reducing farm profitability. These problems must be overcome to meet goals of reduce pesticides use while providing high value produce for domestic and international markets. Problems common among sites relate to privatization following collapse of a centralized economy, with a generation of farms lacking experience in farm decision making. (D.G. Pfeiffer, et. al. 2007).

Albania is divided into four wine regions: The coastal plain rises to 300 m/990 ft and encompasses the towns of Tirana, Durresi, Shkodra, Lezha, Lushnja, Fier, Vlora, and Delvina. The hilly region varies between 300 and 600 m/1,980 ft altitude and includes Elbasan, Kruje, Gramsh, Berat, Permet, Librazhd, and Mirdita. The sub-mountainous region lies between 600 and 800 m and surrounds the towns of Pogradec, Korca, Leskovic, and Peshkopi. Some cultivars of vine are also grown in the mountains as high as 1,000 m/3,300 ft. Soils are generally clay silica of varied depths and exposures.

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 per cent of the crop, and take their name from the hill village of Shesh 15 km from the capital Tirana. At low yields the former has an attractive floral aroma while the latter is capable of producing wines worthy of ageing. http://albanianwines.weebly.com/.

Among a number of insect pests of vines in Albania, the common grapevine moth Lobesia botrana is predominant. Other insects cause only sporadic damage. Lobesia botrana was found in all types of vineyards producing three generations a year and with a high population density in years with moderately hot summers and high humidity. The most severe infestations generally occurred in vineyards with extended training systems and on compacts cluster cultivars. Limiting factors where high summer temperatures and mortality with overwintering pupae due to numerous parasites and predators. Damage varied with cultivar, compact cluster cultivars being the most attacked. (Sh. Shahini et. al. 2007).

The intervention thresholds established from controlled experiments and damage evaluations took in account the dependence of treatment effectiveness upon cluster conformation as well as cultivar susceptibility to attack. For the less susceptible varieties sampling was done at the larval infestation level of 10% to 15% clusters. For cultivars with compact grape clusters not only did the intervention threshold have to be lower 5% helped considerably to minimize pest management cost. Furthermore, their use made it possible to intervene against heavy attacks at exactly the right moment, particularly important in the case of compact cluster cultivars (Sh. Shahini et. al. 2007).

## II. SYMPTOMS

The following description refers to grapevine, on which symptoms largely depend on the phenological stage of the reproductive organs. On inflorescences (first generation), neonate larvae firstly penetrate single flower buds. Symptoms are not evident initially, because larvae remain protected by the top bud. Later, when larval size increases, each larva agglomerates several flower buds with silk threads forming glomerules visible to the naked eye, and the larvae continue feeding while protected inside. Larvae usually make one to three glomerules during their development.

On grapes (summer generations), larvae feed externally and when berries are a little desiccated, they penetrate them, bore into the pulp and remain protected by the berry peel. Larvae secure the pierced berries to surrounding ones by silk threads in order to avoid falling. Frass may also be visible. Each larva directly damages several berries (one to six), but if the conditions are suitable for fungal or acid rot development, a large number of berries placed around may be also affected. Damage is variety-dependent: generally it is more severe on grapevine varieties with dense grapes, because this increases both larval installation and rot development. On both inflorescences and grapes, several larvae may co-exist in a single reproductive organ. Larval damage on growing points, shoots or leaves is unusual. (http://www.cabi.org/isc/datasheet/42794)

## III. MATERIAL AND METHOD

**Location and varieties**

The experiment is carried out in a vineyard of 2 hectares located in Hamallaj, Durres. This location is a low land closes the sea. The cultivar planted was an autochthon cultivar called “Shesh i zi”, which is grown for winemaking and also it is the most susceptible native cultivar by common grapevine moth, Lobesia botrana. Duration of study was three years, 2011 – 2013.

**Experimental design**

For the purpose of experiment was applied the split plot experimental design. For replication the two subdivision plots were divided into eight plots with a total number of 6200 vines. This experimental design is applied also in a previous study in Albania. (Sh. Shahini et. al. 2010)

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

**Fig. 1**. Experimental design

## IV. TREATMENTS

Two treatments were realized using Bt. var. Kurstaki and Bt. var. Aizawai. First year of the study plots A1 to A4 were treated with var. Kurstaki and A5 to A8 were left as control. Parcels B1 to B4 were treated with var. Aizawai and B5 to B8 were left as control. In second year of study A1 to A4 were treated with var. Aizawai whilst A5 to A8 were left as control. Parcels B1 to B4 were treated with var. Kurstaki whilst B5 to B8 were left as control. In the third year of the study, plots A5 to A8 were treated with var. Kurstaki and B5 to B8 were treated with var. Aizawai whilst A1 to A4 and B1 to B4 were left as controls.

**Time of treatment**

For each generation (second and third) were realized two treatments. First treatment was realized 5 days after first catch of adults and second one was realized 10 days after first treatment.

**Detection of population dynamic of L. botrana**

An evaluation of adult insect population density can be realized installing in the vineyard four traps with sexual pheromones, starting from phonologic stage of "puffy bud". The traps will be monitored every week to count and take off the captured adults (all males), recording data in special files. Pheromone capsules should be replaced every 45 days in the spring and every 30 – 35 days in the summer. Ground parts of traps should be replaced when their adhesive material can't catch more insects.

**Estimation of incidence and severity**

To estimate the incidence are analyzed 200 bunches (50 bunches for each replication) for the presence of the larvae of L. botrana. Bunches taken as samples are chosen randomly. Sampling from two side rows normally should be avoided. Observing of bunches should be done very carefully recording the number of infested bunches per 200 bunches taken as sample, presence of parasites, predators and phonologic stage of grapevine.

**Sampling time**

Samples were taken 10 days after second treatment for each generation (second and third generation) of L. botrana.For assessing the severity of the damage by the common grapevine moth is used McKinney index (McKinney, 1923), which categories the percentage of bunches attacked into 6 classes.

**Table. 1**. Index of McKinney

| Classes | Attack percentage of bunches |
|---|---|
| 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 |

To recognize population density of larvae, it is needed to take samples weekly, starting from the link moment, monitoring or sampling 200 blooms or bunches/ha. Bunches taken as samples are chosen randomly following a diagonal direction in the vineyard or 2 – 3 parallel rows. Sampling from two side rows normally should be avoided. More efficient samples are those that schedule vintage of bunches and their analyzing in lab. One such method, it is not so practice and it is used above all for scientific researches. Observing of bunches should be done very carefully recording the number of infested bunches per 200 bunches taken as sample, presence of parasites, predators and phonologic stage of grapevine.

First sampling could be realized 10 days after starting of second flying, in the grapevine phonologic stage of "grape grains like pepper grains" or "closing of bunch", because sampling and controlling of antophagus generation is unnecessary. Sampling continues until the vintage.

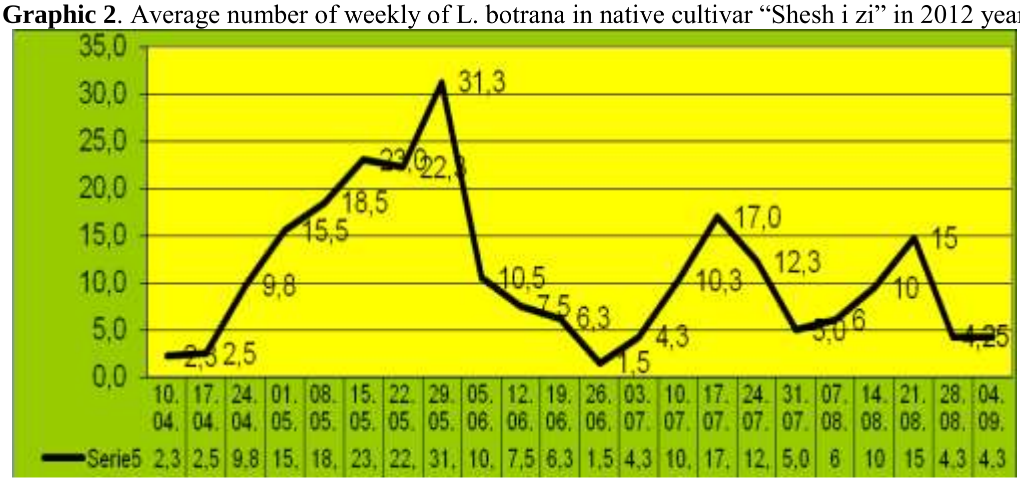
Intervention thresholds which are normally used for carpophagus generations are 1 – 2 % of bunches infested for table cultivars and 15 – 15 % for cultivars for processing. For table cultivars first treatment against first and second carpophagus generations is should be realized 7 days after first catching in the pheromones traps, without waiting to achieve the threshold level (ore zero threshold).

## V. RESULT AND DISCUSSION

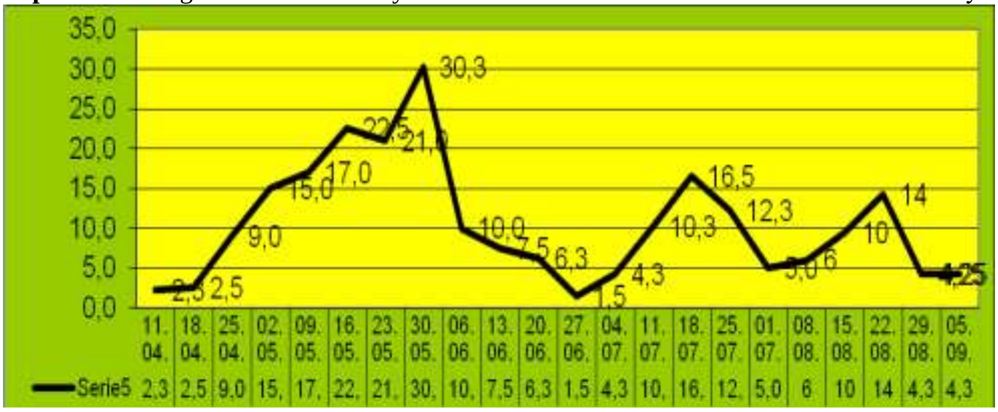
For the purposes of the monitoring the changes in population level of the moth adults, four pheromone traps were placed in the non treated plots as controls. The traps were placed furthest from the treated plots to avoid the potential contamination of the rows close to them. (Sh. Shahini et. al. 2010l). The pheromone traps were trap test R of ISAGRO Italy, isagro S.p.A. Italy.

**Graphic 1.** Average number of weekly of L. botrana in native cultivar "Shesh i zi" in 2011 year


**Graphic 2**. Average number of weekly of L. botrana in native cultivar "Shesh i zi" in 2012 year



**Graphic 3**. Average number of weekly of L. botrana in native cultivar "Shesh i zi" in 2013 year




The evaluation of Lobesia botrana population dynamic is based on a weekly monitoring of insect using pheromone traps in native cultivar "Shesh i zi". In Albanian climatic conditions, common grapevine moth, Lobesia botrana, gives three generation per year. The flight of the moths starts in the second 10 days of the April and reaching the peak of flying for first generation at the second half of the May. The peak of flying for second generation of Lobesia botrana reaches at second half of June and for the third one reaches at second half of August.

**Incidence and severity of L. botrana on native grape cultivar "Shesh i zi"**

**Table 2.** Data average in control variant for second generation of L. botrana (2011 – 2013)

| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 41 | 39 | 41 | 37 |
| Incidence % | 82.0 | 78.0 | 82.0 | 74.0 |
| Average Incidence | | | | **79.0** |
| Class 1 | 16 | 12 | 13 | 17.0 |
| Average 1 | | | | **14.5** |
| Class 2 | 15 | 15 | 18 | 13.0 |
| Average 2 | | | | **15.3** |
| Class 3 | 9 | 9 | 9 | 6.0 |
| Average 3 | | | | **8.3** |
| Class 4 | 1 | 3 | 1 | 0.0 |
| Average 4 | | | | **1.3** |
| Class 5 | 0 | 0 | 0 | 1.0 |
| Average 5 | | | | **0.3** |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | **0.0** |
| Average Intensity of Severity | | | | **25.3** |

**Table 3.** Data average in treatment variant with var. Aizawai for second generation of L. botrana (2011 – 2013)

| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 12 | 13 | 12 | 11 |
| Incidence % | 24.0 | 26.0 | 24.0 | 22.0 |
| Average Incidence | | | | **24.0** |
| Class 1 | 8 | 8 | 8 | 5.0 |
| Average 1 | | | | 7.3 |
| Class 2 | 4 | 5 | 4 | 6.0 |
| Average 2 | | | | 4.8 |
| Class 3 | 0 | 0 | 0 | 0.0 |
| Average 3 | | | | 0.0 |
| Class 4 | 0 | 0 | 0 | 0.0 |
| Average 4 | | | | 0.0 |
| Class 5 | 0 | 0 | 0 | 0.0 |
| Average 5 | | | | 0.0 |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | 0.0 |
| Average Intensity of Severity | | | | **5.6** |

**Table 4.** Data average in control variant for third generation of L. botrana (2011 – 2013)

| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 45 | 46 | 46 | 48 |
| Incidence % | 90.0 | 92.0 | 92.0 | 96.0 |
| Average Incidence | | | | **92.5** |
| Class 1 | 14 | 15 | 8 | 18.0 |
| Average 1 | | | | 13.8 |
| Class 2 | 20 | 17 | 21 | 17.0 |
| Average 2 | | | | 18.8 |
| Class 3 | 7 | 11 | 13 | 9.0 |
| Average 3 | | | | 10.0 |
| Class 4 | 4 | 3 | 4 | 4.0 |
| Average 4 | | | | 3.8 |
| Class 5 | 0 | 0 | 0 | 0.0 |
| Average 5 | | | | 0.0 |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | 0.0 |
| Average Intensity of Severity | | | | **32.1** |

**Table 5.** Data average in treatment variant with var. Aizawai for third generation of L. botrana (2011 – 2013)

| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 14 | 11 | 11 | 20 |
| Incidence % | 28.0 | 22.0 | 22.0 | 40.0 |
| Average Incidence | | | | **28.0** |
| Class 1 | 7 | 8 | 5 | 15.0 |
| Average 1 | | | | 8.8 |
| Class 2 | 7 | 2 | 5 | 5.0 |
| Average 2 | | | | 4.8 |
| Class 3 | 0 | 1 | 1 | 0.0 |
| Average 3 | | | | 0.5 |
| Class 4 | 0 | 0 | 0 | 0.0 |
| Average 4 | | | | 0.0 |
| Class 5 | 0 | 0 | 0 | 0.0 |
| Average 5 | | | | 0.0 |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | 0.0 |
| Average Intensity of Severity | | | | **6.6** |

**Graphic 4.** Mean incidence and weight severity of infestation by L. botrana at var. Aizawai

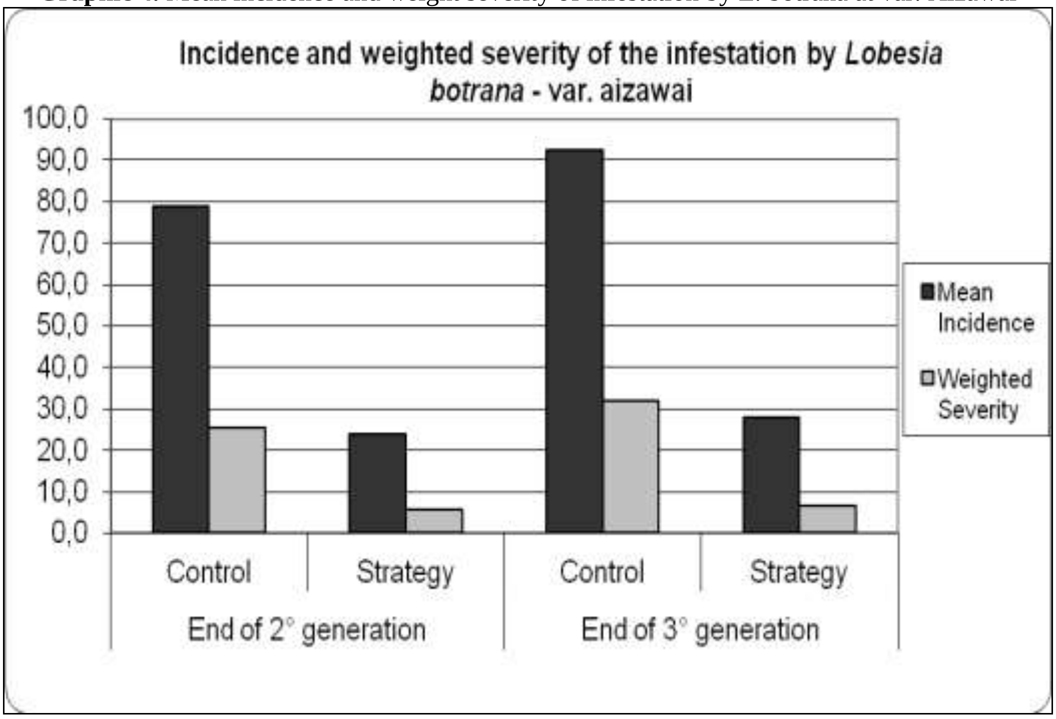


**Table 6**. Data average in control variant for second generation of L. botrana (2011 – 2013)

| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 39 | 38 | 31 | 34 |
| Incidence % | 78.0 | 76.0 | 62.0 | 68.0 |
| Average Incidence | | | | **71.0** |
| Class 1 | 20 | 15 | 15 | 16.0 |
| Average 1 | | | | **16.5** |
| Class 2 | 13 | 14 | 11 | 12.0 |
| Average 2 | | | | **12.5** |
| Class 3 | 6 | 8 | 5 | 6.0 |
| Average 3 | | | | **6.3** |
| Class 4 | 0 | 1 | 0 | 0.0 |
| Average 4 | | | | **0.3** |
| Class 5 | 0 | 0 | 0 | 0.0 |
| Average 5 | | | | **0.0** |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | **0.0** |
| Average Intensity of Severity | | | | **20.4** |

**Table 7.** Data average in treatment variant with var. Kurstaki for second generation of L. botrana (2011 – 2013)

| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 16 | 20 | 17 | 17 |
| Incidence % | 32.0 | 40.0 | 34.0 | 34.0 |
| Average Incidence | | | | **35.0** |
| Class 1 | 12 | 17 | 12 | 10.0 |
| Average 1 | | | | 12.8 |
| Class 2 | 4 | 3 | 5 | 7.0 |
| Average 2 | | | | 4.8 |
| Class 3 | 0 | 0 | 0 | 0.0 |
| Average 3 | | | | 0.0 |
| Class 4 | 0 | 0 | 0 | 0.0 |
| Average 4 | | | | 0.0 |
| Class 5 | 0 | 0 | 0 | 0.0 |
| Average 5 | | | | 0.0 |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | 0.0 |
| Average Intensity of Severity | | | | **7.4** |

**Table 8.** Data average in control variant for third generation of L. botrana (2011 – 2013)

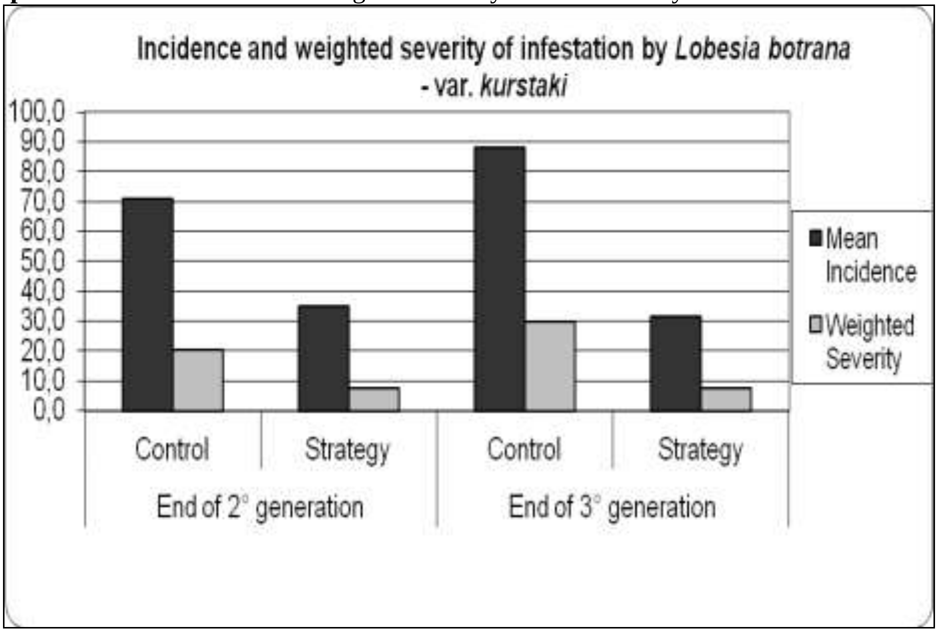
| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 44 | 44 | 44 | 44 |
| Incidence % | 88.0 | 88.0 | 88.0 | 88.0 |
| Average Incidence | | | | **88.0** |
| Class 1 | 15 | 11 | 12 | 9.0 |
| Average 1 | | | | 11.8 |
| Class 2 | 23 | 23 | 19 | 20.0 |
| Average 2 | | | | 21.3 |
| Class 3 | 4 | 8 | 10 | 11.0 |
| Average 3 | | | | 8.3 |
| Class 4 | 2 | 2 | 3 | 4.0 |
| Average 4 | | | | 2.8 |
| Class 5 | 0 | 0 | 0 | 0.0 |
| Average 5 | | | | 0.0 |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | 0.0 |
| Average Intensity of Severity | | | | **30.0** |

**Table 9**. Data average in treatment variant with var. Kurstaki for third generation of L. botrana (2011 – 2013)

| | | | | |
|---|---|---|---|---|
| Analyzed bunches | 50 | 50 | 50 | 50 |
| Attacked bunches | 14 | 16 | 16 | 17 |
| Incidence % | 28.0 | 32.0 | 32.0 | 34.0 |
| Average Incidence | | | | **31.5** |
| Class 1 | 10 | 10 | 9 | 7.0 |
| Average 1 | | | | 9.0 |
| Class 2 | 4 | 5 | 7 | 10.0 |
| Average 2 | | | | 6.5 |

| | | | | |
|---|---|---|---|---|
| Class 3 | 0 | 1 | 0 | 0.0 |
| Average 3 | | | | 0.3 |
| Class 4 | 0 | 0 | 0 | 0.0 |
| Average 4 | | | | 0.0 |
| Class 5 | 0 | 0 | 0 | 0.0 |
| Average 5 | | | | 0.0 |
| Class 6 | 0 | 0 | 0 | 0.0 |
| Average 6 | | | | 0.0 |
| Average Intensity of Severity | | | | **7.6** |

**Graphic 5.** Mean incidence and weighted severity of infestation by L. botrana at var. Kurstaki




The infestation found in control plot was much higher compared with that in the treatments. For var. Aizawia the incidence of damage ranged from 24% in treated plots against 79% in control variants for second generation and 28 % in treated plots against 92% in control variants for third generation of the pest. For var. Kurstaki the incidence of damage ranged from 35% in treated plots against 71% in control variants for second generation and 31% in treated plots against 88% in control variants for third generation of the pest. Also the values of severity shows differences between treated with Bt. varieties and not treated plots. Bt varieties, var. Aizawai and var. Kurstaki, provide a good control for second and third generation of Lobesia botrana, which are the most dangerous generations of this pest. Using of Bt. for controlling of L. botrana is also useful for human health and environment.

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