

Experience with mating disruption against apple clearwing moth (*Synanthedon myopaeformis*)

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Abstract

The effect of mating disruption method (Isomate P, Shin-Etsu) on Apple clearwing moth (*Synanthedon myopaeformis*, Borkhausen, 1789) was studied during the years 2010 – 2013 in the Czech Republic. Study was carried out in two production apple orchards. Chosen localities were Tucharaz (middle Bohemia) 36 ha and Stošíkovice (south Moravia) 12 and 6.5 ha (MD only in 2010 and 2011). Both localities have been covered with mating disruption since 2010. In April we investigated the average number of *S. myopaeformis* caterpillars per tree every year. The following average numbers of caterpillar per tree were found on the locality Tucharaz: 2010 – 0.57, 2011 – 0.36, 2012 – 0.17, 2013 – 0.40. Following numbers were found in Stošíkovice: area 12 ha 2010 – 1.63, 2011 – 0.6, 2012 – 1.31, 2013 – 1.56; area 6 ha 2010 – 1, 2011 – 0.1, 2012 – 0.69, 2013 – 0.31.

Keywords: mating disruption, apple, apple clearwing moth, pheromone

Introduction

The mating disruption method is based on continuous release of female sexual pheromone from the special designed dispenser. Such dispensers are placed in to the orchard in pest species specific number before the first flight of pest. Sexual pheromone is gradually released and part of it cleaves on leaves. Such green matter has a role of secondary dispenser. As a result the whole orchard area is covered by female sexual pheromone. Consequently males are not able to find females and mating is disrupted.

Mating disruption method (Shin-Etsu) in the Czech Republic was used in 2005 for the first time. Since then areas where this method is used are still increasing. This method is currently used against codling moth – *Cydia pomonella* L (Isomate C plus), oriental fruit moth - *Grapholita molesta* Busck, 1916 and plum fruit moth – *Grapholita funebrana* Treitschke, 1835 (Isomate OFM rosso), summer fruit tortrix - *Adoxophyes orana* Fischer von Röslerstamm, 1834 and dark fruit-tree tortrix - *Pandemis heparana* Denis & Schiffermüller, 1775 (Isomate C/LR) (Psota, 2014). Some trials were made also against Currant Clearwing - *Synanthedon tipuliformis* in the Czech Republic (Ouředníčková, 2011). There is also Shin-Etsu mating disruption against apple clearwing moth called Isomate P. It contains 80.4 % of (Z,Z)-3,13 Octadecadien-1-yl Acetate and 3.3 % of (E,Z)-3,13 Octadecadien-1-yl Acetate. Unfortunately this product is still not commercially available in Europe.

On the other hand apple clearwing moth is a serious problem in many apple orchards in the Czech Republic. Its harmfulness is increasing especially in old orchards. This pest is attacking in preference regularly and deeply cut trees (Laštůvka & Šefrová, 2012). Harmful occurrence of this pest is well known all over the Czech Republic. Damaged trees are slowly wasting and have short longevity. Apple clearwing moth larva lives in phloem under the bark and therefore it is almost impossible to spray successfully any insecticide (Alford, 2007). Restriction of bark injury is possible preventive measure (Schloffer *et al.*, 2003). Current control is promoted by food attractant traps. Such traps contain dilution consists of beer and apple juice in 1:1 ratio (Lánský *et al.*, 2005). Erler (2010) tried to cover tree stems

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with cotton oil during two years. He found 80 % decrease of adults and pupal exuvia after the first year.

Boldyrev & Dobroserdov (1980) observed parasitization rate of apple clearwing moth larvae by parasitoid *Leskia aurea* within eight years. They found out that 3-45 % of larvae were parasitized. Birds could reduce apple clearwing population by eating larvae (Schloffer *et al.*, 2003).

In general there is serious demand for real effective control of apple clearwing moth in the Czech Republic. Such demand could be fulfilled by mating disruption product Isomate P. Therefore we are testing this method in two locations. The main reason of these trails is to get experience before the authorisation of Isomate P.

Material and Methods

We have studied the effect of mating disruption (Isomate P, Shin-Etsu) on apple clearwing moth larvae average number. One dispenser contains 180 mg of sexual pheromone. The standard application dosage is 300 dispensers per hectare. Mating disruption method Isomate P has meaning especially in young orchards that are threatened by nearby source of apple clearwing moth. In such orchards the aim is to keep the population of apple clearwing moth at the possible lowest level for several years. Therefore we have chosen two locations where relatively new young orchard neighbouring with old one having strong apple clearwing moth population.

On the first site (Tuchoraz, middle Bohemia) Isomate P was applied on the area of 36 ha (fig. 1). This orchard was planted at 2005 with apple varieties Gala, Golden Delicious and Idared. The mating disruption was first applied in April 2010. We kept the standard dispenser dosage during whole trial.



Figure 1: Situation map of the location Tuchoraz

The second site is located in South Moravia (village Stošíkovice). This site was consist of two neighbouring orchards (Orchard 9 – 6.5 ha, planted in 2009 and Orchard 10 – 12 ha, planted in 2007) (fig. 2). Grown apple varieties were Gala, Golden Delicious, Idared and Breaburn. First application of mating disruption was in April 2010. After the first year the dispenser dosage was, due to the economical reason, decreased to 220 dispensers per hectare. Site Orchard 9 was covered by pheromones only during years 2010 and 2011. We have also evaluated the apple clearing moth larvae number in neighbouring orchard without MD (control plot, red coloured area). This orchard is markedly older with wider spacing thus particular numbers cannot be compared with those from the treated orchard. Therefore we were able only to compare long-term trend of apple clearing moth larvae number.



Figure 2: Situation map of the location Stošíkovice.

At each location we have always evaluated in April average incidence of apple clearing moth larvae. We precisely inspect the bark at the base of the trunk. Damaged areas were incised with a knife, and noted the possible presence of larva. We always evaluated 75 trees in the location Tucharaz and 16 trees in each orchard in Stošíkovice. Data from the first assessment in 2010 represents the initial larva numbers before mating disruption application.

Results

The summary results from both locations are shown in Table 1.

The continuous decrease of the apple clearwing moth larvae number was found during the two years after the mating disruption application in Tucharaz location. The average larvae number increased in 2013.

The decrease of apple clearwing moth larvae number was found after the first year from mating disruption application in the site Orchard 9 (location Stošíkovice). During the following years larvae number has slightly increased. Although this site was last treated with mating disruption in 2011 average larvae number in 2013 is still lower than in year 2010.

In site Orchard 10 the same trend as in Orchard 9 was recorded. It means significant apple clearwing moth larvae number after the first year. During following years the increasing trend has occurred.

In control plot the increasing trend between the years 2010 and 2012 was observed. It is in contradiction with situation in Orchard 9 and Orchard 10. The rapid decrease of larvae number in year 2013 could be caused by population dynamic of apple clearwing moth in this site.

Table 1: Average apple clearwing moth larvae number on the location Tucharaz and location Stošíkovice.

Year	Tucharaz	Stošíkovice		
		Orchard 9	Orchard 10	Control plot
2010	0.57	1.00	1.63	1.68
2011	0.36	0.10	0.60	2.10
2012	0.17	0.69	1.31	2.60
2013	0.40	0.31	1.56	1.38

Discussion

Decrease of apple clearwing moth larvae number was observed after the mating disruption Isomate P was applied in both locations. It is positive to find out that larvae number is still lower after the three years from the last MD application in comparison to the initial numbers. The decrease of MD dispenser dosage could have some effect on average larvae number increase in the location Stošíkovice.

The long-term trend of larvae number is different from MD covered sites in comparison to control site in Stošíkovice location. This difference is the strongest between the years 2010 and 2011. This finding supports the effect of MD.

The life cycle of apple clearwing moth has probably also strong effect on the larvae number. Therefore the continuation of this trial is essential in order to get more clear evidence of MD effect.

Unfortunately due to absence of similar studies, our results cannot be confronted. However, thank to this study, we believe that using the mating disruption Isomate P can keep the population of apple clearwing moth in young apple orchards on the minimum level for several years.

This research will continue in the following years in two selected locations.

Acknowledgements

We would like to thank to growers from Tuchoraz and Stošíkovice for their participation in this research. This research was supported by The Ministry of Agriculture of the Czech Republic (project number QJ1210209).

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