ATTRACT & KILL TECHNIQUE AGAINST *LOBESIA BOTRANA* DEN.&SCHIFF. (LEPIDOPTERA: TORTRICIDAE) IN ROMANIA

Silvia Cazacu[1], Sonica Drosu[2], Loreta Dumitrascu[1], Lucia Gansca [3], Ion Oprean[3]*

[1]Research Development Institute for Viticulture Valea Calugareasca, Department of Plant Protection
[2]Research Development Institute for Plant Protection Bucharest
[3] Research Institute for Chemistry "Raluca Ripan" Cluj-Napoca

[*] correspondence address:
Research Development Institute for Viticulture Valea Calugareasca
Department of Plant Protection
Phone number: 0040244236300
E-mail: silvia.cazacu@yahoo.com

Abstract: This paper presents the results of the studies carried out during 2006-07 in 3 vineyards situated in the representative wine growing centres of Romania (Research Development Institute for Viticulture Valea Calugareasca situated in middle of the country, Research Development Station for Viticulture Murfatlar in the South-Eastern and Research Development Station for Viticulture Iasi in Eastern part of the country) with a product PRELUDIU LB used in *Attract* & *Kill* technique. The product, obtained by Research Institute for Chemistry "Raluca Ripan" Cluj-Napoca, consists of a viscous formulation containing specific grapevine moth *(Lobesia botrana)* pheromone (E-9-dodecenylacetate and E,Z-7,9-dodecadienyl acetate) and a pyrethroid. The formulation was applied uniformly on the branches of the vines, by hand (400g/ha), 1-2 time in the season, depending of the infestation level. The efficacy of a Romanian product PRELUDIU LB was ranging between 61.20-81.37% in the two years study; the losses of the yield were reduced with 25-33%. The results of this strategy show that it can compete with conventional spray applications and is therefore a good alternative for grapevine moth control in integrated wine growing.

Key words: grapevine moth, pheromones, *Attract* & *Kill* technique

INTRODUCTION

The grapevine moth, *Lobesia botrana* (LB), is the most important pest in some vineyards in Romania. Currently, grapevine moth control relies primarily on conventional spray applications. The grapevine moth is successfully controlled with pheromone, but the most common use of pheromones is still for prognosis.

The *mating disruption* is an efficient method to direct control of the grapevine moth, studied for many years (Roehrich and Carles 1982 in France, Krieg et al. 1987 in Germany, Varner and Ioriatti 1992 in Italy, Perez Marin et al. 1995 in Spain) and becoming more and more widespread in European vineyards (Friedrich, and Schirra 2001 in Germany, Varner et al. 2001, Ciglar et al. 2002 in Croatia, Charmillot and Pasquier 2004 in Switzerland, Kapothanassi et al. 2004 in Greece, Gordon et al. 2005 in Israel, Nansen et al. 2007 in England).

Studies on the *Attract* & *Kill* strategy, involving the combination of the pheromone with an insecticide were also achieved (Charmillot et al. 2005). Degen et al. (2005) reviews the various methods based on the uses of sexual pheromones, which were used in the past, are currently in use or still in development: mass trapping, attract-and-kill, auto sterilization, mating disruption (conventional, falsetrail following, micro-encapsulated formulations, auto-confusion). The theoretical mode of action and strengths and weaknesses of each technique, a general assessment of the various procedures are discussed.

In Romania, Research Institute for Chemistry from Cluj-Napoca has synthetisized pheromones for different species, including grapevine moth and same papers present the results of the studies done (Jacob 1977, Filip and Guluta 2004).

This paper presents the results of the trials carried out during 2006-07 with the Romanian

product PRELUDIU LB used as an *Attract* & *Kill* method, alternative for grapevine moth control in integrated wine growing.

MATERIAL AND METHOD

The product PRELUDIU LB used in *Attract* & *Kill* technique was obtained by the Research Institute for Chemistry "Raluca Ripan" Cluj-Napoca and consists of a viscous formulation containing specific grapevine moth *(Lobesia botrana)* pheromone (E-9-dodecenylacetate and E,Z-7,9-dodecadienyl acetate) and a pyrethroid. The formulation was applied uniformly on the branches of the vines, by hand (400g/ha), 1-2 time in the season, depending of the infestation level. In 2006 was applied 2 treatments (first time after the first moths in pheromones traps and the second one about six weeks later) and in 2007 was applied only one treatment at the beginning of the second generation because of high temperature that influenced the development of the pest and the attack level.

The field trials were done in 3 vineyards situated in the representative wine growing centres of Romania (Research Development Institute for Viticulture Valea Calugareasca situated in middle of the country, Research Development Station for Viticulture Murfatlar in the South-Eastern in 2006 and Research Development Station for Viticulture Iasi in Eastern part of the country in 2007).

Each surface of the experience was divided into 3 sections on about 0.5 ha for each location. In the first section, the *Attract* & *Kill* treatment with PRELUDIU LB was applied; the second variant was the commercial treatment (standard) and the third, without treatment against target pest, constitutes control. In the second variant the treatments were: at RDIV Valea Calugareasca Karate Zeon in 2006 and Vertimec 1.8 EC in 2007, at RDSV Murfatlar and at RDSV Iasi Decis 25WG were applied for the control of grapevine moth.

The efficacy estimation of the product PRELUDIU LB used in *Attract* & *Kill* treatment was made by the pheromone traps, monitoring the grapevine moth flight activity in those 3 variants (the catches of LB males were checked two time/week and sticky inserts were changed in case of need) and also by evaluation of the injury on treated as well as on untreated plots, sampling 400 blossoms for the 1 st generation and 400 grapes for the 2^{nd} and 3^{rd} generations from 40 vines taken at random.

The efficacy of the *Attract* & *Kill* method was established by Abbot formula. The injury was evaluated calculating the loss of yield on treated and on untreated variants.

RESULTS

The table 1 shows the efficacy of the *Attract* & *kill* technique in two years studies in the three vineyards. It can observe that product PRELUDIU LB controlling grapevine moth had the efficacy ranging between 61.20% and 81.37%, less than chemical standard (87.57%-93.0%). Even the efficacy of the studied product was less than chemical standard this method can be a good alternative for grapevine moth control in integrated wine growing respectively.

Another reason to recommend this method is the decrease of the yield injuries. The table 2 presents yield losses caused by grapevine moth; the loss of yield was less with 25% compared with standard and with 28% compared with untreated plot.

Figure 1 presents the attack level in the experimental variants in the 3 vineyards. It can observe the lower level of the attack in 2007 when the critical temperature influenced the life cycle of grapevine moth and his potential of attack.

In the studies carried out in Romania, the efficacy of the treatments with pheromone by *Attract & kill* technique was checked using pheromone traps that recorded insects flight in the all 3 variants (Tab. 3). It can be observed that *Attract* & *kill* variant recorded a low number of the catches; that means there is a low copulation activity. The combination pheromone-insecticide has a contact action; males are attracted by pheromone and are killed by the insecticide within hours. Thus, the reproduction is inhibited. In the untreated control there was continuous flight and 2-3 picks registered (Fig. 2). Figure 2 presents the dynamics of the grapevine moth in the two years studies. The flight activity lasts from the beginning of May to the end of August.

CONCLUSIONS

The results of the studies presented in this paper confirm those of the authors from different countries. The effectiveness of the *Attract & kill* technique was also lower than that of the classical control in some trials carried out in Switzerland (Charmillot et al., 2005). Many authors of the studies in pheromone field, including Friedrich and Schirra (2001) have related that pheromone products act more efficiently when the population levels are lower. Despite of the lower efficacy than that of the classical control, it can recommend this method due to the specificity of the sex-pheromones employed that ensures that only the target specie is affected, avoiding deleterious effects on beneficial and other non- target organisms, thus being a safety method for humans and environment (Degen et al. 2005).

The literature, based on the results obtained during many years on the large surfaces, shows that the *Attract & kill* technique and the products used have reduced the attack level of the grapevine moth (Charmillot et al. 2005, Degen et al. 2005).

REFERENCES

CHARMILLOT, P. J., PASQUIER, D. (2004). Isonet: une nouvelle gamme de diffuseurs pour la lutte par confusion contre les vers de la grappe. Revue Suisse Vitic. Arboric. Hortic. Vol. 36 (2), 95-100

CHARMILLOT, P. J., DEGEN, T., PASQUIER, D., BRIAND, F. (2005). New pheromone-based methods for grape moth control. Preliminary trials in 2004. Rev. Suisse de Vitic., Arboric. et Hortic., 2005, Vol. 37, Nr. 5, 283-288

CIGLAR, 1., BARIC, B., TOMSIC, T. and SUBIC, M. (2002). Control of grape berry moths (Eupoecilia ambiguella Hb., Lobesia botrana Den. & Schiff; Lepidoptera: Tortricidae) by mating disruption technique. Frag. Phytomed. Herbolog. 27:31-37

DEGEN, T., CHEV ALLIER, A., FISCHER, S. (2005). Evolution de la lutte pheromonale contre les vers de la grappe. Revue Suisse de Viticulture Arboriculture Horticulture, Vol. 37, Nr. 5, 283-288

FILIP, 1., GULUTA, F. (2004). Integrated control of grape berry moth *(Lobesia botrana* Den & Schiff) in Romania. Acta Horticulture 652

FRIEDRICH, L. and SCHIRRA, K. J. (2001). Mating disruption of Lobesia botrana (Lepidoptera: Tortricidae) in vineyards with very high population densities. IOBC wprs Bulletin Vol. 24 (2), 75-79

GORDON, D., ANSHELEVICH, L., HAREl, M., DUNKELBLUM, E., HARARI, A., ZAHA VI, T. and OV ADIA, S. (2005). Mating disruption of Lobesia botrana (Lepidoptera: Tortricidae): Effect of pheromone formulations and concentrations. J. Econ. Entomol. 98:135-142

IACOB MARIA (1977). Actiunea feromonilor sexuali de sintezil in avertizarea tratamentelor de combatere a unor daunatori ai plantatiilor pomicole si viticole. Analele ICPP, XII, 197-215

KAPOTHANASSI, V., MOSCHOS, Th., SOULIOTIS, C. and BROUMAS, T. (2004). Control of the European Grapevine Moth Lobesia botrana in Greece by the Mating Disruption Technique: A Three-Year Survey. Phytoparasitica. 32:83-96

KRIEG, W., NEUMANN, U., SEUFERT, W. and KAFKA, W. (1987). Biological activity of Z-9-dodecenyl acetate for mating disruption of Lobesia botrana. Bull. OILB-SROP. 10:47-50

NANSEN, C., MacDONALD, K. M., ROGERS, C. D., THOMAS, M., POPPY, G. M., BAXTER, 1. H. (2007). Effects of sex pheromone in electrostatic powder on mating behavior by *Lobesia botrana* males. J. Appl. Entomology, Vol. 131, Issue 5, 303310

NEUMAN, U., V. HARRIS, A. GASSER (1992). Recent advances with mating disruption technique in apple and grapes - factors influencing the success of pheromones. Brighton Crop Protection Conference, Pest and Diseases, 1045-1050

PEREZ MARIN, J.L., ORTEGA SAENZ, C., PALACIOS RUIZ, E. and GIL ALBARELLOS MARCOS, C. (1995). A new method for control of grapevine moth, Lobesia botrana: sexual confusion. Bol. Sanidad Vegetal, Plagas. 21:627-640

ROEHRICH, R. and CARLES, J.P. (1982). Test of mating disruption in a vineyard against the vine moth Lobesia botrana Schiff. Colloq. l'INRA. 7:365-371

VARNER, M. and IORIATTI, C. (1992). Mating disruption of Lobesia botrana in Trentino (Italy): organization of the growers and first results. Bull. OILB-SROP. 15: 121-124

VARNER, M., MATTEDI, L., RIZZI, C. and MESCALCHIN, E. (2001). Mating disruption in viticulture: experiences in Trentino. Inf. Fitopatol. 51:23-29

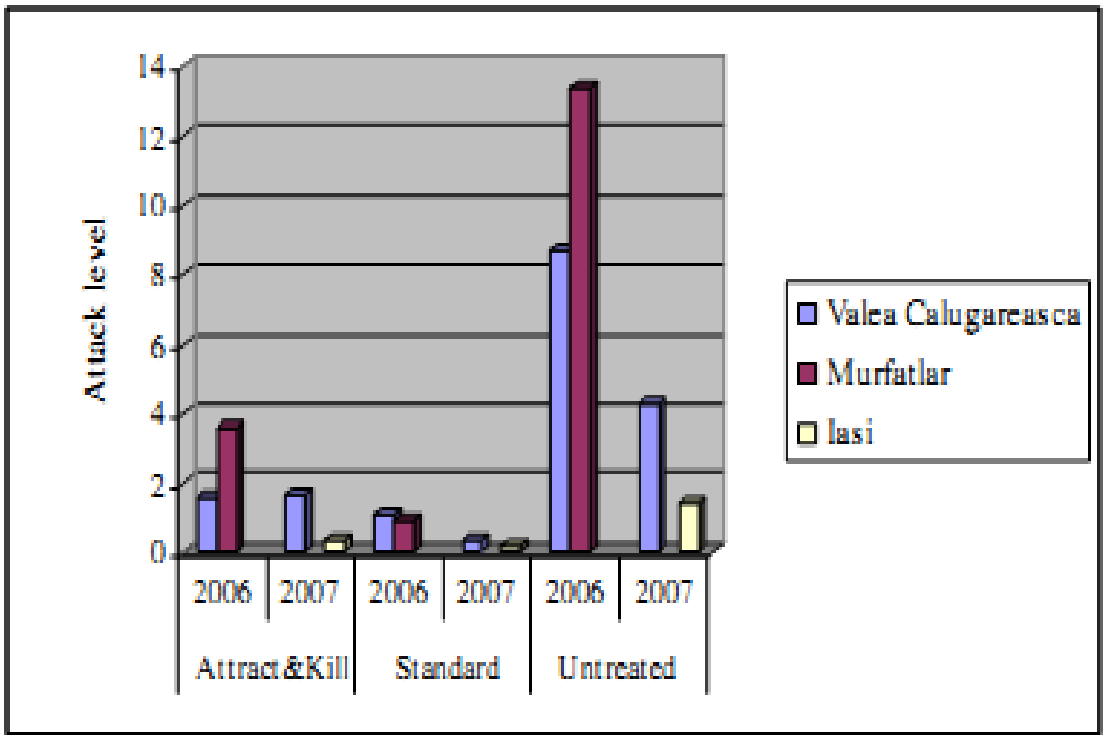

Fig. 1 The attack level of grapevine moth

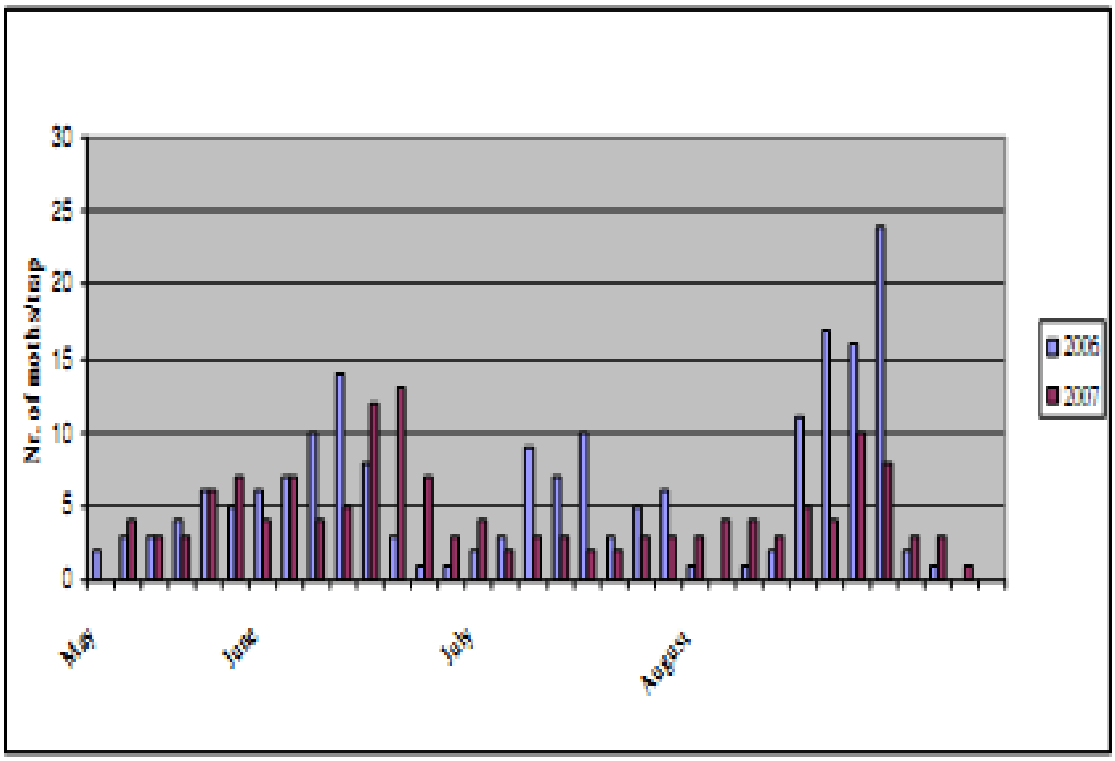

Fig. 2 The *Lobesia botrana* flight moth's dynamics