

Early studies on mating disruption technique of codling moth, *Cydia pomonella*, in the Aegean Region, Turkey

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Abstract-*Cydia pomonella* is the key pest in apple orchards in Turkey. The studies concerning the mating disruption technique were carried out in an 3 ha isolated apple orchard between 1996-1999 years in Aegean region. The experimental orchard was divided up three blocks. The dispensers were applied in mating disruption block before the first appearance of the spring moth only once throughout the season. Chemical treatments were applied in the second block according to forecasting and warning system. Relatively smaller the third block left as control. Weekly moth catches were checked in the pheromone traps placed in each block. Assessments were based on the numbers of fruit damaged fallen down during the vegetation and the number of infested fruits at the harvest. As for the result of four year studies, infestation rates were found to be 7,32%, 35,01%, 1,46% and 11,92% in the years of 1996-1999 respectively.

Key words : Sex pheromone, mating disruption, apples, codling moth, *Cydia pomonella*

Introduction

Codling moth (*Cydia pomonella* (L.)) is the major pest in the apple growing areas of Turkey and causes 40-60 % crop losses under inadequate control measures. Its control has been based on Forecasting and Warning system since 1984 and by utilising this technique the pest can be suppressed with 2-4 sprayings yearly. However, undesired side effects of the chemical control on environment and natural balance have led the researchers to seek the alternate control methods. Mating disruption (MD) technique which seems to be the most promising biotechnical aspect of codling moth has been investigated by many researchers up to date (Rama,1997; Charmillot,1997; Waldner, 1997). This technique was first applied against the codling moth in Turkey.

Materials and Methods

The experiment was conducted in a 3 ha apple orchard in Balıkesir-Dursunbey in Aegean Region within the years of 1996-1999. Apple varieties were Golden Delicious and Starking. MD was conducted on 215 trees while the number of trees were 312 and 43 in chemically treated and control parcels respectively. Pheromone traps (Pherocon) were utilised to maintain the population trend of the pest. The dispensers used were Isomate - C-Plus (Shin - Etsu

Chemical Co., Tokyo), containing 52.9% E,E-8,10-Dodecadien-1-ol, 29.7% Dodecanol, 6.0% Tetradecanol and 11.4% inert ingredients in 165 mg/dispenser. The dispensers were applied according to recommendations at 1000 dispenser/ha, before the first appearance of the spring moth and once during the season. The trees at the edge of the orchard were applied as double. Assessments were based on the numbers of fruits which fell down during the vegetation (weekly) and the number of infested fruits at the harvest. Weekly moth catches were also taken into consideration. In 1999, dispensers were weighed in order to determine the amount of pheromone left inside.

Results and discussion

During the years of the study conducted, codling moth flights were observed between the period of late april- early may and early september (Fig. 1).

The pest was suppressed with 2 and 3 sprayings in the chemically treated parcel in the years of 1996-1998 and 1999 respectively.

As for the result of 4-year mating disruption applications, the lowest infestation rate was found to be 1.46% in 1998 (Tab.1); by the time the lowest population density was also observed. On the other hand the highest infestation rate was found to be 35.01% when the population density was highest in 1997 (Tab.1, Fig.1). However, dispensers used in that year were manufactured in 1995. Consequently, by considering some loses on the effectiveness of the dispensers with time, these results were not taken into consideration. Besides the results of 1997, the efficiency of mating disruption technique was supposed to be higher in subsequent years. However, the population trend seemed high and the infestation rate was found to be 11.98%, as was not expected in 1999 (Tab.1, Fig.1).

Table 1. Fruit infestation rates of the MD experiments conducted in Balıkesir Dursunbey in 1996-1999

Year	Fruit infestation (%)		
	MD block	Sprayed	Control
1996	7.32	1.00	18.03
1997	35.01	1.83	10.50
1998	1.46	2.21	13.91
1999	11.98	2.99	17.42

Witzgall et al (1997) has reported that some male moths were also attracted from nearby untreated orchards. The author has also stated that partly copulation was a possibility on the top of the trees at the edge of the orchards. Parallel to these findings, although there was no capture in the traps, there was a high infestation rate in MD parcels in 1999.

Charmillot et al (1997) has studied on the weight and gas-chromatographic analysis of the Isomate-C-Plus dispensers and has found that approximately 50% of the pheromone inside the dispensers was left for the next season. Thus density of 500 dispenser/ha give the same result in subsequent years. In our studies, the weights showed that the pheromone of the dispensers completely diffused in a single season (Fig. 2).

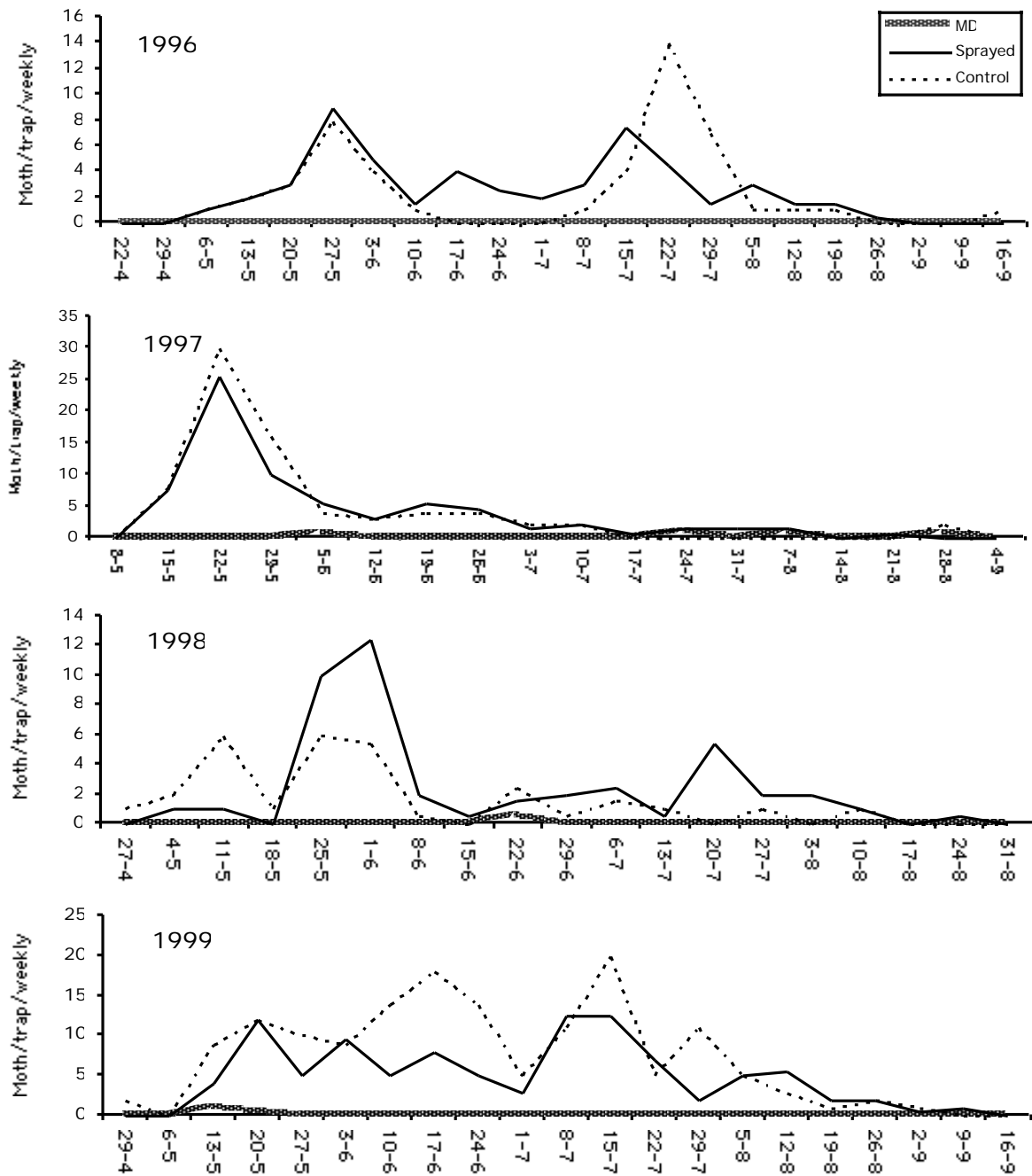


Figure 1. Pheromone trap catches of the MD, sprayed and control plots in Balikesir-Dursunbey in 1996-1999

Figure 1 shows the comparison between the flight period of codling moth in 1999 and diffusion rate of the dispensers in 1999. The flight period of codling moth lasted until the mid-september whereas the dispensers lost their effectiveness by August 13th. This probably was the result of the high infestation rates due to the damage occurred at that period.

Witzgall et al (1997) and Charmillot (1997) stated that mating disruption is a promising and widely used technique for the codling moth being an environmentally- friendly approach

and getting ecological safe yield. Between the years of 1996 and 1999, no chemical application was needed against spider mites in mating disruption parcel. Spider mites were suppressed by predatory mites in mating disruption parcel. Our studies have also showed that the efficiency of this technique may be increased by using dispensers containing enough

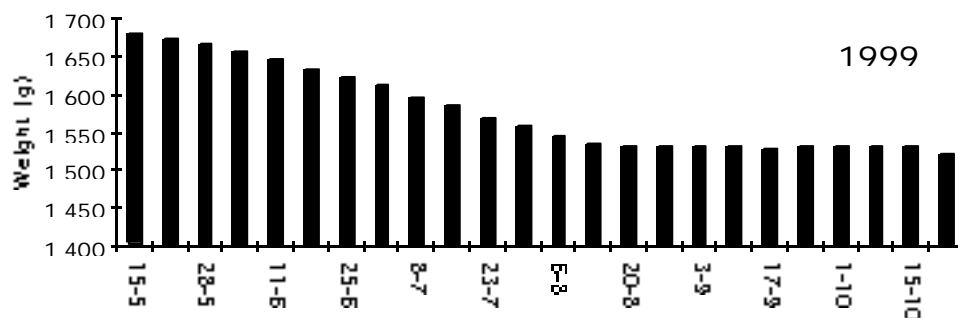


Figure 2. The weight of the Isomate-C-Plus dispensers (average 5 dispensers/week)

amount of pheromone to match our ecological conditions. On the other hand, this technique can be combined with an appropriate insecticide application when the population density of codling moth is higher and flying period is longer. The future of the ecological agriculture shall be based on the implementation of these kinds of alternate control methods.

Acknowledgements

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