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# UTILIZAREA PRODUSELOR BIOLOGICE ÎN LIMITAREA ATACULUI DE *CYDIA POMONELLA* L., ÎN CONDIȚIILE BAZINULUI POMICOL DÂMBOVIȚA

# THE USE OF BIOLOGICAL PRODUCTS IN LIMITING THE ATTACK OF *CYDIA POMONELLA* L., IN THE CONDITIONS OF DÂMBOVIŢA FRUIT GROWING BASIN

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**Abstract**

**The study has been made at Research Station for Fruit Growing Voinesti between 2020-2021, regarding apple susceptible to disease ('Jonathan' and 'Golden delicious'), 3 biological products being tested in the combat of the apple codling moth (*Cydia pomonella* L.), including the use of pheromone traps in order to track the pest. We mention that the codling moth is one of the most harmful species with a high incidence against the quality of fruits and their commercial value, regarding all the apple tree cultures of the Voinesti tree growing zone. As a means of tracking and warning, ATRAPOM pheromone has been used, as well as some biological products treatments: Bactospeine DF conc. 0.1 %, Laser 240 SC conc. 0.06%, MadexTop conc. 0.001%. Some high biological efficiency products have been noticed: Laser 240 SC conc.0.06% with a high 4.0% frequency attack, Bactospeine DF conc. 0.1% with 6%, while the MadexTop conc. 0.001% product had only registered a 2% damage, comparing to the chemical product Karate zeon conc. 0.015% that had an attack frequency of only 11%, while the untreated control group has been registered a 19% attack. Focusing towards using biological products in the combat of some apple tree pests, it will be gradually imposed, constituting the main factor in order to get some productions containing a small amount of phytosanitary products.**

**Cuvinte cheie:** soiuri de măr, viermele merelor, feromoni, produse biologice, eficiență.
**Key words**: apple varieties, codling moth, pheromone, biological products, warning, efficiency.

## 1. Introduction

Apple culture in the Dâmbovița Fruit Growing Basin has expanded primarily due to the influence of Voinești Station, both in terms of cultivated area and the share of research on this type.

In the phytoprotection laboratory, experiences focused on the identification and study of the main pathogens and harmful insects that cause significant damage in apple orchards, including the apple worm (*Cydia pomonella* L.).

In the climatic conditions of the Voinești area, the apple worm has 2-3 generations during the vegetation period, causing significant losses in apple orchards, if phytosanitary treatments are not applied to combat it.

The attack is triggered differently from one year to another depending on the evolution and biological reserve of the pest.

Besides the fact that it reduces the amount of fruit, the fruit left on the tree, especially after the attack in the 2$^{nd}$ and 3$^{rd}$ generations depreciates the quality, the attacked fruit must be completely removed.

The studies and research addressed within the Phytoprotection Laboratory established the evolution of the biology of the pest in each generation, but also of the biological products with high effectiveness in combating it.

## 2. Material and methods

The research was carried out in 2020-2021, monitoring the evolution of the biological cycle, warning of treatments and establishing the effectiveness of the products used for combating it.

The monitoring of the biological cycle and warning of the application of treatments was carried out with the ATRAPOM type pheromone.

In order to combat it, alternative strategies have been adapted using biological products with the aim of significantly reducing the chemical factor, but also developing less polluting methods and means in order to protect the environment and obtain healthy harvests.

The researches were carried out in an apple plantation, belonging to the Voinești Fruit Tree Experimental Base no. 1, with varieties sensitive to diseases (Ionathan, Golden delicious) with 30-year-

old trees, grafted on M.26 rootstock, planted at a distance of 4 x 3.5m (714 trees/ha), freely flattened palmate crown shape on the row of trees (Fig. 1).

5 experimental variants were organized, 3 biological products were tested (Bactospeine DF, Laser 240 SC and MadexTop), compared to the product Karate zeon (chemical standard) and the untreated witness, thus:

- V1 – Bactospeine DF, conc, 0,1%;
- V2 – Laser 240 SC conc. 0,06%;
- V3 – MadexTop conc. 0,001%;
- V4 – Karate zeom conc. 0,015%;
- V5 – Martor netratat.

Each variant included 5 trees (one tree, one repetition), the treatments being applied with the STHIL 400 spray pump, with 10 l of solution/variant.

For each generation of the pest, 2 treatments were applied with an interval of 7-8 days between treatments.

The optimal time to apply the treatments was determined with the help of the ATRAPOM pheromone, through 2 weekly readings (Monday, Thursday) and changing the pheromone every 45 days, correlating the number of butterflies captured in this interval with the specific PED value (3 – 5 butterflies captured daily / trap).

To establish the biological effectiveness of the tested products, 200 fruits/variant were analysed in Generation I, respectively 300 fruits in Generation II.

The use of the pheromone allowed the recording of the main parameters of the annual biological cycle of the pest: the appearance and duration of each generation, the first peak of flight and the beginning of the egg laying, the numerical density of the population and the assessment of the risk of attack, the necessity and optimal moments of application of treatments.

## 3. Results and discussions

Previous research has established that the biology of the apple worm (*Cydia pomonella*), in our country, depending on the area, has 1-3 generations / year, frequently 2 generations and hibernates as a thick-walled winter cocoon stage larva.

The first generation of butterflies makes its staggered appearance in May. The preovipository period lasts 5-6 days in the first generation and 3-4 days in the second generation. Eggs are laid individually or in small groups, always on smooth surfaces, attacking the fruit during the feeding and development phases. Adults typically emerge in late June, early July and give birth to the second generation.

Butterflies of the summer generation lay their eggs directly on the fruit, the emerging larvae usually penetrate the side where a leaf or an adjacent fruit is usually found attached.

In autumn, the mature larvae leave the fruit and migrate to the hibernation shelters, where they remain in diapause until the following spring.

The larvae of the apple worm attack the fruit in 2 forms: primary – when the fruit is superficially gnawed and secondary – when the fruit shows galleries of excrement and rotting around the penetration hole.

Attacked fruits no longer develop normally, lose their commercial value and can no longer be stored. In untended orchards, the damage reaches 70-80%.

The research carried out at RSFG Voinești in the years 2020-2021 established the optimal moment of application of the treatments and the effectiveness of the administered products.

An important role in combating the apple worm is the establishment of the optimal moment of application of phytosanitary treatments. In the climatic conditions of the Voinești area, in the years 2020 - 2021, 2 generations of apple worms were recorded.

By monitoring the appearance of the pest with the ATRAPOM pheromone, it was established that the first generation in the Voinești area takes place already during the flowering of the apple tree, i.e. in the first half of May. The daily capture of 3-5 butterflies represented the optimal period of application of the first treatment (Fig. 2).

Thus, in 2020, the first generation of the apple worm was nominated on 08.05.2020, and in 2021, on 12.05.2021. 8 days after the first treatment from the first generation of the apple worm, the second treatment with the same products was applied.

The second generation was established 56-63 days after the first, so the first treatment was applied on the dates of 10.07 in the year 2020 and 07.07 in the year 2021. The second treatment was applied at an interval of 8 days, same as in the first generation (Fig. 3).

The results obtained from the testing of the biological products, compared to a chemical standard product and the untreated witness are presented below.

The biological effectiveness of the products used to combat the apple worm is presented in table 1.

At each variant, the attacked and fallen fruits were analysed and evaluated. The results from the treated variants were interpreted compared to the untreated control variant.

At the end of the first generation of the pest, in the variants treated with biological products, the attack frequency was between 4.5 - 8.0% compared to the "*chemical standard*" where the values were between 5.5 - 6.5%, and in the "*untreated witness*" of 29.50 - 33.56%.

After the 2nd generation, before harvesting the fruits, the effectiveness of the products was evaluated, recording values between 5.00 - 8.33% attacked fruits, respectively 91.5 - 95.0% attack-free apples, compared to 20,33 – 25.66% wormy fruits in the "*untreated witness*".

The control of the apple worm with the chemical insecticide Karate zeon in conc, 0.015%, shows that the frequency of attacked fruit at the end of June, after the first generation of the apple worm was between 5.5 - 6.5%, while at "the *untreated witness*" recorded 29.5 - 33.56%

Analysing the effectiveness of the products used to combat the apple worm according to the percentage of apples that remained free of attack, following the application of the product Bactospeine DF, conc. 0.1%, in the 2 generations, a percentage of 92.5 - 93.67 % remained on the tree in 2020 and 91.67 - 93.5% in 2021.

With the biological product Laser 240 SC conc. 0.06%, the attack-free fruits left on the tree were in percentage of 92.00 - 92.67% in 2020 and 93.0 - 94.0% in 2021.

Increased effectiveness, compared to the 2 biological products analysed, was obtained with the biological product Madex Top in conc. 0.001%, where the fruits remaining free of attack on the tree were in the percentage of 94.34 - 95.00% in 2020 and 95.0 – 95.5% in 2021.

The product Karate zeon (chemical standard), in conc. 0.015%, compared to biological products, had an effect close to combating, so that 91.0 - 94.5% fruit remained free from attack in 2020 and 92.34 – 93.4% in 2021.

In the untreated witness, the percentage of fruit remaining free of attack was between 70.5 - 79.67% in 2020 and 66.44 - 74.67% in 2021.

The analysis shows that biological products can be used in the treatment of other pests, but primarily of the apple worm (*Cydia pomonella L*.), considering that fruits intended for consumers are preferred over those on which are applied chemical treatments.

## 4. Conclusions

For the apple plantations in the Voinești – Valea Dâmboviței Fruit Growing Basin, the apple worm (*Cydia pomonella* L.) represents one of the harmful species with a major incidence in reducing production, but especially for the quality of the fruits and their commercial value.

In the climatic conditions of the Voinești fruit-growing area, in the years 2020 - 2021, the development of 2 generations/year of apple worms was recorded, these being carried out in the first half of May and the first decade of July, at an interval of 56 - 63 days between generations.

Among the biological products studied at SCDP Voinești in the period 2020-2021, the products with the best biological effectiveness within the limit of the attack stood out: Madex Top conc. 0.001% (94.34 – 95.00 fruit free from attack, followed by Laser 240 SC conc. 0.06% with a percentage of 92.67% - 94.00%

The chemical product Karate Zeon conc. 0.015% showed a good effectiveness with values between 91.00 - 92.34% compared to "untreated witness" where the percentage was 74.34% - 79.67% fruit free of attack.

The use of specific pheromonal attractants allows the correct monitoring of the pest population and the establishment of optimal periods of warning and application of treatments, with the possibility of stopping the attack using only pheromonal traps.

Biological products represent a new stage of their use in the fight against pests in apple orchards, including the apple worm (*Cydia pomonelle L*.), especially in orchards cultivated with varieties genetically resistant to diseases, with a significant decrease in production costs and the level of pollution in soil and plant.

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**Tables and Figures**

**Fig. 1. Orchard with flowering trees**

**Fig. 2. ATRAPOM Trap**

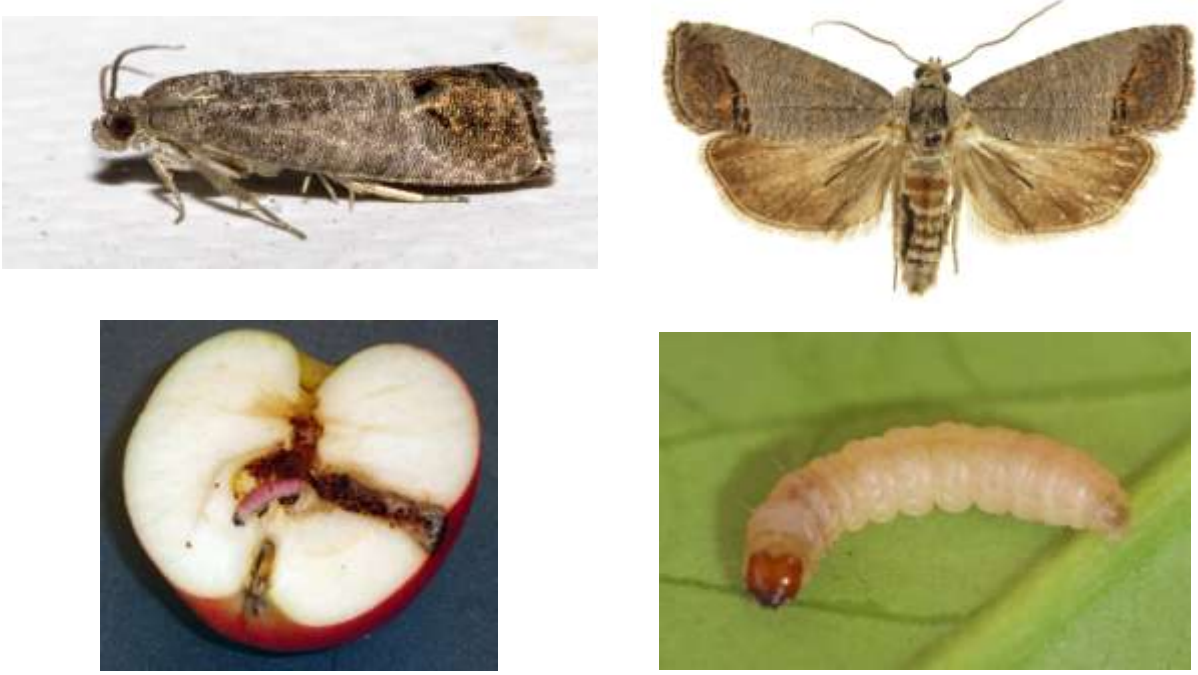

**Fig. 3. Stages of development for *Cydia pomonella* L.**

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**Table 1. The effectiveness of some biological insecticides, used to combat the species *Cydia pomonella L.***

| Variety (Product) | Conc % | Year | Effectiveness % | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | First Generation | | | Second generation | | |
| | | | Total fruits observed tree+drop | Attacked d.c. | | Total fruits observed tree+drop | Attacked d.c. | |
| | | | | Nr. | % | | Nr. | % |
| Bactospeine DF (biological product) | 0.1 | 2020 | 200 | 15 | 7.50 | 300 | 19 | 6.33 |
| | | 2021 | 200 | 13 | 6.50 | 300 | 25 | 8.33 |
| Laser 240 SC (biological product) | 0.06 | 2020 | 200 | 16 | 8.00 | 300 | 22 | 7.33 |
| | | 2021 | 200 | 14 | 7.00 | 300 | 18 | 6.00 |
| Madex Top (biological product | 0.001 | 2020 | 200 | 10 | 5.00 | 300 | 17 | 5.66 |
| | | 2021 | 200 | 9 | 4.50 | 300 | 15 | 5.00 |
| Karate Zeon (chemical standard) | 0.015 | 2020 | 200 | 11 | 5.50 | 300 | 27 | 9.00 |
| | | 2021 | 200 | 13 | 6.60 | 300 | 23 | 7.66 |
| Untreated witness | - | 2020 | 200 | 59 | 29.50 | 300 | 61 | 20.33 |
| | | 2021 | 200 | 67 | 33.56 | 300 | 77 | 25.33 |