

STUDY ON THE HARMFUL FAUNA FROM EDUCATIONAL RUSCIORI FARM (SIBIU COUNTY) AND ITS ECONOMIC IMPORTANCE

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Abstract

The work fits into the broader concept called "Plant protection". The researchers from the Faculty of Agricultural Sciences, Food Industry and Environmental Protection of "Lucian Blaga" intensified their research work in the direction of plant pathology, as well as on the specific pests. The research was carried out between 2014-2015 in the School Farm's apple orchard in the Rusciori village, Sibiu County. This research aimed to identify the fauna of the studied agricultural ecosystems, determining the severity of pest attack, assessing the damages and suggesting solutions. The Rusciori Farm passed through a period of decline due to the frequently changing of orchard owners. At present, by appropriate studies, it was tried to bring the farm into an appropriate form. In this study, there were the following research methods: direct observation on the plant, the collection of the entomological material with attacked organs of the plants, the use of the entomological jar, the use photo paper. The main conclusion was that the integrated protection by applying measures and means of prevention and treatment against pests play a very important role, representing the number one technological factor on fruit growing practice.

Key words: fruit trees, damaging fauna, protection

INTRODUCTION

Development of human society in economic and travel increasingly faster progress (especially the technology) led to a number of consequences on the ecology, not always negative, but particularly harmful to the environment, the only living environment of all organisms this planet, what we call, in the universal language of love: "Sweet home, our single home." In this context, Victor Vernescu in his 2004 "Pathogens and pests on crop plants" demonstrate the theoretical and practical importance of the concept of protection of which it is the plant protection [18]. Do not forget that "the protection of plants triggers the production, productivity, efficiency and ultimately profit, the fundamentals of welfare" [17]. In line with this concept, the staff of the Faculty of Agricultural Sciences, Food Industry and Environmental Protection "Lucian Blaga" has intensified the research work both in the direction of plant pathology [13-16], as well as in the direction of the specific pests, mostly insects that bring serious damage to

agricultural production [1-4,7-10]. Also, the plant protection research has not identified only the crop diseases and pests, but also it found appropriate ways and means to prevent and fight against them.

Today, the faculties involved in the project of the integrated management of the Rusciori school farm, the fruit tree farm, aimed to study both the pathogens and pests of the apple culture.

Apple, the biblical tree, has its origin in a complex spread Asian, the sign and the land between the four rivers surrounding the "Garden of Eden". Apple is the first fruit mentioned in the Bible and who led the first people to choose between an "Endemic existence" and another responsible.

From the original area, the apple has spread to Egypt, Greece, Rome finally embracing the temperate zone. Theofrast wrote that in the year 2400 BC apple was known in Europe [5]. Testimonies of apple spread to the Mediterranean world abounds in Greek and Roman mythology as in the writings of many authors of antiquity.

Hera, Zeus's wife and sister, appreciating the

beauty and qualities of the apple when, at his wedding with Zeus, Gaia, mother of all, I gave the bride an apple. This has made a real apple orchard known as the "Garden of the Hesperides", named after the three sisters and daughters of Zeus, to guard the garden, Hesperides. Vigilance was pierced Hesperides not only great hero Heracles who meet one of the twelve labors ordered cousin or Euristeu.

Apple, caused the greatest feats of the ancient Greek Trojan War. At the wedding of Peleus with Nereid Thetis whole community was invited Olympians. Only the goddess of discord was not invited. Revenge, it threw out the window in the middle of the wedding, a golden apple that read: "the more beautiful". The verdict in choosing the most beautiful of the goddesses Hera, Athena and Aphrodite gave him Paris, who then kept the flocks of his father King Priam of Troy, on the mountainside Ida. Aphrodite was chosen, but only after I promised the goddess of Paris that he would give his wife the most beautiful woman, Helen, wife of King Menelaus. War was as stated.

Apple culture in the Roman Empire testify us many ancient authors. Pliny the Elder in the encyclopedia "Naturalis Historia" describes about 17 varieties of apple in Rome. Cato treatise "De re rustica" describes six varieties of apple. Pliny the Elder, quoting Virgil recalls as Rome and Italy spread the process of grafting trees. They went so far in the choice of rootstock that was used even brambles. The choice was stopped by grafting thistles belief that attracts lightning. [6] The whole Roman Empire are grown about 40 varieties of apple [20].

Apple through its nutritional qualities star remained exceptional throughout European history. There are numerous cases when painters considered a success out of play on the canvas the beauty and roundness apple.

In the fairy tale world, the apple has retained the same status as the narcissistic show enchanted apple queen of the fairy tale "Snow White" or golden apples from the Garden of the King of Ispirescu's fairy tale "Prâslea the Brave and the Golden Apples". As a visual delight, an apple orchard in bloom stands next to a grove of cherry blossoms or a chain of

waves in the breeze.

In science, legend apple sits at the base of an idea that changed almost all precepts of physics. The fall of an apple on Newton's head would have induced its concept of gravity. Newton's treaty "Mathematical principles of natural philosophy" developed "the first true universal law of nature" that explains the orbits of celestial bodies using mathematical formulas and it was based on the fact that every object in the universe attracts the rest of the objects. It is the universal law of gravitation [19].

Apple nutrition force consists of its contents in various sugars, natural multi-vitamins, especially in the apple peel, minerals, fiber, digestive and still others. These nutrients make the apple to be a part of the daily human diet. The prescription of "an apple a day" reflects the importance of eating apples in different forms and maintaining a state of full health. Ideal and healthy it is as each inhabitant to consume at least an amount of 20 kg of apples per year. Orchards in Romania offers this amount of apples produced by the 40 varieties of apple tree.

In Romania, the apple crop was an economic concern ever since Dacia testify as reliefs on Trajan's Column in Rome. Cantemir in "Descriptio Moldaviae" speaks about true forest trees [19].

In this context, the objective of the paper was to study the agroecosystem entomofauna in the apple orchard of Rusciori didactic farm belonging to the "Lucian Blaga" University from Sibiu, Romania.

MATERIALS AND METHODS

The study wildlife in the apple orchard was carried out between: 2014-2015;

The location investigations were made was Rusciori didactic farm belonging to the "Lucian Blaga".

The purpose of the study and knowledge of agroecosystem entomofauna studied following methods were used in the orchard: direct observation on the plant, along with entomological collection of attacked organs of plants, using entomological jar, using photography. The entomofauna caught with

entomological jar was determined in the laboratory. IOR was used, a magnifier loupe 1983 IPM Scope.

For damage assessment were used two indicators: attack frequency and intensity of the attack which determines the pest attack. By attack frequency means the ratio of the number of plants or organs attacked (n) and total number of plants or organs attacked (N). Expressed as a percentage formula:

$$F\% = \left(\frac{n}{N}\right) \cdot 100$$

Intensity of the attack is the proportion in which a plant is attacked or one of its organs:

$$I\% = \sum \left(\frac{i \cdot f}{n}\right) \text{ where:}$$

i- share the plant was attacked;

f-number of plants attacked in the same proportion;

n -the total number of attacked plants.

The degree of infection was determined during the growing period and it was calculated as follows:

$$G_a\% = \left(\frac{f\% - i\%}{100}\right)$$

RESULTS AND DISCUSSIONS

Seated, 3 km from localitatea Sura Mica and 7 km from Sibiu, the Rusciori village is a part part of the microregion called " Secaşelor Country ". The Didactic Farm is located on the Rusciori village land, even on the Sibiu-Rusciori road (Photo 1).



Photo 1. Rusciori village location (Google Earth)

Farmland has 41.69 ha of which 37.78 ha are occupied by orchards. Apple varieties grown in the farm are: Golden Delicious, Jonathan, Starkrimson, Red Melba, Wagner rewarded. The trees are distributed into three plots as follows: Plot I 46 rows of trees, Plot 2 with 67 and Plot 3 with 52 rows of apple trees.

Over the time and untill 1977, the Apatin Farm belonged to the Sura Mica State Agricultural Enterprise, and then passed its heritage to the Cîsnădie Fruit Growing Station. Afterwards, it belonged until 1990 to Cristian Montanology Institute. For nine years 1990-1999, the activity of the fruit growing farm declined. The lack of funds led to its degradation: maintenance-free and without any appropriate treatment. The farm was taken over in 1999 by "Lucian Blaga" University until 2004. Immediately after taking the farm, periodic monitoring visits were made to identify pests and their attack manner on the various organs of the fruit trees. In this period, there were identified the pests presented in Table 1.

Table 1. The harmful fauna from educational Rusciori farm

Nr. crt.	Borer	Stage of attack
Ord. Homoptera		
1.	Fam. <i>Aphididae</i> <i>Aphis pomi</i> De Geer	Larva, adult
2.	Fam. <i>Diaspididae</i> <i>Quadraspidiosus perniciosus</i> Comst.	Larva, adult
3.	Fam. <i>Schizoneuridae</i> <i>Eriosoma lanigerum</i> Hansm.	Larva, adult
Ord. Coleoptera		
4.	Familia <i>Curculionidae</i> <i>Anthonomus pomorum</i> L. (Photo 2)	Larva, adult
5.	Familia <i>Curculionidae</i> <i>Scolytus mali</i> Becht.	Larva, adult
Ord. Lepidoptera		
6.	Fam. <i>Geometridae</i> <i>Operophtera brumata</i> L.	Larva
7.	Fam. <i>Tortricidae</i> <i>Adoxophyes reticulana</i> Hb.	Larva
Ord. Acari		
8.	Fam. <i>Tetranychidae</i>	Larva, adult
Ord. Rodentia		
9.	Fam. <i>Muridae</i> <i>Microtus arvalis</i> Poll.	Adult



Photo 2. *Anthonomus pomorum* L. – adult (Original photo)

The main target species of the university farm belong to three classes: Insecta (7 species), Arachnida (1 species) and Mammalia (1 species). Insects are the most and are represented by three orders: Homoptera 3 species (*Aphis trees*, *Quadraspidiosus perniciosus*, *Eriosoma lanigerum*), Coleoptera two species (*Anthonomus pomorum*, *Scolytus mali*) and Lepidoptera 2 species (*Operophtera frosted*, *Adoxophyes reticulana*). Fauna harmful in attack mode [12], and the amount of damage the attack without serious damage to orchards are presented in Table 2.

Table 2. The economic importance of the analyzed species

Species	Ioss
<i>Aphis pomi</i> De Geer	Polyphagous species, attacking mainly apple. Lice are mounted to the underside of the leaves from the top shoots. The leaves pierced twist, turn yellow and dry. The frequency of attacks is poor, but present in all varieties of apple farm. The degree of infection (G. A.) is East.
<i>Quadraspidiosus perniciosus</i> Comst.	The species locates all plant organs, preferring woody parts. The degree of infection of apple trees in the orchard Rusciori has averaged over all cultivars except Jonathan variety of 3rd plot where the attack is weak.
<i>Eriosoma lanigerum</i> Hansm.	The attack is manifested in the form of stems and branches swelling. Trees dried over time. Colonies of lice are obvious due to the waxy secretions white covering colony (Photo 3). The degree of woolly aphid attack in the orchard teaching is extremely strong Starkrimson varieties, winning Wagner, Jonathan and Golden Delicious and the Red varieties Melba and Starkrimson of only three strong plot.
<i>Anthonomus pomorum</i> L.	Preferentially attack the apple. Rusciori attack at producing major damage is caused by larvae that consume fully

	reproductive organs of the flower. The degree of attack is extremely powerful, especially Jonathan and Golden varieties presenting flowers antonomate (as cloves) (Fig. 4). The degree of attack is extremely powerful, fruits were very little, almost no trees belonging Starkrimson varieties, Wagner Awarded Red Melba - showed no flowers.
<i>Scolytus mali</i> Becht.	Adults dig galleries between bark and wood, fruit larvae wooden, galleries even deeper. The larvae attack mode is dangerous because they may disrupt the movement of sap in the tree. With time the plant is dried. Part of the apple orchard has many channels and outlets of adults on the trunk. The degree of infection is still rated one easily.
<i>Operophtera brumata</i> L.	Pest is polyphagous, but also occurs in apple. The strong attack caterpillars can destroy a tree in full leaf table. This species was identified on all apple varieties grown on the farm. Grage attack was assessed by middle attack.
<i>Adoxophyes reticulana</i> Hb.	Polyphagous species is found and apple. Larvae were observed in the trees attacked by twisting them in the form of a cone. When the fruit is ripe can chew their epicarp (peel), producing qualitative damage. The degree of infection in the farm is average for all varieties of apple.
<i>Panonychus ulmi</i> Koch.	Polyphagous species that attacks all species of fruit. In the orchard Rusciori degree of attack is high. They were found on all apple varieties studied. The mites suck sap sting and leaves. The tissue at the site of attack depigmentează, culoritul go from silvery-white to rusty. Attacked leaves dry and fall.
<i>Microtus arvalis</i> Poll.	Climatic conditions in recent years have favored the growth of populations of <i>Microtus arvalis</i> in fruit tree orchards. At Rusciori mice gnawed the bark from the neck and roots. The degree of infection in the orchard is very strong all over them.



Photo 3. *Eriosoma lanigerum* Hansm. – attack (Original photo)



Photo 4. *Anthonomus pomorum* L. – attack (Original photo)

In our country, there known about 12-15 species of pests and if they are not kept under control, the varieties of apple production can be compromised even by 100%. Of these species, nine are found in Rusciori orchard where they produce major damages. The degree of pest of fruit trees generally ranges from moderate to extremely loud. Of the nine species identified in the interval 2014-2015, with the highest degree of pest are *Eriosoma lanigerum* Hansma., *Anthonomus pomorum* L., *Microtus arvalis* Poll. In the category of medium degree of damage, there are: *Aphis trees* De Geer, *Quadraspidiosus perniciosus* Comst., *Operophtera frosted* L. *Adoxophyes reticulana* Hb., *Panonychus ulmi* Koch. *Quadraspidiosus perniciosus*. A special attention was drawn to the species considered not numerous, but a massive attack of them may reduce the quantity and quality of fruit, and dry the orchard in a few years. The species with the lowest degree of attack is *Scolytus mali* Becht. (Photo 5). The increased number of pests is due to the lack of hygiene measures on plant, the mechanical works, and agro and phytosanitary treatments.



Photo 5. *Scolytus mali* Becht. – attack (original)

CONCLUSIONS

The varieties of apple trees in the Ruscori Farm were attacked by 9 major animal pest species (insects, mites, and rodents).

The degree of attack achieved by the studied pest species ranged from weak (species) to extremely strong (three species).

Jonathan is the most attacked variety. On it there were identified almost all pests present in the farm.

The climatic conditions in recent years have favored the growth of populations *Eriosoma worrying lanigerum*, *Anthonomus pomorum*, and *Microtus arvalis* in the orchard and fruit and compromised the culture.

The integrated protection by means of measures to preventive and treat pest play an important role, being the number one technological factor in the fruit growing practice. Higher yields and cost-efficient plant protection is based on applied science.

Similar studies to monitor the pests in agricultural crops have been carried out and in Sibiel Village, Sibiu County, in a private orchard of apple trees using pheromone traps to limit *Cydia pomonella* population, [7,8] but it was about other species like lepidoptere [10,11] damaging crops [9].

REFERENCES

- [1]Antonie Iuliana, 2015, Entomofauna dăunătoare agroecosistemelor și importanța ei economică (I), in: Protecția plantelor, Ed. Univ. "Lucian Blaga" din Sibiu.
- [2]Antonie Iuliana, 2015, Entomofauna dăunătoare agroecosistemelor și importanța ei economică (II), in: Protecția plantelor, Ed. Univ. "Lucian Blaga" din Sibiu.
- [3]Antonie Iuliana, Managementul integrat al insectelor dăunătoare în protecția plantelor, 2015, in: Protecția plantelor, Ed. Univ. "Lucian Blaga" din Sibiu.
- [4]Bryson, B., 2015, Despre toate pe scurt, Ed. Polirom, București, 66.
- [5]Pârvu, C., 2004, Enciclopedia plantelor. Plante din flora României, vol.III, Ed. Tehnică, București.
- [6]Plinius, 2002, Naturalia Historia. Enciclopedia cunoștințelor din Antichitate, Vol.III, Ed. Polirom, Iasi, 180-228.
- [7] Stancă-Moise, C., 2014, Method of analysis for population limitation of the Lepidoptera pest in fruiterers (Lepidoptera: Tortricidae) in Sibiel village, Sibiu county in conditions of year 2013, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. Vol. 14(1):333-

336.

[8] Stancă Moise, C., 2015, Observation on the biology of species *Cydia pomonella* (worm apple) in an orchard in the town Sibiel, Sibiu county in 2014. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. Vol.15(3):293-296.

[9] Stancă Moise, C., 2016, Behaviour and dynamics of *Mamestra brassicae* species (Lepidoptera: Noctuidae) in an agricultural ecosystem in the town Sibiel, county in regim of the years 2014-2015. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. Vol.16(1): 325-329.

[10] Stancă Moise, C., 2016, Migratory species of butterflies in the surroundings of Sibiu (Romania). Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. Vol.16(1): 319-324.

[11] Stancă-Moise, C., 2015, Family Pieride (Lepidoptera, Pieridae) and evolution over time in forest grove Sibiu (Sibiu, Romania), Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. Vol.15(1): 307-311.

[12] Stancă-Moise, C., 2014, Controlul populațiilor de dăunători, Editura Universitatii Lucian Blaga din Sibiu, 224 p.

[13] Tănase Maria, 2000, Le cuscuta, contribution sur les connaissances recentes dans la region de Sibiu (Contribuții la cunoașterea răspândirii cuscutei în județul Sibiu), Volumul Simpozionului științific "Prezent și perspectivă în horticultură" Cluj – Napoca 24 nov. 2000, 343-346.

[14] Tănase Maria, 2000, Limitarea răspândirii cuscutei prin mijloace biologice, a 5-a Conferință Națională pentru Protecția Mediului prin metode și mijloace biologice și biotehnice și a 2-a Conferință Națională de Ecosanogeneză, Universitatea Transilvania Brașov, 26-27 mai 2000, 259-264.

[15] Tănase Maria, 2000, Plante gazdă noi ale cuscutei, Lucrări științifice U.S.A.M.V. "Ion Ionescu de la Brad" Iași, seria horticultură, 2000, 43:288.

[16] Tănase Maria, 2003, Fitopatologie, Editura Universității "Lucian Blaga" Sibiu.

[17] Tomșa, M., Tomșa Elena, 2003, Protecția integrată a pomilor și arbuștilor fructiferi la începutul mileniului III, Editura Gee, București.

[18] Vernescu, S.V., 2004, Patogenii și Dăunătorii plantelor de cultură. Curs universitar, Editura Pantheon, București.

[19] <http://editurauniversitaria.ucv.ro/marul-traditie-si-modernism/rasfoire>

[20] <http://www.farmacia-verde.ro/2011/05/06/marul-unul-dintre-cele-mai-valoroase-alimente-din-natura/>