

Control of codling moth *Cydia pomonella* L. by using CIDETRAK® CMDA COMBO™ MESO™ dispensers in Bulgaria

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Abstract

*Organic fruit production is one of the most attractive directions for Bulgarian farmers. However, it meets serious difficulties – due to a long list of pests occurring in the orchards compared to the short list of plant protection products permitted for use in this system. The codling moth (CM), *Cydia pomonella* L., causes heavy damage in Bulgarian apple orchards. In spite of numerous chemical treatments, these orchards show increasing flight densities of CM moths, growing populations of hibernating larvae, and rising fruit damage rates. Thus, the control of CM by conventional spraying programmes have become ineffective, apparently due to the development of resistance to insecticides. The trials were carried out during the years 2016-2017 in North East of Bulgaria. The aim of this study was to test the effectiveness of mating disruption (MD) for control of codling moth, in apple orchards comparing CIDETRAK® CMDA COMBO™ MESO™ dispensers at high and low rates of 80 and 20 dispensers per ha. These products were developed and are manufactured by Trécé Inc., USA. Fruit damage in the trial plot was compared with that in the reference orchard, located in the vicinity, which was treated with conventional pesticides. Damage in the trial (MD) plot increased slowly with time. And even in late cultivars, fruit damage by CM in the MD plot was below the economic threshold – from 0.5 to 1.5%. Mating disruption is an option that may be effective in controlling codling moth, provided that an orchard has a proper size, shape, isolation and low or moderate population density. The present results confirm that mating disruption, using CIDETRAK® CMDA COMBO™ MESO™ dispensers against codling moth, can provide more effective control compared to insecticide treatments alone. The usage of CIDETRAK® CMDA COMBO™ MESO™ dispensers at reduced rates of 80 and 20 dispensers per ha shows that the number of dispensers used does not affect the effectiveness of mating disruption. The reduced rate of dispensers used will help growers to decrease labor in the field. Applications of these dispensers can provide effective control of codling moth, with better results than the conventional protection programmes employed in Bulgaria.*

Keywords: Codling moth, apple, mating disruption, CIDETRAK® CMDA COMBO™ MESO™ dispensers

Introduction

Organic fruit production is one of the most attractive directions for Bulgarian farmers. However, it meets serious difficulties – due to a long list of pests occurring in the orchards compared to the short list of plant protection products permitted for use in this system. Reduction of pesticide use is an important issue for human health (Lee et al. 2004), as well as for conservation of biodiversity (Mc Laughlin 1995). Hence, there is an urgent need to find alternative solutions for crop protection from pests.

After entering into the EU, many conventional pesticides have been completely prohibited. Therefore, alternative methods have been extensively tested during the last years. Sex pheromones are harmless and effective means for monitoring and control of the pests.

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Pheromone traps have been widely applied in the world plant protective practice as additional means or substitute to the laborious, traditional methods for monitoring of the insect pest species (Wright 1970 ; Giannotti and Orlando 1975).

Accordingly, mating disruption appears to be a very promising solution. The codling moth, *Cydia pomonella* L., remains the principal insect pest of apple, pear, and walnut in Bulgaria. Till the present time it has been controlled by routine applications of a broad spectrum of insecticides, such as organophosphates, to maintain this pest at an economically acceptable level. Disadvantages of such practices include strongly negative effects on beneficial species and eventually development of resistance to insecticides used (Sauphanor et al. 2000; Boivin et al. 2001). The presence of strong insecticide resistance was reported for codling moth strains collected from some orchards in Bulgaria (Charmillot et al. 2007). In spite of numerous chemical treatments, these orchards show increasing flight densities of CM moths, growing populations of hibernating larvae, and rising fruit damage rates. Thus, the control of CM by conventional spraying programmes have become ineffective, apparently due to the development of resistance to insecticides.

Objectives

The aim of this study was to test the effectiveness of mating disruption (MD) for control of CM (codling moth), in apple orchards comparing CIDETRAK® CMDA COMBO™ MESO™ dispensers at high and low rates of 80 and 20 dispensers per ha. These products were developed and are manufactured by Trécé Inc., USA

Methods

The trials were carried out during the years 2016-2017 in North East of Bulgaria. Monitoring of CM flight was carried out by sex pheromone trapping in the years of the study. PHEROCON® VI Delta, sticky traps, were installed in the trial orchard using a scheme provided by the producer. The traps were baited with standard PHEROCON CM L2 – codlemone. The traps and lures used were products of Trécé Inc., USA. The traps were installed before CM flight started. For comparison, PHEROCON® VI Delta sticky traps were installed in a reference orchard located in the same region, which was treated with insecticides only. All pheromone traps were checked twice a week.

CIDETRAK® CMDA COMBO™ MESO™ mating disruption dispensers contain a unique combination of codling moth pheromone and a patented male and female behavior modifying kairomone called DA. They are designed to deliver long-lasting performance with remarkably fast application for apples, pears and walnuts.

CIDETRAK® CMDA COMBO™ MESO™ provides a dramatic reduction of dispenser rate and increased performance. We used these dispensers at the dosage 80 and 20 dispensers per ha.

The damage to apples was inspected during the season and at harvest on 1600 apples.

Results and discussion

In the reference orchard the first flight of codling moth in 2016-2017 began in the last decade of April and finished till the third week of September (Fig. 1, 2). The pest developed 2 full generation during the years of study.

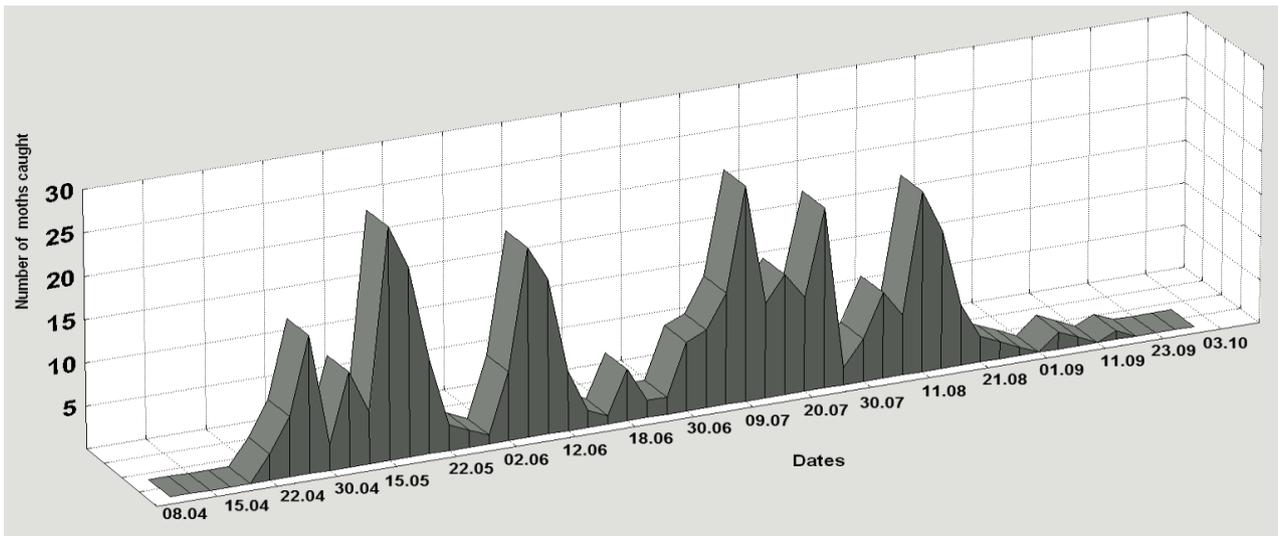


Figure 1. Flight dynamics of codling moth (*Cydia pomonella* L.) in the reference apple orchard in 2016.

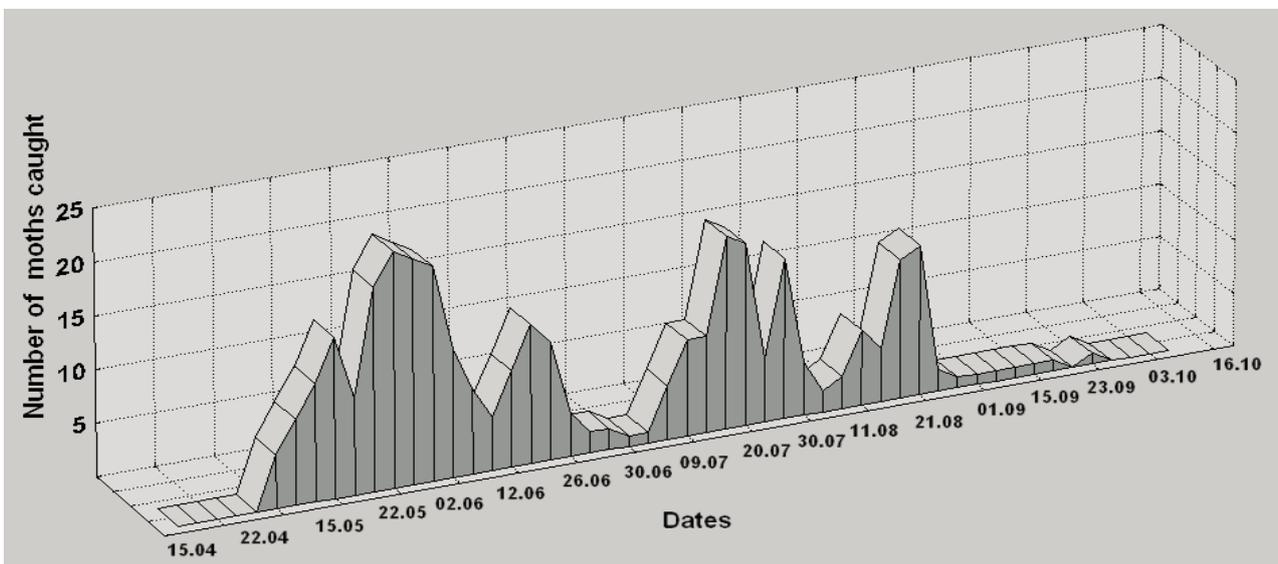


Figure 2: Flight dynamics of codling moth (*Cydia pomonella* L.) in the reference apple orchard in 2017.

CIDETRAK® CMDA COMBO™ MESO™ at 80 and 20 dispensers/ha, completely inhibited CM captures in the pheromone traps, installed in the trial plot, indicating a high level of disruption. The result with MD in apple orchards was very positive in the years of the study. And there was almost no difference between high and low rates of the dispensers used. Fruit damage in the trial plot was compared with that in the reference orchard, located in the vicinity, which was treated with conventional pesticides. Damage in the trial (MD) plot increased slowly with time. And even in late cultivars, fruit damage by CM in the MD plot was below the economic threshold – from 0.5 to 1.5%. Ten insecticide treatments were applied in a nearby, conventionally treated orchard during each season, to control CM and other pests. Nine to ten of them were timed against CM. The fruit damage by CM in this orchard was from 5.2 to 8.4 % in the successive years. The economic threshold in Bulgaria is 1.5-2% damaged fruits at harvest time. The significance of differences in the damage rate between the trial and reference orchards was estimated by use of Chi-square tests.

Considering the risks of pollution of the environment and fruits, reduction of use of chemicals in fruit production is an urgent need. Monitoring of pests by use of pheromones is helpful in reducing insecticide treatments, by more precise timing. The resistance of insects to insecticides, oblige to introduce non-chemical pest control methods. Mating disruption is an option that may be effective in controlling codling moth, provided that an orchard has a proper size, shape, isolation and low or moderate population density. In orchards with a high density of codling moth, a combination of mating disruption with insecticides and/or granulosis virus for orchards registered for a biological production may be a perspective strategy.

Conclusions

The present results confirm that mating disruption, using CIDETRAK® CMDA COMBO™ MESO™ dispensers against codling moth, can provide more effective control compared to insecticide treatments alone. The usage of CIDETRAK® CMDA COMBO™ MESO™ dispensers at reduced rates of 80 and 20 dispensers per ha shows that the number of dispensers used does not affect the effectiveness of mating disruption. The reduced rate of dispensers used will help growers to decrease labor in the field. Applications of these dispensers can provide effective control of codling moth, with better results than the conventional protection programmes employed in Bulgaria.

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