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Effect of lufox, on *Lobesia botrana* Den. & Schiff. (Lepidoptera: Tortricidae)

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ABSTRACT

Lobesia botrana, is a major pest of vineyards in the world. Lufox is being an IGR insecticide and is a mixture of Lufenuron and Fenoxicarb. In this study the effect of Lufox and Phosalone was carried out against the three pest generations. Different factors including: percentage of infected bunches, and percentage of infected berries to grape berry moth recorded. The results showed significant differences between the treatments. The average numbers damaged in each bunch were 0.91 in Lufox treatments, whereas the average of the damaged in each bunch in the treatment of Phosalone and control were 2.74 and 10.45, respectively.

Keywords: *Lobesia botrana*, Lufox, Lufenuron, Fenoxicarb, Phosalone, IGR insecticide.

INTRODUCTION

The grapevine moth, *Lobesia botrana* (Denis & Schiffermuller) (Lepidoptera: Tortricidae), is a major pest in a wide grape growing area comprising Europe, the Middle East, northern and western Africa, the Caucasian area and Japan (Gable and Roehrich, 1995; Moschos, 2006). Yield reduction caused by this insect results from larvae feeding directly on grape and subsequent attack by pathogens. Most growers control this pest with traditional chemical pesticides; however, mating disruption and microbial insecticides also are used as alternatives (Coscolla, 1997). Considerable effort is being directed towards reducing the use of traditional pesticides with increased use of integrated pest management (IPM) techniques, emphasizing the joint use of natural enemies and selective pesticides, an alternative compatible with the protection of non-target organisms and the environment (Dent, 2000). Insect growth regulators (IGR), interfere with the formation and deposition of cuticle chitin in a wide range of insect groups, resulting in abortive molting (Mosson *et al*., 1995; Cohen, 2001). They act mainly as Larvicides and Ovicides (Le *et al*., 1996). However, effects on adult fecundity, fertility and longevity, also have been reported (Marco *et al*., 1998). IGRs tend to be selective and generally less toxic to non target organisms than conventional insecticides (Perry *et al*., 1998). Lufox is potent IGRs with proven activity against many Lepidopteran pests of horticultural and urban environments (Charmillot *et al*., 2006).

Lufox is mixture of juvenile hormone mimic (Fenoxycarb 7.5% EC), ethyl [2-(4- phenoxyphenoxy) ethyl] carbamate and Chitin Synthesis inhibitor (Lufenuron), (Axor 3% EC). N-[[[2,5-dicholoro-4-(1,1,2,3,3,3-hexafluoropropxy) phenyl] amino] carbonyl] -2,6-difluorobenzamide (Reda et al., 2010 a,b). It is ovicidal and larvicidal to several species and effects on adult Diptera and Orthoptera, also have been described (Syngenta Crop, 2007; Cantus *et al*., 2008; Reda *et al*., 2010 a,b)(Fig.4). Lufox is thought to be relatively benign to natural enemies (Gonzales *et al*., 2009 a,b).

Previous studies of Lufox on two species of the most important pests in vineyards and its incorporation with a few fungicides for control of several important diseases was used in vineyards (Minguea *et al*., 2004; Moschos, 2006). Here, we study the effect of Lufox on *L. botrana* Den & Schiff, various generation and comparative with Phosalone. These studies are fundamental to use of Lufox in IPM of *L. botrana* Den & Schiff.

MATERIALS AND METHODES

Chemicals and reagents used in this work have been supplied from various chemical companies.

Lufox (Fenoxycarb 7.5% EC + Lufenuron 3% EC), was obtained from Syngenta Co. in Switzerland. Phosalone from Bayer Co. Ltd. was used in our research. All stock pesticide emulsions are prepared using distilled water. Poison sprayer was supplied from Mah Pash Co.

Pheromones and pheromone traps are from Iranian research Institute of plant protection (one in the plot and the others 500 meter away on posts approximately 150 cm high, so that the foliage did not interfere with diffusion of the attractant).

A stock of *L. botrana* Den & Schiff, was established from three pest generations is an ecological vineyard in Urmia, Iran, during March to October 2010 and augmented with new individuals once year.

In this study, we use a new IGR pesticide (Lufox), for study its effect on controlling of grape berry moth, *L. botrana* Den & Schiff, by using of pheromone traps. This research was conducted as a completely randomized block design experiment with three treatments and four replications. The treatments were 2000 ppm of Lufox and 1500 ppm Phosalone and a control (untreated), respectively.

Every experimental unit is including of three grapevines. Spraying is done using Mah pash poison spraying manually. Spraying against first generation had been done 5-7 days after flight peak, and for second and 3rd generation had been down 4-5 days after flight peaks.

Percentage of affected bunches were determined for each of grapevines in all of generations. Percentages of affected berries also are considered in second and 3rd generations. Samplings were done in 3 sections as below:

1- One week before every spraying.
2- One week after every spraying.
3- Two week after every spraying

Statistical Analysis

The signification of results (Three Generation of *Lobesia botrana*), was tested by ANOVA and means separated by a Duncan’s multiple range test at p<0/01 using SAS (Motulsky and Christopoulos, 2004). Henderson and Tiltons formula was used to correct and assimilate master data (Henderson and Tilton, 1955).

RESULTS

According to the obtained results, Lufox, has better and benefit effect on controlling of grape berry moth, *L. botrana* Den & Schiff, in comparison with Phosalone.

In Phosalone treatment 5.14% of beards were affected by pest that in each bunch, 2.74 berries were affected but in Lufox treatment, the obtained percentage of affected were 1.46% that in each beards 0.91 berries were affected.

Most clusters of infection for the first generation was 8/22%, but berry is the highest pollution due to increased sugar levels 5/89% in the third generation. According to the results, a Lufox pesticide is create the highest performance on pest control in every third generation and showed the lowest infection of the clusters and berries.

The analysis of variance percent infected clusters pest and the number of cubes in the clusters of infection (144 clusters) in experimental plots after applying the experimental treatment as shown in Table1 (Table 1).

Table 1: Analysis of variance to the level of pollution in different treatments for clusters and berries.

Resource change	DF	Clusters F	Berries F
Block (Replication)	3	1.30 [n.s.]	2.23 [n.s.]
Treatment	2	44.98**	59.30**
Response	6		
Total	11		
		CV: 3.65%	C.V.: 6.54%

n.s.: no significant difference, **: significant at one percent

The results of Table 1 show that differences between treatments at 1% are significant, but in between blocks of each treatment, this difference is not significant (df 2, 6; F= 44.98; P= 0.0001; CV.= 3.65%).

Average weight of generated clusters in control (untreated) treatment 21.90 ± 4.53, Average weight of generated clusters in Phosalone treatment 22.62 ± 5.72 and average weight of generated clusters in Lufox treatment 36.78 ± 7.74.

Comparison mean of percentage infected clusters and number of infected cubes in each cluster based on a multiple range Duncan test at 1% level of probability shows that Lufox effect on controlling of grape berry moth, *L. botrana* is better than Phosalone and the difference is very meaningful (Table 2).

Table 2: Comparison of levels infection in different treatments.

Treatment	Clusters	Berries
Control (Untreated)	15.87 ± 1.85[a]	10.45 ± 2.18[a]
Phosalone	5.14 ± 0.73[b]	2.74 ± 0.43[b]
Lufox	1.46 ± 0.35[c]	0.91 ± 0.37[c]

Numbers in columns having dissimilar character in 1% are significant

Average infection levels of *Lobesia botrana* in Cluster and Berries in different treatments is shown in Figs. (Figs. 1 & 2).

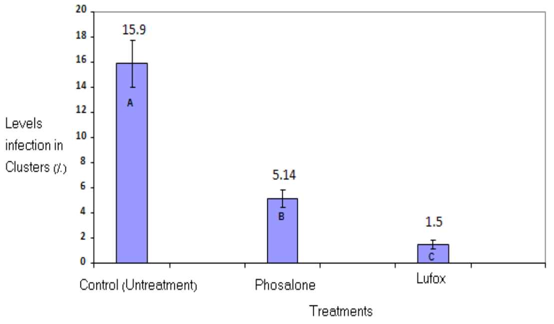

Fig. 1: Average infection levels in clusters in different treatments.

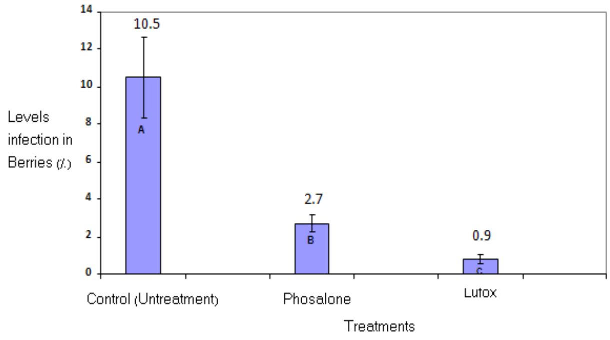

Fig. 2: Average infection levels in Berries in different treatments.

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The catch of pheromone traps show gives this pest in most parts of Iran especially in northwestern of Iran in West Azerbaijan, and in Urmia has completed three generations and spraying against first generation had been done 5-7 days after flight peak, and for second and 3rd generation had been down 4-5 days after flight peaks (Fig. 3).

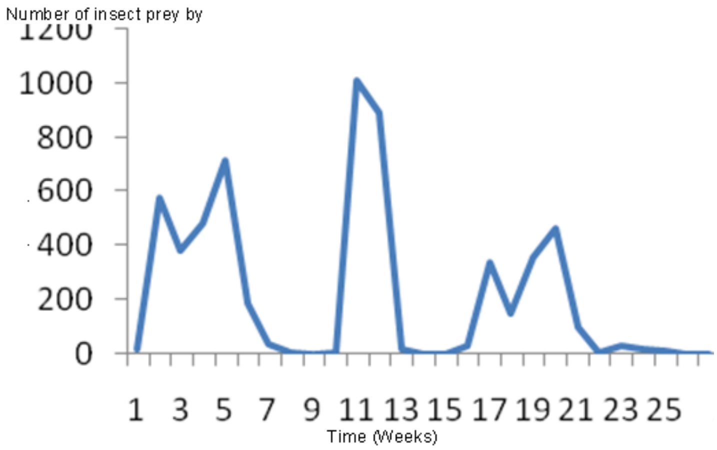

Fig. 3: Graph of flight peaks for *Lobesia botrana* in Urmia (2010).

Fig. 4: Ovicidal, Larvicidal and effect on Adult Lepidoptera of Lufox (Fenoxycarb 7.5% EC + Lufenuron 3% EC.

DISCUSSION

According to the obtained results, Lufox, has better and benefit effect on controlling of grape berry moth, *Lobesia botrana* Den & Schiff, and mixture of juvenile hormone mimic (Fenoxycarb 7.5% EC), and Chitin Synthesis inhibitor (Lufenuron 3% EC), during the investigation it was shown Lufenuron has a destructive effect on the control grape berry moth, on the egg stage, larval ages and adults while, Fenoxycarb is a Juvenile hormone mimic, the impact is devastating on eggs, last larval age and adult. Accordingly Lufox has good control effect on all phases of biological pest grape berry moth, *Lobesia botrana* Den & Schiff (Cantus *et al*., 2008).

Lufox with several other toxins and in combination with several fungicides was used to control fungi Aspergillus and Botrytis in Spain and studied the remaining amount of the poison in wine production, the results showed Lufox had the best performance whether alone or in combination with fungicides used in pest control grape berry moth and fungi listed and left remains the lowest in the product (Minguez *et al*., 2004).

In a similar survey was conducted in vineyards in several cities in Spain of several fungicides with multiple pesticides, including Lufox was used to control Ochratoxin fungi, Lufox In combination with fungicides in this study, controls pest and fungus (Belli *et al*., 2005).

Lufox with several other toxins and in combination with several fungicides was used to control fungi Ochratoxin A in grapes and grape derived products and studied the remaining amount of the poison in wine production, the results showed Lufox had the best performance whether alone or in combination with fungicides used in pest control grape berry moth and fungi listed and left remains the lowest in the product (Varga and Kozakiewicz, 2006).

In these order strict correlation was observed between the number of perforations caused by these larvae and OTA concentrations in grapes. Consequently, researchers at the Institut Coope´ratif du Vin (ICV) successfully used the insecticides Lufox (carbamate type insecticide containing luferunon and fenoxycarb), Decis (a pyrethroid insecticide containing delthametrin) and *B.t* (*Bacillus thuringiensis*) for lowering OTA content of wines (Merrien, 2003).

In Switzerland, several types of insecticides of different groups were used to control two major pest types, *Lobesia botrana* and *Eupoecilia ambiguella* that Lufox was one of these insecticides. The Lufox performance was acceptable on eggs and larval ages of these two pests and the study showed this pesticide no effect on useful insects in nature (Charmillot *et al*., 2006).

In order to control *Lymanteria dispar* was used Lufox pesticide with another several pesticides and results showed highly significant different on egg and larval ages of this pest (Zartalouidis *et al*., 2009).

To control two important pests on banana, during two different researches, several IGR insecticides including Lufox were used to control two pest, *Chrysodeixis chalcites* and *Dysmicoccus grassii* that Lufox having an excellent effect on the two pests and controlled the two major pests and no effect was hand beneficial insects released on biological control (Gonzalez *et al*., 2009 a,b).

During the two study, conducted on female and male of *Schistocerca gregaria* in Egypt, reviews were two types of IGR Insecticides including Lufox on ovaries of female locusts and testes of male locusts that results showed the Lufox had a devastating impact on the sperm derived by males and eggs produced by females and on the different parts of the testes and ovaries locusts. Reduced fertility and fecundity this important pest and has to zero and even had the effect on longevity adults (Reda *et al*., 2010 a, b).

In a review, some pesticides remain, biological pesticides including *B.t* and IGR pesticides including Lufox in animals and humans body achieved products created by animals for food and fruit for human's consumption of grape that was done through various methods results showed that low levels remained Lufox pesticide in products (Varga *et al*., 2010).

According to a study result that was in a vineyard in the village Rykan in Imamzadeh regional city of Urmia in West Azerbaijan province in the North West of Iran, Lufox, a new IGR Insecticide, was higher and better than the common poisons Phosalone during the third generation in the control of grape berry moth, recommended this pest control compilation. These studies are fundamental to use of Lufox in *Lobesia botrana* Den & Schiff (Lepidoptera: Tortricidae), management.

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