OBSERVATIONS ON THE STRUCTURE, DYNAMICS AND ABUNDANCE OF CARABID SPECIES (ORDER *COLEOPTERA*, FAMILY *CARABIDAE*) FROM FRUIT TREE ORCHARDS

OBSERVAŢII PRIVIND STRUCTURA, DINAMICA ŞI ABUNDENŢA SPECIILOR DE CARABIDE (ORD. *COLEOPTERA*, FAM. *CARABIDAE*) DIN PLANTAŢIILE POMICOLE DE MĂR

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Abstract. *The paper presents the obtained results from the observations made in a apple fruit tree orchards within SC Loturi Service SRL Delesti, Vaslui County. The material collection was done using the Barber traps once a week during June - September. Several collections of entomological material captured in the soil traps were made, then the carabid species were selected and identified. The collected species belong mainly to the following genres: Harpalus, Pterostichus, Amara, Calathus, Carabus etc.*
Key words: Barber traps, apple orchards, *Amara*

Rezumat: *În lucrare sunt prezentate rezultatele oţinute în urma observaţiilor făcute într-o plantaţie pomicolă de măr din cadrul SC Loturi Service SRL Deleşti, jud. Vaslui. Colectarea materialului s-a facut cu ajutorul capcanelor Barber o dată pe saptămână în perioada iunie - septembrie. Au fost făcute mai multe colectări ale materialului entomologic capturat în capcanele de sol, apoi au fost selectate şi identificate speciile de carabide. Speciile colectate aparţin, în special, următoarelor genuri: Harpalus, Pterostichus, Amara, Calathus, Carabus, etc.*
Cuvinte cheie: capcane Barber, livezi de măr, *Amara*

INTRODUCTION

Globally, the apple is one of the most important tree species, cultivated on all continents. In world fruit production, apples have a special place, and together with bananas and oranges account for 2/3 of the total annual harvest.

Under the pedo-climatic conditions of Romania, because of the large yields that can be obtained on the surface unit, the apple culture is one of the most profitable agricultural crops.

Regarding crop systems and orchard types, in the second half of the century, XX has increasingly emphasized the tendency to intensify tree culture,

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which has led to new ways of driving, steering and maintaining the crown to cope with the increase in tree density per hectare.

However, modest tree-growing has implicitly led to the rise to environmental and health insensibility, the use of pesticides, fertilizers and other chemically active substances, whose shortcomings we know well. In this context, the pollution of the environment with pesticides and fertilizers, fruit growing occupies one of the main places.

At present, manifestations of global attitudes towards the environment and human health are increasingly evident, through the sustainable exploitation of natural resources and especially of agriculture as an essential factor in changing the environment.

Phytosanitary protection is a key link in apple culture technology, with an important role in achieving high and constant production, knowing that the production potential of these horticultural systems can be reduced by 20-30% or sometimes total compromise due to the disease and pest attack.

"Loturi Servive" SRL owns an area of 30 ha, cultivated with apple, obtained by the purchase of private orchards from the private owners as well, with the restitution of the land to the former owners of significant areas of the state exploited farms in the communist period.

Considering the necessity of performing phytosanitary treatments at the optimal moments of control of the complex of pests and phytopathogens specific to the apple, in the orchards belonging to SC "Loturi Servive" SRL, as in all intensive orchards in the area, among the rows of trees is arranged a vegetal carpet consisting mainly of garmin, with the main purpose of providing access to plant phytosanitary treatments every time when required, often in short periods without rains.

Also, by adopting the culture technology, the maintenance of the vegetal carpet is done by mowing it 2-3 times during a vegetative season, chopping the resulting material and using it as a mulch, thus ensuring an intake of organic matter to enrich the nutrient intake of soil.

In addition to this advantage, the vegetal carpet can influence local ecosystem conditions, such as: physical, chemical and microbiological properties of the soil; biodiversity of useful entomofauna; reducing the level of attack of phytopathogenic agents and specific pests, and with multiple effects on the quantity and quality of fruit and ultimately on the profitability of apple crops.

MATERIAL AND METHOD

Barber soil traps were used to collect the biological material. These consisted of introducing into the soil recipients in which a solution of formalin (40%) diluted with water to a concentration of 5% was placed.

The experience was organized on two rows, at a distance of 12 meters between rows and at a distance of 6 meters between traps, and each row had 3 traps.

The sampling was done between May and August at intervals of about 10-15 days.

At each harvest, the collected insects were placed in gauze cloth, each sample separately and replaced, or the trap fluid was then filled. The collected biological material was labeled, with the label specifying: the collection date, the trap number and the stationary.

In the laboratory the material was cleaned of vegetal remains and then washed under the water jet, selected on a systematic order, and then the carabid species were determined.

As far as the data interpretation is concerned, a number of ecological indicators have been centralized following the collection of the material.

Structure - represents the organization, selection and centralization of insect species from an ecosystem with specific characteristics.

Abundance-Express the number of individuals collected.

Species dynamics - all changes (quantitative) occurring within a population unit.

The situation of sampling during the research period is the following:

-The first harvest on 18.05.17;
- The second harvest on 26.05.17;
- The third harvest on 07.09.17;
- Fourth harvest on 28.07.17;
- Fifth harvest on 18.08.17;
- The sixth harvest on 15.07.17.

RESULTS AND DISCUSSIONS

The research was carried out in a fruit tree plantation that targeted the useful and harmful entomofauna belonging to the Carabidae family, which was harvested using Barber soil apertures.

Thus, after identifying the 39 specimens collected, 19 species belonging to the Carabide family (Chatened du Gaetan, 1990; Panin 1951) were recorded.

The largest number of specimens collected (12) was recorded at the first harvest on 18.05.2017, and the collared species were: *Amara aenea*, *Panagaeus bipustulatus*, *Pseudophonus pubescens*, *Calathus fuscipes*, *Panagaeus cruxmajor*, *Amara crenata*, *Calosoma denticole*, *Microlestes nigrita*, *Tachyura quadrisignata*. At the second harvest on May 26, 2017, 7 species of carabid were recorded which totalized a total of 10 specimens and these were: *Harpalus calceatus*, *Carabus violoceus*, *Anisodactylus binotatus*, *Brachinus elegans*, *Harpalus tardus*, *Cicindela solute*, *Pterostichus niger*. At the next harvest on July 15, 2017, the total number of specimens collected was 7, belonging to the 4 species of *Amara aenea*, *Anisodactylus binotatus*, *Calosoma denticole*, *Harpalus griseus*. On 28.07.2017, at the fourth harvest a number of three species, *Carabus violoceus*, *Anisodactylus binotatus*, *Lebia humeralis*, with a total of 5 specimens were collected. The two collected species (*Anisodactylus binotatus*, *Lebia humeralis*) at the second harvest on 18.08.2018 totalized a total of 2 specimens. At the sixth harvest on September 7, 2017, the three harvested species (*Carabus violoceus*, *Harpalus aeneus*, *Harpalus calceatus*) totalized 4 specimens.

Table 1

Structure, dynamics and abundance of carabid species for each harvest

No	Name of species	Harvested number / Date of harvested					
		Harvest 1/ 18.05.17	**Harvest 2/ 26.05.17**	**Harvest 3/ 15.07.17**	**Harvest 4/ 28.07.17**	**Harvest 5/ 18.08.17**	**Harvest 6/ 07.09.17**
1	*Calathus fuscipes* Goeze.	1	-	-	-	-	-
2	*Panagaeus cruxmajor L.*	1	-	-	-	-	-
3	*Carabus violoceus* L.	-	1	-	1	-	2
4	*Amara aenea* De Geer.	2	-	4	-	-	-
5	*Amara crenata*Dejean	1	-	-	-	-	-
6	*Anisodactylus binotatus* Fabr.	-	1	1	2	1	-
7	*Brachinus elegans* Chaudoir	-	1	-	-	-	-
8	*Calosoma denticole* L.	1	-	1	-	-	-
9	*Harpalus aeneus* F.	-	-	-	-	-	1
10	*Harpalus calceatus* Duft.	-	4	-	-	-	1
11	*Harpalus griseus* Panz.	-	-	1	-	-	-
12	*Harpalus tardus* Panz.	-	1	-	-	-	-
13	*Cicindela solute* L.	-	1	-	-	-	-
14	*Microlestes nigrita* Wollaston	1	-	-	-	-	-
15	*Panagaeus bipustulatus* Fabr.	2	-	-	2	-	-
16	*Pseudophonus pubescens* Mul	1	-	-	-	-	-
17	*Tachyura quadrisignata* Duft.	2	-	-	-	-	-
18	*Lebia humeralis* Dejean.	-	-	-	-	1	-
19	*Pterostichus niger* Schall.	-	1	-	-	-	-
TOTAL - 19 species		**12**	**10**	**7**	**5**	**2**	**4**

After the diet (Constantineanu and Pisică, 1977; Manole *et al.,* 2009; Talmaciu *et al.,* 1996; Talmaciu *et al.,* 2007), a number of 12 species predator behavior (Ps), making them useful species within the group and 7 species are mixed feeding regime are thus deemed as harmful species. Also, 24 (61.48%) of the total number of specimens collected belong to the useful entomofauna and only 15 (38.52%) specimens belong to the harmful entomofauna.

Table 2

The situation to the regarding on the type of fauna and the representative percentage

No.	Name of species	Total samples	Type of fauna	%
1	*Anisodactylus binotatus* Fabr.	5	P	12.82
2	*Carabus violoceus* L.	4	P	10.25
3	*Panagaeus bipustulatus* Fabr.	4	P	10.25
4	*Calosoma denticole* L.	2	P	5.12
5	*Tachyura quadrisignata* Duft.	2	P	5.12
6	*Calathus fuscipes* Goeze.	1	P	2.56
7	*Brachinus elegans* Chaudoir	1	P	2.56
8	*Cicindela solute* L.	1	P	2.56
9	*Microlestes nigrita* Wollaston	1	P	2.56
10	*Lebia humeralis* Dejean.	1	P	2.56
11	*Panagaeus cruxmajor L.*	1	P	2.56
12	*Pterostichus niger* Schall.	1	P	2.56
Total predator species		***24***		***61.48***
13	*Amara aenea* De Geer.	6	M	15.38
14	*Harpalus calceatus* Duft.	4	M	10.25
15	*Amara crenata*Dejean	1	M	2.56
16	*Harpalus aeneus* F.	1	M	2.56
17	*Harpalus griseus* Panz.	1	M	2.56
18	*Harpalus tardus* Panz.	1	M	2.56
19	*Pseudophonus pubescens* Mul	1	M	2.56
Total mixed species		***15***		***38.52***
TOTAL - 19 species		**39**		100

*Ps- *predator species* M- *mixed species* (they show mixed diet regime, have also phytophagous preferences, but do not deny the predatory insect status)

In total, in the SC Loturi Service SRL, Delesti, Vaslui stationary in the fruit apple orchard, during the whole of the six harvests were collected 39 specimens of carabids belonging to the useful and harmful entomofauna that can affect directly or indirectly the production or the quality of the fruits.

CONCLUSIONS

In 2017, in the apple fruit orchard belonging to Loturi Service SRL stationary were collected by using the soil traps type Barber, 39 samples of Carabid beetles belonging to 19 species, the largest number of samples being recorded species: *Amara aenea*, *Anisodactylus binotatus, Carabus violoceus,*

Panagaeus bipustulatus, Harpalus calceatus, Calosoma denticole, Tachyura quadrisignata, and the other 12 carabid species recorded a one samples.

In 2017, in apple orchards we mentioned that we performed a total of six sampling by the traps method type Barber, between May and September.

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