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The behaviour of codling moth (Lepidoptera: Tortricidae) in the Croatian apple orchards

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Abstract: The codling moth, *Cydia pomonella* (L.), is the most important pest in apple production in Croatia and abroad. The pest is very adaptable to different climatic conditions and is known for the development of resistance to several chemical groups of insecticides. Because of these reasons, the populations of codling moth are differentiated in many ecotypes of various biological and physiological development requirements.

Following the dynamics and abundance of codling moth butterflies in the past ten years in Croatia the differences in the behaviour of this pest were observed. In the past ten years the appearance and the flight of codling moth butterflies have been monitored by using pheromone traps (Csalomon) always placed in the same position and observed every two days. In this paper data from the 2000, 2008 and 2009 were analyzed. The research results showed earlier appearance of butterflies in the vegetation season (in the 2000 butterflies began appearing in late April, while in 2008 and 2009 they appeared in mid-April). Furthermore, the flight of butterflies in the vegetation seasons in 2008 and 2009 lasted several days more than in 2000. In the last two years, the total number of caught butterflies has increased (2000 – 165 specimens, 2008 – 326 specimens and 2009 – 451 specimens) as well as the maximum daily number of caught butterflies (2000 – 14 specimens, 2008 and 2009 – 33 specimens). The average number of caught butterflies in 2000 was 4.46 specimens, in 2008 – 7.09 specimens and in 2009 – 10.7 specimens.

The possible causes for these modifications could be the climate changes that allow better overwintering of pests, longer period of development in the vegetation season or possible modifications in the genetic structure of treated and untreated codling moth specimens evidenced by recent genetic studies.

Key words: IPM, *Cydia pomonella*,development changes, population increase, Croatia

Introduction

The codling moth *Cydia pomonella* (L.) is the most important pest in apple production in Croatia and abroad. Beside apples, the pest can also complete the development process in pears, walnuts, quince and many other fruits causing economic losses in the production (Ciglar, 1998). Larvae attack the fruits and pollute them with frass. Fruits damaged early in the season drop off trees soon after damage occurs. Fruits damaged later in the season remain on trees but lose their market value (Maceljski 2002).

The pest is very adaptable to different climatic conditions and is known for the development of resistance to several chemical groups of insecticides (Sauphanor *et al.* 2000, Boivin *et al.* 2001, Bouvier *et al.* 2001). Because of these reasons, the populations of codling moth are differentiated in many ecotypes of various biological and physiological development requirements (Thaler *et al.* 2008).

In Croatia, two generations of codling moth (CM) appear per year. Despite the large number of treatments, which in the past ten years have increased several times, the damages to apple fruits are more than 1%.

Following the dynamics and abundance of codling moth butterflies in Croatia, the differences in the behaviour of this pest were observed.

Material and methods

The monitoring of the codling moth was conducted during the growing season of the years 2000, 2008 and 2009 in an apple orchard in the north-west part of Croatia. The orchard was characterized by intensive cultivation in accordance with integrated control procedures and was regularly sprayed with organophosphate IGR insecticides.

Using pheromone traps with a pheromone lure (Csalomon) males of codling moth were collected in years 2000, 2008 and 2009. Pheromone traps were placed in the orchard ten days before the appearance of the first generation, which is recently in mid-April. Monitoring process was completed in the last decade of September.

During the studied period (i.e. last ten years) pheromone traps were always placed in the same position and observed every two days.

Results and discussion

Dynamics of appearing male moths is shown on Figure 1, Figure 2 and Figure 3.

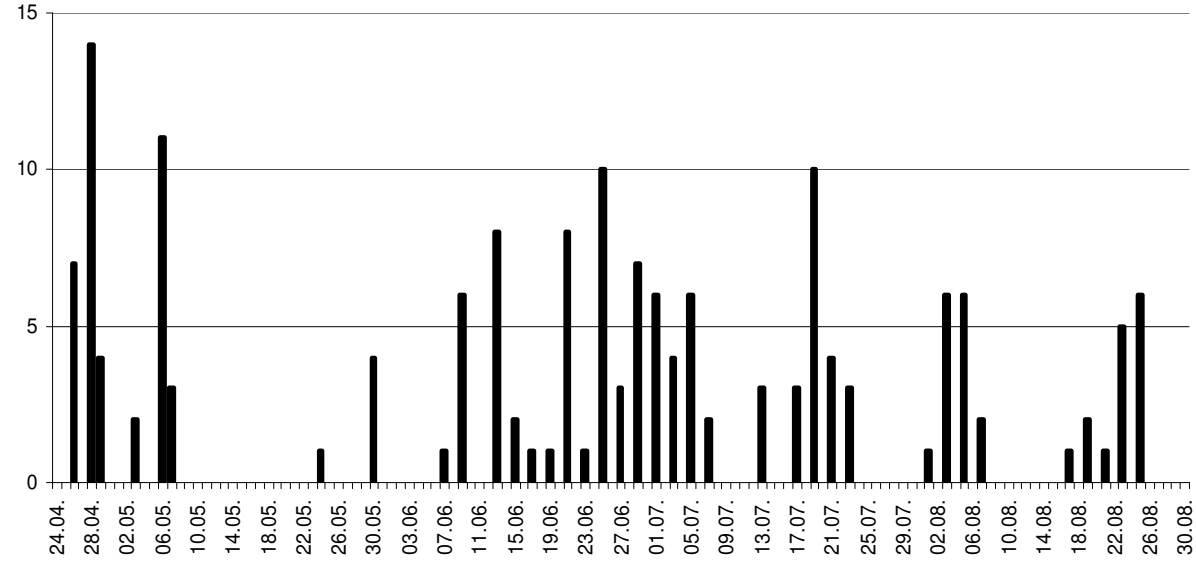

Figure 1. Capture of codling moths in 2000.

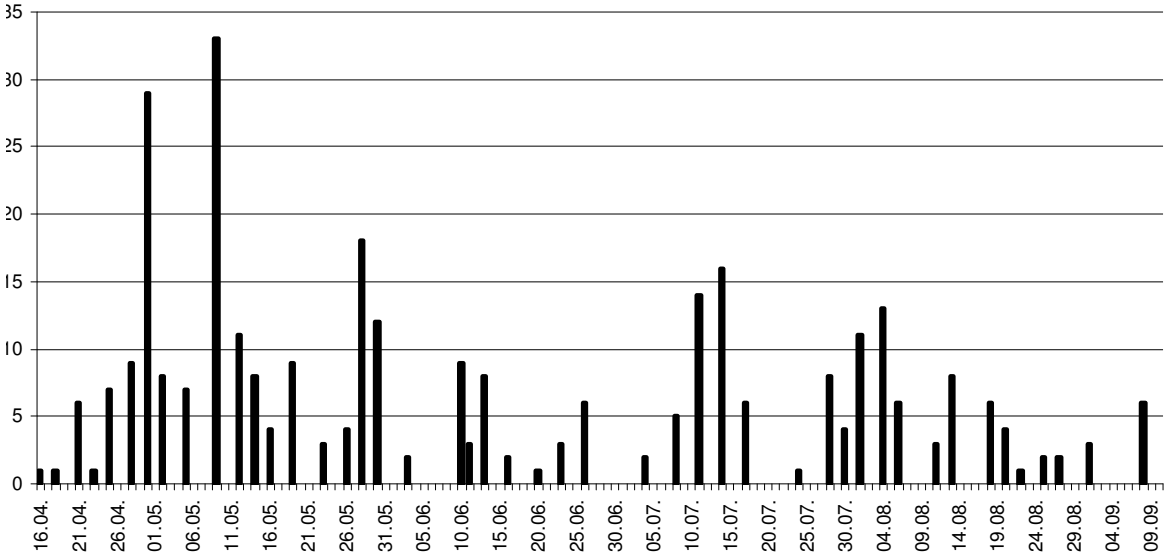

Figure 2. Capture of codling moths in 2008.

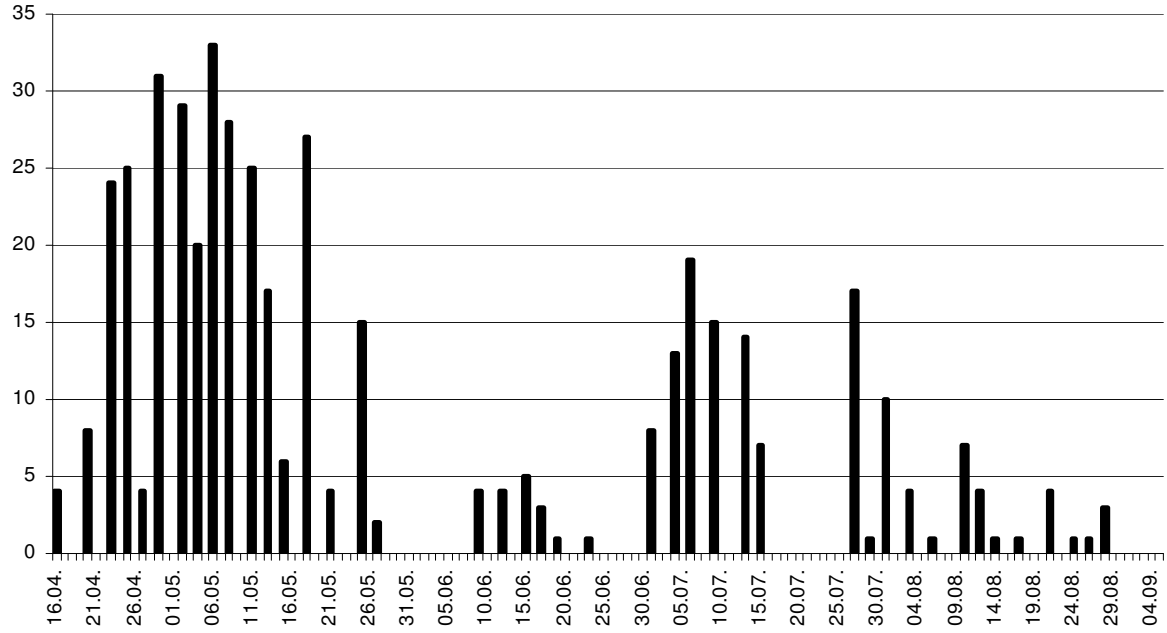

Figure 3. Capture of codling moths in 2009.

The results showed earlier appearance of butterflies in the vegetation season (in the 2000 butterflies began appearing in late April, while in 2008 and 2009 they began to occur in mid-April). Furthermore, the flight of butterflies in the vegetation seasons in 2008 and 2009 lasted several days more than in 2000 (Figure 1, Figure 2 and Figure 3).

In the last two years, the total number of caught butterflies has increased (2000 – 165 specimens, 2008 – 326 specimens and 2009 – 451 specimens) as well as the maximum daily number of caught butterflies (2000 – 14 specimens, 2008 and 2009 – 33 specimens). The average number of caught butterflies in 2000 was 4.46 specimens, in 2008 – 7.09 specimens and in 2009 – 10.7 specimens (Table 1).

Table 1. Differences in the behaviour of *Cydia pomonella* L. during monitoring period.

	2000.	2008.	2009.
Total number of caught moths	165	326	451
Max. daily number of caught moths	14	33	33
Avg. number of caught moths	4.46	7.09	10.7

The possible causes for these modifications could be the climate changes that allow better overwintering of pests, longer period of development in the vegetation season or possible modifications in the genetic structure of treated and untreated codling moth specimens evidenced by recent genetic studies.

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References

Boivin, T., Chabert d'Hières, C., Bouvier, J.-C., Beslay, D., Sauphanor, B. 2000: Pleiotropy of insecticide resistance in the codling moth, *Cydia pomonella.* Entomologia Experimentalis et Applicata 99: 381-386.

Bouvier, J.-C., Buès, R., Boivin, T., Boudinhon, L., Beslay, D., Sauphanor, B. 2001: Deltamethrin resistance in the codling moth (Lepidoptera: Tortricidae): inheritance and number of genes involved. Heredity 87: 456-462.

Ciglar, I. 1998: Jabučni savijač – *Cydia pomonella* L. In: Integrirana zaštita voćaka i vinove loze, eds. Zrinski, Čakovec: 82-87.

Maceljski, M. 2002: Jabučni savijač (*Cydia/Laspeyresia, Carpocapsa, Grapholita/ pomonella* L.). In: Poljoprivredna entomologija, II. Edition, eds. Zrinski, Čakovec: 302-309.

Sauphanor, B., Brosse, V., Bouvier, J.-C., Speich, P., Micoud, A., Martinet, C. 2000: Monitoring resistance to diflubenzuron and deltamethrin in French codling moth populations (*Cydia pomonella*). Pest Management Science 56: 74-82.

Thaler, R., Brandstätter, A., Meraner, A., Chabicovski, M., Parson, W., Zelger, R., Dalla Via, J., Dallinger, R. 2008: Molecular phylogeny and population structure of the codling moth (*Cydia pomonella*) in Central Europe: II. AFLP analysis reflects human-aided local adaptation of a global pest species. Molecular Phylogenetics and Evolution 48: 838-849.