

**THE BIOLOGICAL CYCLE OF THE CODLING MOTH -  
CYDIA POMONELLA L., AT WALNUT CULTIVARS UNDER  
THE CONDITIONS OF THE IAȘI FRUIT TREE  
ECOSYSTEM**

**CICLUL BIOLOGIC AL VIERMELUI MERELOR - CYDIA POMONELLA  
L., LA SOIURI DE NUC ÎN CONDIȚIILE ECOSITEMULUI POMICOL  
IAȘI**

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**Abstract.** *The purpose of this paper is to follow *Cydia pomonella*'s biological cycle with the help of pheromone traps in order to warn the treatments and to know the evolution of the pest in the NE area of Romania in the case walnut tree growing. Another objective pursued is to effectively combat this pest with plant protection substances. The observations were made in 2017, having as research material 14 walnut genotypes, in the 7<sup>th</sup> year since planting, being grafted on *Juglans regia* as rootstock. In case of variant 1 phytosanitary treatments with fungicides and insecticides were carried out and in the second variant (V2) no phytosanitary treatments were carried out, pest control being carried out by biotechnical means, using *AtraPom* synthetic sex pheromones traps. During this period the climatic factors, which influence the occurrence of the pest, were analyzed. Based on the observations made, the flight curve of the species was drawn in the studied area. Following the monitoring of the *C. pomonella*, we can warn the treatments according to the number of adults captured, as follows: for the first generation in the period 16-20.05.2017 and for the second generation in the period between June 25<sup>th</sup> to July 1<sup>st</sup>.*

**Key words:** pheromone, traps, walnut, *Cydia pomonella* L.

**Rezumat.** *Scopul acestei lucrări este de a urmări ciclul biologic al dăunătorului *Cydia pomonella*, cu ajutorul capcanelor cu feromoni în vederea avertizării tratamentelor și de a cunoaște evoluția dăunătorului în zona de NE a României la cultura nukului. Un alt obiectiv urmărit este acela de a combate eficient acest dăunător cu ajutorul substanțelor de protecție a plantelor. Observațiile au fost efectuate în anul 2017, având ca material de cercetare 14 genotipuri de nuc, în anul VII de la plantare, fiind altoite pe *Juglans regia*. În cazul variantei 1 au fost efectuate tratamente fitosanitare cu fungicide și insecticide, iar în cea de-a doua variantă (V2), nu s-au efectuat tratamente fitosanitare, controlul dăunătorilor fiind realizat cu ajutorul mijloacelor biotehnice, utilizând capcane*

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cu feromoni sexuali sintetici AtraPom. În această perioadă s-au analizat factorii climatici, ce influențează apariția dăunătorului. Pe baza observațiilor făcute s-a întocmit curba de zbor a speciei în zona studiată. În urma monitorizării dăunătorului *Cydia pomonella*, putem avertiza tratamentele în funcție de numărul de adulți capturați, astfel: pentru prima generație 16-20.05.2017, iar pentru a doua generație 25.06-01.07.

**Cuvinte cheie:** capcană, nuc, *Cydia pomonella* L.

## INTRODUCTION

Walnut is a species of particular economic and social importance, due to the high food value of fruit, wood quality and the use of raw materials for various industries (chemical, pharmaceutical). Unlike other fruits, nuts are a food rich in protein substances, minerals, vitamins (Cociu *et al.*, 2007). Lately both consumption and walnut tree surfaces increased (FAO, 2016). Although walnuts are a species that is attacked by a relatively small number of diseases and pests compared to other cultures, their effective control is not to be neglected because both diseases and pests can compromise culture. The codling moth, *Cydia pomonella* (L.) (*Lepidoptera: Tortricidae*), is the most important pests of apples worldwide but also for other fruit tree species and is often studied in the last years (Basheer *et al.*, 2016; Piskorski and Dorn, 2011; Jones and Wiman, 2008). In our country the walnut tree is attacked by the pest *Cydia pomonella* L. whose larva can attack fruits (Teodorescu *et al.*, 2003).

## MATERIAL AND METHOD

*Cydia pomonella* L. species biological cycle research was conducted in 2017, with 14 research genes of walnut genotypes in the 7<sup>th</sup> year of planting, being grafted on *Juglans regia*. With the help of the biological criteria, we can determine the optimal time to apply the treatments, the biology of the pest being closely related to climatic data.

Table 1

Main climatic elements of 2017 in Iași area

Month	Year 2017				
	TEMPERATURE			RAINFALL mm	HUMIDITY
	mean	low	high		
I	-4.9	-17.1	7.3	323.6	97.26
II	-0.80	-21.9	14.4	13.8	82.10
III	7.89	-1.2	22.7	108	89.75
IV	9.72	-2.5	25.5	140.4	89.16
V	22	3.9	30.3	72	61.51
VI	20.64	9.1	34.5	56	65.9
VII	21.03	10.6	34.2	56.4	69.3
VIII	20.99	6.8	37.7	67	61.76
IX	16.79	0.7	31.5	31.2	68.09
X	10.42	0	26.5	76.8	74.1
XI	15.5	-2.6	15.1	32.2	54.5
XII	16	-5.7	13	69.44	84.03
Total	19.03	-21.9	37.7	1046.84	67.04

The climatic conditions of the analyzed period had a strong influence on the evolution of the pest and implicitly on its occurrence. Analyzing the climatic data from this period we find that since April the maximum temperature exceeded 25.5°C, the highest peak and record for the Iasi area in 2017 was 37.7°C in August and the minimum temperature was recorded in February -21.9°C (tab. 1). In April there was a climatic accident, temperatures of up to -2.5°C were recorded after high temperature days, the trees are growing in turn, the low temperatures were accompanied by snowfall. The rainfall recorded in 2017 were significant but were unevenly distributed throughout the year.

In the analyzed period, *Cydia pomonella*'s biological cycle was studied with AtraPom-type sex pheromone traps produced by Raluca Ripan Institute for Research in Chemistry. In the case of the two variants, were placed pheromone traps of the AtraPom type, which were placed in each experimental version of three traps, which were read once at every two days between May and July. The pheromone was changed once at every 3 weeks, and when necessary, the glue plates of the traps were also changed, which were damaged due to rain, temperatures, etc. Data collection was made on the same day both at V1 and V2, except in days of rain, when adults do not lay eggs. Phytosanitary treatments were performed in variant 1, as shown in table 2.

Table 2

Treatments performed on walnut trees during March-July 2017(\*\*\*, 2017)

Treatment	Pests and diseases	Products and concentrations applied
T1	Hybernating forms of pests	B. Bordelaise 5% - 5 kg/ha Mospilan 20SG 0.03% - 0.3 kg/ha
T2	<i>Gnomonialeptostyla</i> (Anthracnose)	Dithane M45 0.2%- 2 kg/ha Decis 25 WG 0.003% - 30 gr/ha
T3	<i>Gnomonialeptostyla</i> (Anthracnose), <i>Sciaphobussqualidus</i> (ladybug) Codling moth- <i>Cydia pomonella</i>	Folicur solo 0.075% - 0.75 l/ha Calypso 0.02% 0.2 l/ha
T4	<i>Gnomonialeptostyla</i> (Anthracnose) Codling moth- <i>Cydia pomonella</i>	Signum 0.05%- 0.5 kg/ha Decis 25 WG 0.003 % 30 gr/ha
T5	<i>Gnomonialeptostyla</i> (Anthracnose) Codling moth- <i>Cydia pomonella</i>	Flint plus 0.125% -1.25 kg/ha Calypso 0.2%- 0.2 l/ha
T6	<i>Gnomonialeptostyla</i> (Anthracnose) Codling moth- <i>Cydia pomonella</i>	B. Bordelaise 0.5% 5 kg/ha Novadim 0.075%- 0.75 l/ha

## RESULTS AND DISCUSSIONS

Following the observations, the catches were recorded every two days, based on the data collected, the catches dynamics of the male species were compiled. The evaluation of the results was done by monitoring the flight activity of adults with the AtraPOM sexual pheromone, the traps being located in each experimental version of 3 traps, read every two days between May and July. The

data collection was performed on the same day for both treated and chemically untreated versions.

Table 3

**Number of adults of *Cydia pomonella* (codling moth) in synthetic sex pheromone traps of the AtraPOM type, Variant 1**

Year	G I		G II	
	Date of observation	No. of adults caught per trap	Date of observation	No. of adults caught per trap
2017	11.05	9	23.06	11
	13.05	4	25.06	6
	16.05	11	27.06	3
	18.05	10	29.06	12
	20.05	7	01.07	9
	22.05	3	03.07	4

In the observations made in version 1, generation I, where plant protection products were used, 9 adults were captured on 11.05.2017, exceeding the five butterflies / trap / week. After this date, when a maximum catch for the first generation was recorded, the number of catches decreased as phytosanitary treatments were carried out to control the pest. An increase in the number of butterflies was noticed in the data collection carried out on May 16<sup>th</sup>, with a number of 11 butterflies / trap. In case of variant 2, where only pheromone traps were located, 12 butterflies / trap were recorded on May 11<sup>th</sup> as compared to variant 1, where there were nine males / trap. The treatments were performed according to the indicated period, at the emerge of both generation 1 and generation 2. The maximum catch of the second generation was on June 29<sup>th</sup> with capture of 12 butterflies/trap at V<sub>1</sub> compared to V<sub>2</sub> where there were 19 butterflies /trap, but we notice a much smaller number of males in variant 1.

In the analyzed period, the largest number of butterflies captured (every 2 days) was in the case of the untreated plant-protection variant, with a number of 19 butterflies. Obtained information has rationalized the treatments, setting the right time to apply them (Ungureanu *et. al*, 2005).

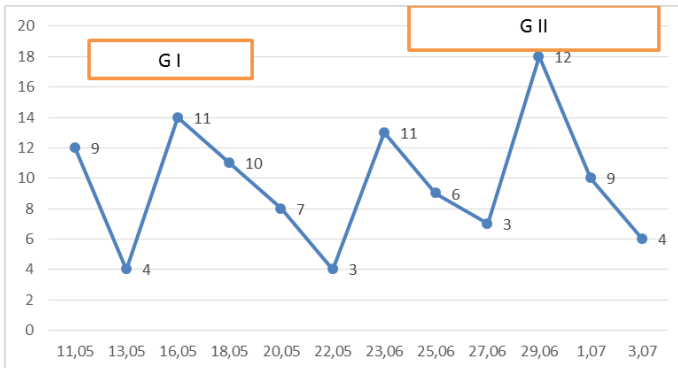
Table 4

**Number of adults of *Cydia pomonella* L. (codling moth) in synthetic sex pheromone traps of the AtraPom type (Iași, 2017, variant 2, walnut orchard)**

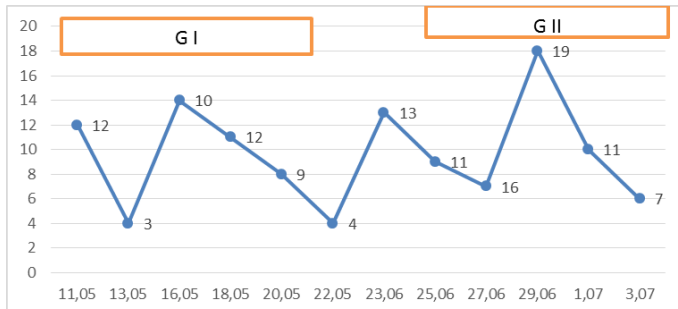
G I		G II	
Date of observation	No. of adults caught per trap	Date of observation	No. of adults caught per trap
11.05	12	23.06	13
13.05	3	25.06	11
16.05	10	27.06	16
18.05	12	29.06	19
20.05	9	01.07	11
22.05	4	03.07	7

The flight curve was drawn up based on recorded catches as shown in the graphs (fig.1 and fig. 2).

The tip of the flight curve helped to set the warning times for treatments at the chemically treated variant. For the first generation, the period June 16<sup>th</sup> to 20<sup>th</sup> was warned for treatments and in the case of the 2<sup>nd</sup> generation, the treatment warning was between June 25<sup>th</sup> and July 1<sup>st</sup>.



**Fig. 1** The number of adults of *Cydia pomonella* (codling moth) in AtraPOM-type synthetic pheromone traps (Iași, 2017 variant1)



**Fig. 2** The number of adults of *Cydia pomonella* (codling moth) in AtraPOM-type synthetic pheromone traps (Iași, 2017 variant 2)

## CONCLUSIONS

1. Although chemical treatments provide greater protection against codling moth versus unconventional methods of control, the assessment of the number of adults trapped in the analyzed period demonstrates a high efficacy of both methods of control used but with a difference in the fruit pest attack.

2. Differences between the treated and untreated variant of walnut tree growing did not record significant differences regarding the attack on the fruit.

3. Pheromone traps can follow the biological cycle of the species in order to warn the treatments, but also to limit their number.

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