PHD DISSERTATION

„Contributions to the study of mining microlepidopteres apple orchards in the environmental conditions in Husi – Vaslui”

Doctoral student:Eng. ARTENE Irimia
Doctorate coordinator: Prof. TĂLMACIU Mihai PhD.
Prof. FILIPESCU Constantin PhD.

ABSTRACT

The weights of apple and fruit culture in the world economy have highlighted the role of apples in rational human nutrition in the prevention and combating of disease, in increasing national income and to improve microclimatic conditions of life. Apples are chemically very complex. It contains sugars, organic acids, tanoide substances, pectic, protein, cellulose, phenolic substances, alcohols, esters, carbonyls, acetates, etc..

Content in nourishing substances, and balance sugar / acid specifically associated with aromatic substances and a color range, making apple înbinare happy to be a food and organoleptic properties. The harmony of taste, texture, subtle and pleasant fragrance of apples are widely appreciated and it falls into the category of food required on all meridians and parallels of the globe.

In many species of insects harmful to apple, not microlepidopters mining emerges as the most damaging to fruit plantations, but may be seen as one of the most difficult to refute, because the hidden mode of life. Microlepidopters larvae (moth) mining, living within leaf languages, mezophils feed on leaves, which produce various galleries, which make up some designs characteristic of each species.

Furthermore, these microlepidoptere mining pests were considered of secondary importance against which there is no need to apply specific treatments. Based on research conducted in recent years found that occurrences of microlepidopteres mining explosive under certain conditions, visible harm trees, even if they apply treatments to control other pests.

Given the importance of mining for microlepidopteres apple plantations, we proposed that the conditions of the research Husi - Vaslui to address the following issues:

- the identification of species of harmful mining microlepidopteres apple plantations in the region

- contribution to the study of biology , ecology, plants attacked by the pest species and how to microlepidopteres mining;

- integrated control measures agrofitotehnic, physical, mechanical, biological and chemical.

The main mining microlepidoptere apple fruit plantations in the research Husi-Vaslui are *Stigmella (Nepticula) malella* Stt. (mining linear), *Lyonetia clerckella* L. (mining winding), *Leucoptera scitella* Zell. (mining circular), *Phyllonorycter (Lithocolletis) blancardella* F. (mining marbled) and *Phyllonorycter corylifoliella* Hb. (mining plated).

Stigmella malella Stt. (linear mining) has 3 generations per year and winters in the state of kisses under fallen leaves or the soil surface layer at a depth of 0.5-1.0 cm. The first butterflies appear in early April. Larvae attack the leaves of apple, to produce gnaved characteristic, which often pierce the leaves and ribs, resulting in browning and even fall leaves.

To follow the flight dynamics adults *Stigmella malella* Stt. pheromone traps were used with sex-specific, ATRA-MAL. Thus, in 2004 the G1 peak flight was recorded on and so 4.V warning was issued for the period 4.V-8.V.2004; for maximum curve G2 aircraft was registered on 9. VII, and the warning was given for the period 9.VII-13.VII, the G3, the maximum curve flight was on 22.VIII and warning was issued for the period 22.VIII-26.VIII.

In 2005, the maximum flight curve of adults in G1 was on 11.V and warning launched during 11.V-14.V, the G2 was found on 11.VII, which warn given period 11.VII-15.VII and the G3 has been recorded on 3.IX, giving warning to the period 3.IX-6.IX.

In determining the biological reserve and frequency of these species attack Research was conducted during autumn and spring, for each generation. The research was done in apple plantations in 3 localities in the Husi-Vaslui: Husi, Stănileşti and Munteni, on to a piece of every 4 rows, on each of 10 trees per row, willing randomized to Golden Delicious apple variety which is to be the most attacked microlepidopterele mining in 2004 and 2005.

The biological reserve *Stigmella malella* Stt. species, in the area Husi, in 2004, has averaged 25.95% per 100 leaves, in the area Stănileşti, biological reserves was 28.0%, exceeding the economic threshold of pest (PED), the 25 mine/100 leaves, and the location Munteni, biological reserves was only 18.4%, so below pest.

In spring 2005, the town Husi biological reserve was 15.2%, in the area Stănileşti was 18.6% and in the area Munteni was 9.4%.

Lyonetia clerckella Zell. (mining winding) develops in 2-4 generations per year, depending on ecological factors favorable. Winters in the adult stage under fallen leaves or the bark of trees. Butterflies appear in the first decade of April. Larvae bearing me in palisade tissue, the leaf cuticle.

To follow the dynamics *Lyonetia clerckella* L. adults were used traps with specific sex pheromones ATRA-CLERK. Maximum flight in 2004 from G1 was recorded on 8.V. And the warning was released for the period 8.V-12.V, the G2 maximum flight was noted on 16.VII. and avertzarea launched 16.VII-18.VII period, and the maximum flight G3 2.IX was on, and the warning was released for the period 2.IX-4.IX.

In 2005, flying up the G1 was on 11.V. and warning was given during 11.V-12.V, the G2, on 11.VII. was recorded flying up and warning was given for the period 11.VII-13.VII, and the G3, 3.IX on the flight up and there was warning given period 3.IX-6.IX .

Biological cycle of this pest in plantations, mining microlepidopter apple-area research Husi-Vaslui, was followed in plantations. In determining the biological reserve of this species were made in autumn and spring surveys for each generation.

The data obtained the reserve's biological species *Lyonetia clerckella* L. Husi in 2004 in the area was on average 18.6% on 100 leaves. Since economic pest threshold value (PED) is 25 mine/100 leaves, means that biological reserve in the area Husi slightly exceeded the economic threshold of pest (PED), totaling a value of 24.47%, in the area Stănileşti , biological reserves was 16.17%, exceeding the threshold and in the area Munteni biological, biological reserves of this species was 15.95%, below the economic threshold of pest.

Leucoptera scitella Zell. (mining circular), has 3 generations per year and winters in the state of kisses in the fallen leaves or branches thicker crust or even a shallow soil. A larva mines the circular rod and develops between the two epidermises of leaves.

Provide a knowledge of flight in apple plantations of species *Leucoptera scitella* Zell., Could achieve using traps with specific sex pheromones, that ATRA-SCIT. Thus, in 2004 the G1 peak flight has occurred 2.V and so on, the warning was issued for the period 2.V-4.V.2004, for G2, the maximum flight curve was recorded on the day of 10.07 . and the warning was given for the period 10.VII-16.VII.2004, the G3, the maximum curve flight was on 16.VIII. and the warning was issued for the period 16.VIII-20. VIII.2004.

In 2005, the maximum flight curve of adults in G1 was on 11.V. and warning launched during 11.V-13.V, the G2, the maximum flight curve was recorded at 10.VII . and the warning was given for the period 10.VII-13.VII. and the G3, the maximum curve was recorded on 16.VIII and warning launched during 16.VIII-18.VIIII.2005.

Biological cycle of the species *Leucoptera scitella* Zell., damaging in plantations in the area of research Husi-Vaslui, was addressed by observations in plantations of Golden Delicious apple variety in an effort to occurrence and duration of each stage of the insect, the amount of actual temperatures and phenology for all 3 generations, in 2004.

Frequency of species attack *Leucoptera scitella* Zell. It was followed in the 3 generations, in 2004 and 2005 and from data stands following:

Frequency of species attack the G1 *Leucoptera scitella* Zell., The town was 30.50% Husi in 2004 and 35.22% in 2005.

In town Stălineşti, attack frequency was 24.35% in 2004 and 25.89% in 2005.

In the, Munteni area the attack rate was 26.56% in 2004, 26, 84% in 2005.

Phyllonorycter (Lithocolletis) blancardella F. (mining marbling) has 3 generations per year. Winters in the state of kisses in numerous galleries in leaves, oval with mezofilul gallery is looking jaded point of mosaic. Butterflies appear in early spring, in late March or early April.

Frequency of species attack *Phyllonorycter blancardella* F., was monitored in the 3 generations, in 2004 and 2005 and from data stands following: attack frequency in G1 has *Phyllonorycter blancardella* F. species in the area of Husi was 24.80% in 2004 and 21.97% in 2005, in G2 it was 27.80% in 2004 and 31.70% in 2005, and the G3 was 22.90% in 2004 and of 23.60% in 2005, the average attack rate was 25.16% in 2004 and 25.75% in 2005.

In town Stănileşti frequency attack *Phyllonorycter blancardella* F., the G1 was 22.80% in 2004 and 20.57% in 2005, the G2 was 27.90% in 2004 and 28, 72% in 2005 and the G3 was 21.97% in 2004 and 23.55% in 2005.

In the, Munteni area the frequency of attacks this species, the G1 was 23.10% in 2004 and 19.52%, in 2005, the G2 was 28.20% in 2004 and 28.62 in 2005, and the G3 was 21.30% in 2004 and 21.57% in 2005.

Phyllonorycter corylifoliella Hb. (mining plated) are 3 generations per year, namely: generation Ia (G1) which has evolved in the months from May to June, generation II (G2), which has evolved in the months from July to August and generation III (G3), which has evolved in the months August-September hibernând stage of fallen leaves or stern in the surface layer of soil. Winters in the fully developed stage larva eaten the leaf miner, mine is oval and is visible on top of the leaf.

Frequency of species attack *Phyllonorycter corylifoliella* Hb. It was followed in the 3 generations, in 2004 and 2005 and from data stands following:

Frequency attacking *Phyllonorycter corylifoliella* Hb. species, The town of Husi averaged 13.49% in 2004 and 14.21% in 2005.

In town Stălineşti frequency attack *Phyllonorycter corylifoliella* Hb., Was 13.56% in 2004 and 14.75% in 2005.

In the Munteni area, the frequency of attacks this species was 13.48% in 2004 and 13.78% in 2005.

From data on the frequency of attacks in the area Husi, we find that its values were below the economic threshold of pest (PED), 30 mine/100 leaves, in which only recommended every year to monitor the evolution of the species.

In the structure and dynamics of populations collected from plantations carabide apple observations during 2005-2007, the situation is as follows:

In 2005 the species with the greatest number of specimens were *Pseudophonus rufipes* Dej. with 853 samples, followed by species *Harpalus distinguendus* Dej. 195 samples *Pseudophonus griseus* canvas. with 85 samples, *Amara aenea* Degeer. with 48 samples, *Amara familiaris* L. with 37 samples and *Calathus fuscipes* Panz. with 19 samples. The other species had a much smaller number of samples and there is one species (*Broscus cephalotes*) that had a single samples.

In 2006 the species with the greatest number of specimens collected were *Pseudophonus rufipes* Dej., followed by species *Harpalus distinguendus* Dej., *Pseudophonus griseus* Panz., *Amara aenea* Degeer., *Amara familiaris* L. *Calathus fuscipes* canvas. etc.. The other species had a much smaller number of samples, with a total of 6 species (*Carabus besseri* Fischer., *Zabrus tenebrioides* Goeze, *Carabus glabratus* Paykull, *Amara crenata* Dejean., *Idiochroma dorsalis* Pontopp. and *Amara apricaria* Payk) that have had only one samples.

In 2007 the species with the greatest number of specimens collected were *Pseudophonus rufipes* Dej. with 625 specimens representing 65.30% of the total, followed by species *Harpalus distinguendus* Dej. with 127 specimens representing 13.27% of total *Pseudophonus griseus* Panz. with 59 specimens representing 6.17% of total, *Amara familiaris* L. with 43 specimens representing 4.49% of total, *Amara aenea* Degeer. with 29 specimens representing 3.03% of total *Calathus fuscipes* Panz. with 21 specimens representing 2.19% of the total.

It is noted that during 2005 - 2007, the species with the greatest number of specimens collected were *Pseudophonus rufipes* Dej. 1998 samples, followed by species *Harpalus distinguendus* Dej. with 434 samples, *Pseudophonus griseus* Panz. with 187 samples, *Amara aenea* Degeer. with 101 samples, *Amara familiaris* L. with 102 samples, *Calathus fuscipes* Panz. with 55 samples, etc. Other species have a smaller number of specimens collected.

Also during 2006 - 2007 were commented on: the development level of biodiversity entomofaunistică in apple orchards and biodiversity entomofaunei mining apple plantations. For

comparative analysis of entomofaunei collected from apple orchards in the years 2006-2007 is frapaj method the following conclusions:

Class *Arachnida* collected materials was represented in the two years of species belonging to orders *Acarina* and *Araneae*. Of these, 75% were collected in batches of chemical and 25% of untreated plots. The highest values of dominance were recorded in 2007 in plots treated and the untreated. The *Arachnid*, most representatives belonged to the order *Acarina* and the less the order *Araneae*. If mites could see a clear dominance of the phytophagus observed in all groups during the two years, but note the difference between the ratios determined by phytophagus mites and the predators.

Class *Insecta* was well represented numerically in untreated plots than in plots treated chemically, representing 59% of all insects collected throughout the observation period.

The chemically treated plots could be observed large differences in the abundance of insects in the two years of observations; in 2007 abundance was approximately 3 times higher compared with that of the previous year.

Class *Insecta* fewer representatives belonged to the orders *Ephemeroptera, Dictyoptera, Dermaptera* and *Psocoptera*, and most individuals belonged to the orders *Homoptera, Coleoptera, Diptera* and *Hymenoptera*.

In order *Homoptera* most individuals were identified in untreated plots, almost twice as many compared to those of plots treated chemically aphids dominated numerically, they in turn have the highest values of abundance and dominance in the untreated plots (91.14%) in 2007.

Order *Coleoptera* is characterized by an increase in abundance in 2007 compared with 2006, but also by decreasing their numbers in the untreated plots in 2006 and 2007 compared to chemically treated, which is also understandable given the fact that the number was higher afids the chemically treated.

Integrated control methods group should combine agro-technical measures for the execution of chemical treatments, according to the first adult emergence warning when maxims of butterflies flight each generation.

Thus in 2006 were applied to 12 treatments, using the following fungicides and insecticides: Funguran 0.3% 0.3% Kumulus; Vantex 0.008% 0.015% Score EC-250, Dithane M45 0.1 %, Bayer 25 WG 0.003% 0.02% Systhane forces, etc..

The year 2007 saw a total of 10 treatments applied using the following products: Oleodiazol 3CE 1.50% 0.15% Merpan 80WG; Microthiol special 0.3% 0.033% 25SC Impact, Clarinet SC 0.1%, Bayer 25WG 0.003% 0.013% 50WG Zato, Calypso 480 SC 0.02% 0.02% Systhane forte0.02% ,Goldazym SC 0.1% ; Actara 0.01% 0.015% Vantex; Topsin 70PU 0.1% 0.1% Novadim, Captan 80WG 0.15%.