OBSERVATIONS ON THE EXISTING CARBIDE SPECIES IN THE APPLE ORCHARDS

Mihai TALMACIU[1], Monica HEREA[1], Nela TALMACIU[1]

e-mail: mtalmaciu@yahoo.fr

Abstract

In this paper new contributions are made to the knowledge of the species of carabids in a fruit tree apple of Delesti in the Vaslui country. The material was collected from May to September throughout the research period, using Barber traps. From the biological material collected, all species collected have been listed and determined and only the species belonging to the Carabidae family have been selected afterwards. In the period of the observations were collected throughout 1573 specimens of harmful and useful insects, so 795 were collected in 2018 for 11 species, and 778 were collected in 2019 for 33 species. Analysis of the collected material was found the most frequevence species was: *Carabus coriaceus L., Pseudophonus rufipes Mull., Opatrum sabulosum L., Phyllotreta vittula F., Phyllotreta nemorum L., Formicomus pedestri Anysodactilus binotatus, Harpalus distinguendus, Harpalus calceatus, Harpalus tenebrosus, Harpalus griseus, Amara crenata, Harpalus tardus, Metabletus truncatelus, Amara aenea si Harpalus pubescens*.

Key words: species of carabids, Barber traps, apple

In the pedo-climatic conditions of Romania, due to the high yields that can be obtained on the surface unit, apple cultivation is one of the most profitable agricultural crops.

Regarding the culture systems and the types of orchards, in the second half of the century. XX has increasingly accentuated the tendency of intensification of the tree culture, which has led to new ways of conducting, directing and maintaining the crown, to cope with the increase of tree density per hectare (Talmaciu M. *et al*, 2016).

Plant protection is a key link in apple cultivation technology with an important role in achieving high yields and constant, being known that the production potential of these systems horticultural can be decreased 20-30%, or sometimes total compromise due to the attack of diseases and pests (Baban E., 2006).

There is currently more obvious manifestation of global attitudes towards the environment and to human health, the sustainable use of natural resources and especially agriculture as a key factor in changing environment.

This paper presents the results of researches on the epigeos entomofauna existing in the apple orchards of the SC Loturi Service SRL Delesti, Vaslui farm.

MATERIAL AND METHOD

The researches aimed to determine the useful entomofauna of carabids from apple orchards in the area of Moldova.

The collection of entomological material (Neculiseanu *et al*, 2000) using soil traps was first used by Barber in 1931, who proposed the use of fixing liquids in traps to collect insects (Talmaciu M., 2005).

Various containers (jars, boxes, plastic cups, etc.) with a volume of 400 to 800 ml can be used as a trap, which are buried in the ground so that the upper part of it is at ground level. A lid is placed on top of the container to protect the trap against precipitation, plant debris, lumps of soil etc.

In this case, (*figure 1*) were used the plastic boxes with a volume of 500 ml and a diameter of 10 cm, in which a solution of formalin in conc. of 4%.

In the studied biotope were placed 10 traps, in 2 rows, installed from the edge to the inside, at a distance of 10 m between rows and 6 m between traps in a row.

The samples were collected in each of the 2 years of research (2018 and 2019) during April-September, at intervals of about 10-14 days.

[1]"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine, Iasi

Figure 1 **Installation of soil traps in experimental plots**

RESULTS AND DISCUSSIONS

In 2018, the experimental group with the following working variants was placed in the research stationary:

- V1 - existing plant carpet (control);
- V2 - vegetable carpet overgrown with pebbles (*Lotus corniculatus*);
- V3 - vegetal carpet covered with white clover (*Trifolium repens*);

The collection of the entomological material from the Barber-type soil traps was done between May and September, at intervals of about 7-10 days, at the following dates: Harvest I. 23.05., Harvest II. 08.06., Harvest III. 21.06., Harvest IV. 08.07., Harvest V. 22.07., Harvest VI.02.08., Harvest VII. 16.08., Harvest VII. 30.08., Harvest IX. 10.09. si Harvest X. 21.09.

By variants and harvests, in 2018, the situation is presented as follows:

In variant 1, existing vegetal carpet (control), in 2018, regarding the species and the number of carabids collected, the situation is presented as follows:

- A number of 9 species of carabids were collected, totaling 320 copies (*table 1*).

- Carabids species with the largest number of specimens collected were *Harpalus calceatus* 121 copies, 48 copies *Anysodactilus binotatus*, *Harpalus tenebrosus* 41 copies, 40 copies *Harpalus pubescens.*

Tabel 1

The structure of the carabid species at variant 1 in 2018

No. crt.	Species	Harvest										Total
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1	*Anysodactilus binotatus*	7	21		4	15					1	48
2	*Harpalus aeneus*							1				1
3	*Harpalus calceatus*	10	54		5	13	9	21	4		5	121
4	*Harpalus distinguendus*	9		4	5	10			2		4	34
5	*Harpalus griseus*	2	21	1				2			3	29
6	*Harpalus pubescens*	9		1	2	1	24	3				40
7	*Harpalus tardus*		1	1							2	4
8	*Harpalus tenebrosus*			3		20		18				41
9	*Metabletus truncatelus*				1			1				2
TOTAL 9 specimens		**37**	**97**	**10**	**17**	**59**	**33**	**46**	**6**	**0**	**15**	**320**

In variant 2, a carpet of vegetation overgrown with pebbles (*Lotus corniculatus*), in 2018, as regards the species and the number of collected carabids, the situation is presented as follows: - It has collected a total of 10 species of carabids which totaled 277 copies (*table.2*).

- Carabids species collected in this experimental variant are: *Amara aenea, Anysodactilus binotatus, Harpalus azureus, Harpalus calceatus, Harpalus distinguendus, Harpalus griseus, Harpalus pubescens, Harpalus tardus, Harpalus tenebrosus, Metabletus truncatelus.*

In variant 3, vegetal carpet overlaid with white clover, in 2018, as regards the species and the number of collected carabids, the situation is presented as follows:

- In experimental version 3, a number of 10 species of carabids were collected, totaling 248 copies (*table 3*).

- Carabids species collected in this experimental variant are: *Amara aenea, Anysodactilus binotatus, Harpalus azureus,*

Harpalus calceatus, Harpalus distinguendus, Harpalus griseus, Harpalus pubescens.

Table 2

The structure of the carabid species at variant 2 in 2018

No. crt.	Species	Harvest										Total
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1	*Amara aenea*								2			2
2	*Anysodactilus binotatus*	11	12		11	11		2		1		48
3	*Harpalus azureus*	2	3									5
4	*Harpalus calceatus*	2	12	4	13	17	9	18				75
5	*Harpalus distinguendus*	7	4	5	1	5		3		2	2	29
6	*Harpalus griseus*	4	4	4	6			1				19
7	*Harpalus pubescens*	4	18	1	15		3		6	2		49
8	*Harpalus tardus*		2	2								4
9	*Harpalus tenebrosus*			7		7	5	9	12	3		43
10	*Metabletus truncatelus*							3				3
TOTAL 10 specimens		**30**	**55**	**23**	**46**	**40**	**17**	**36**	**20**	**8**	**2**	**277**

Table 3

The structure of the carabid species at variant 3 in 2018

No. crt.	Species	Harvest										Total
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1	*Amara aenea*					2						2
2	*Anysodactilus binotatus*	4	28		6	7				4		49
3	*Harpalus azureus*	1										1
4	*Harpalus calceatus*	9	6	5	18	15	10	15				78
5	*Harpalus distinguendus*	1	8			6		5	2			22
6	*Harpalus griseus*	6	5		9							20
7	*Harpalus pubescens*			8	15	1						24
8	*Harpalus tardus*			3						6		9
9	*Harpalus tenebrosus*					24		12	3			39
10	*Metabletus truncatelus*	3			1							4
TOTAL 10 specimens		**24**	**47**	**16**	**49**	**55**	**10**	**32**	**5**	**10**	**0**	**248**

In 2018, the most abundant species of carabids were common to the three experimental variants are: *Harpalus calceatus, Anysodactilus binotatus, Harpalus tenebrosus, Harpalus pubescens, Harpalus distinguendus, Harpalus griseus, Harpalus tardus, Metabletus truncatelus*.(*figure 2*).

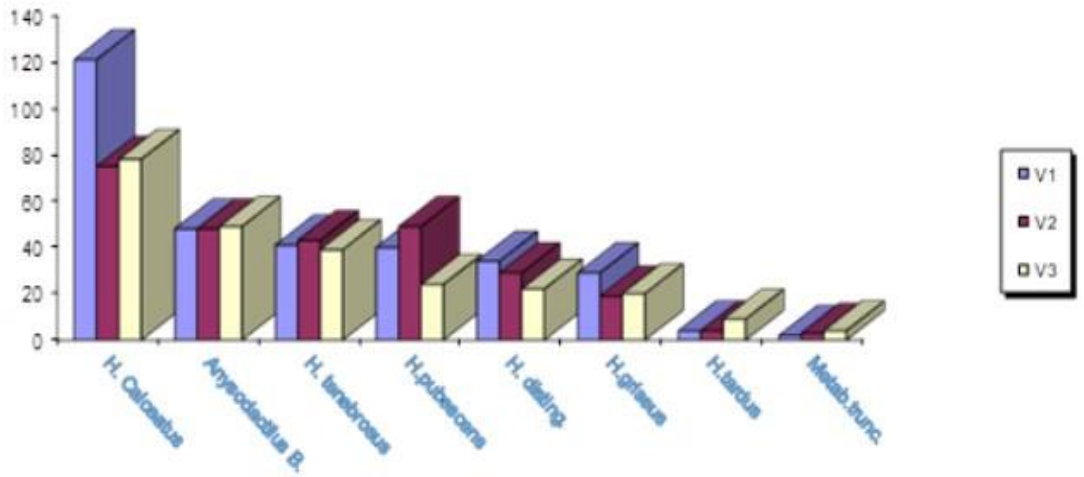

Figure 2 **Abundance of the species of carabids in the three experimental variants in 2018**

Regarding the number of carabids collected in 2018, it is observed that variant V 1 (Control variant, existing vegetable carpet) recorded the highest copies (320 copies), and the smallest number of copies collected had the variant V 3 (248 copies) (*figure 3*)

By variants and harvests, in 2019, the situation is presented as follows: *At first variant*, in 2019, regarding the number of carabids species collected, the situation is presented as follows: - In this experimental variant, it has collected a total of 20 species of carabids which totaled 302 copies (*table 4).* - The carabids species collected in this experimental variant are: *Amara crenata, Anisodactilus binotatus, Harpalus azureus, Harpalus calceatus, Harpalus distinguendus.*

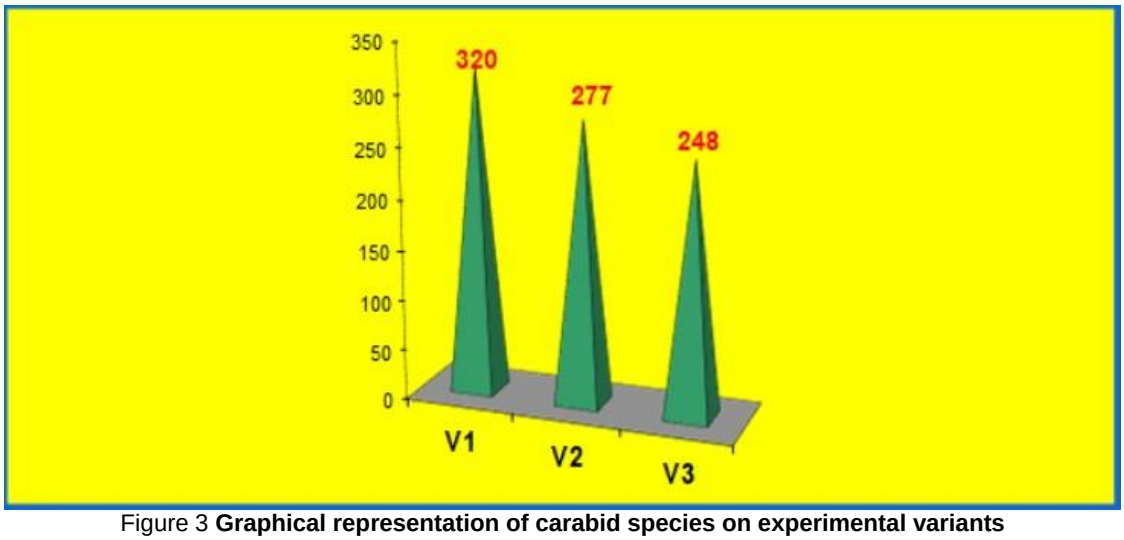

Figure 3 **Graphical representation of carabid species on experimental variants**

In variant 2, vegetal carpet overlaid with guides, in 2019, as regards the species and the number of collected carabids, the situation is presented as follows: - In this experimental variant, it has collected a total of 14 species of carabids which totaled 225 copies (*table 5)*.- The species of collected carabids in this experimental starionary we mention: *Amara aenea, Anatis ocellata, Anysodactilus binotatus, Harpalus calceatus, Harpalus distinguendus, Harpalus tenebrosus, Metabletus truncatelus.*

Tabel 4

The structure of the carabid species at variant 1 in 2019

No. crt.	Species	Harvest										Total
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1	*Amara aenea*					3			1			4
2	*Amara crenata*		4		1	1	2					8
3	*Anysodactilus binotatus*		24	24	7	2	12	6	10	1	1	87
4	*Brachynus explodens*						1					1
5	*Harpalus azureus*									3	3	6
6	*Harpalus calceatus*		30		3			1	6			40
7	*Harpalus distinguendus*		41	15	4	1	5	2	16	1	1	86
8	*Harpalus griseus*		2					4	3			9
9	*Harpalus pubescens*				2		2					4
10	*Harpalus rufipes*		4									4
11	*Harpalus tardus*		1			1		3	1			6
12	*Harpalus tenebrosus*		16		3	2		3	5			29
13	*Idichroma dorsalis*								1			1
14	*Metabletus truncatelus*		1	1		3						5
15	*Microlestes maurus*								5			5
16	*Ophonus obscurus*			1								1
17	*Ophonus sabulicola*						2					2
18	*Pseudophonus pubescens*				1							1
19	*Pterostichus cupreus*						1					1
20	*Pterostichus niger*						1			1		2
TOTAL 20 specimens		0	123	41	21	13	26	19	48	6	5	**302**

In variant 3, vegetal carpet overlaid with white clover, as regards the species and the number of collected carabids, the situation is presented as follows:

- In this experimental version, a number of 14 species of carabids were collected, totaling 251 copies (*table 6*).- Carabids of species collected in this experimental we mention: *Amara aenea, Anysodactilus binotatus, Harpalus calceatus, Harpalus distinguendus, Harpalus tenebrosus, Metabletus truncatelus, Calathus fuscipes, Carabus coriaceus*.

In 2019, the most abundant species of Carabids were common the three experimental variants are: *Anysodactilus binotatus, Harpalus distinguendus,*

Harpalus calceatus, Harpalus tenebrosus, Harpalus griseus, Amara crenata, Harpalus

tardus, Metabletus truncatelus, Amara aenea si Harpalus pubescens.(*figure. 4*).

Regarding the number of carabids collected in 2019, it is observed that variant V 1 (Control variant, existing vegetable carpet) recorded the highest number of copies (302 copies), and the smallest number of copies collected had the variant V2 (225 copies).(*figure 5*).

Tabel 5

The structure of the carabid species at variant 2 in 2019

No. crt.	Species	Harvest										Total
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1	*Amara aenea*			1	2		8					11
2	*Anysodactilus binotatus*		48	16	5		8		3			80
3	*Brachynus explodens*			1								1
4	*Harpalus aeneus*							2				2
5	*Harpalus azureus*								1			1
6	*Harpalus calceatus*		1		3	1			7			12
7	*Harpalus distinguendus*		21	17	8		3	5	19			73
8	*Harpalus griseus*								3			3
9	*Harpalus tardus*		4								6	10
10	*Harpalus tenebrosus*							8	8			16
11	*Metabletus truncatelus*		5		1	1	4	1	1			13
12	*Microlestes maurus*								1			1
13	*Ophonus obscurus*			1								1
14	*Pterostichus cupreus*									1		1
TOTAL 14 specimens		**0**	**79**	**36**	**19**	**2**	**23**	**16**	**43**	**1**	**6**	**225**

Table 6

The structure of the carabid species at variant 3 in 2019

No. crt.	Species	Harvest										Total
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1	*Amara aenea*			1		2						3
2	*Amara crenata*				1			1				2
3	*Anthichus floralis*				1		2					3
4	*Anysodactilus binotatus*	12	37	35	18	2	1	4	14			123
5	*Calathus fuscipes*		1				1					2
6	*Carabus coriaceus*						1					1
7	*Carabus scabriusculus*		1									1
8	*Harpalus calceatus*				6			2	3			11
9	*Harpalus distinguendus*	3	33	6	10	3	1	6	8			70
10	*Harpalus pubescens*								1			1
11	*Harpalus tenebrosus*		4					6			11	21
12	*Metabletus truncatelus*	1	1	1		2	2	1				8
13	*Ophonus obscurus*			2		2						4
14	*Ophonus tenebrosus*	1										1
TOTAL 14 specimens		**17**	**77**	**45**	**36**	**11**	**8**	**20**	**26**	**0**	**11**	**251**

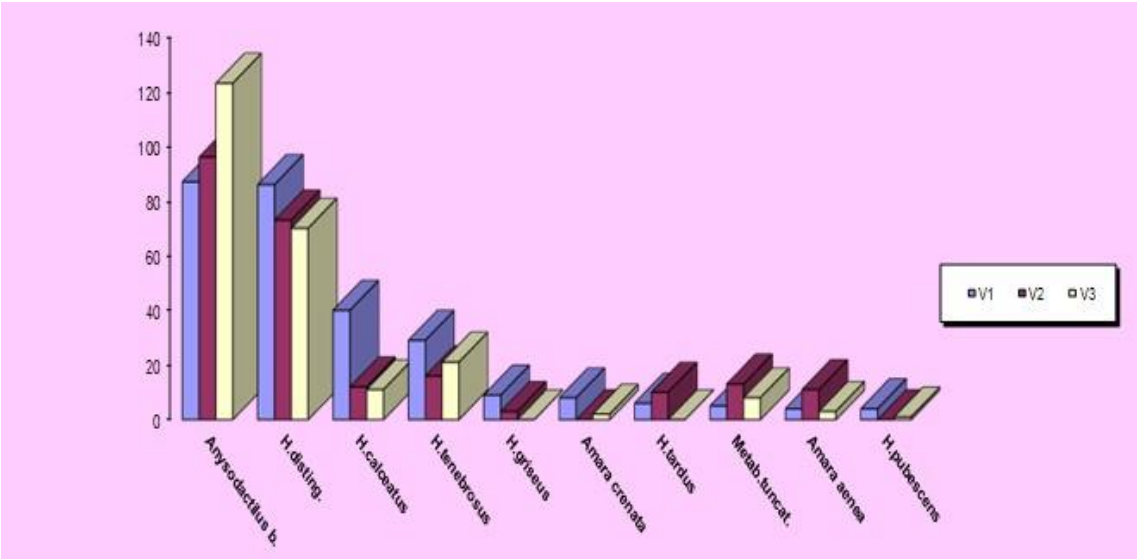

Figure 4 **Carabids abundance species in the three experimental variants in 2019**

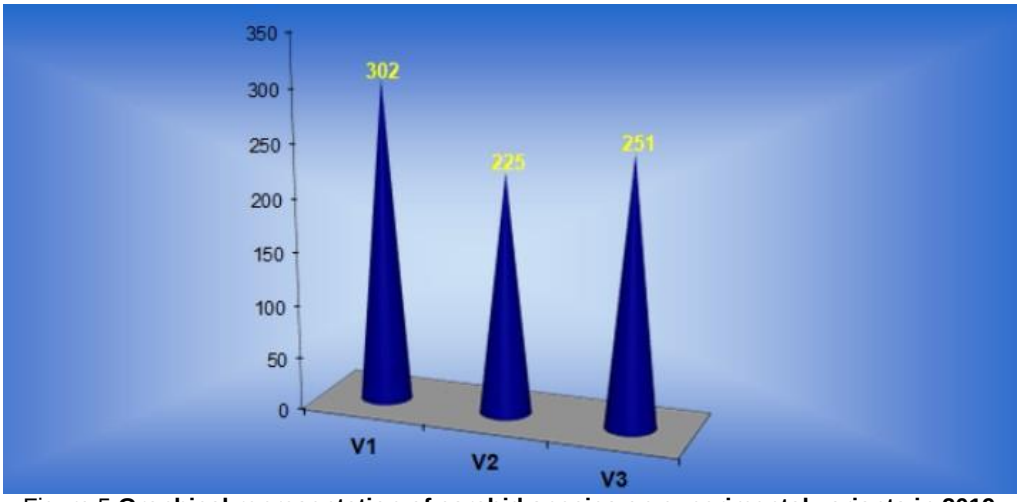

Figure 5 **Graphical representation of carabid species on experimental variants in 2019**

CONCLUSIONS

1. During the two years of research, 2018 and 2019, the collection of the samples was done periodically, at intervals between 10 and 14 days, each 10 collections in each of the two years, at the following dates, as follows: Harvest I on 23.05, respectively 25.05;the harvesting of II on the date of 8.06, respectively, 7.06;the harvesting of the III on the date of 21.06 respectively, 20.06; IV harvest on 8.07, respectively 4.07;V harvesting on 22.07, respectively, 16.07;harvesting of the VI on the date of 04.07, respectively, 31.07; the harvesting of VII on the date of 16.08, respectively, 12.08;the harvesting of VIII on the date of 30.08, respectively, 23.08;the harvesting of IX on 10.09, respectively, 12.09;X harvesting on 21.09, respectively, 26.09;

2. In the year 2018, following the ten harvests, a number of 845 specimens were obtained, in the three experimental variants:

• **V1** - existing vegetal carpet, totaled 320 copies;
• **V2** - vegetable carpet overgrown with pebbles, totaled 277 samples of carabids; •**V3** - vegetal carpet covered with white clover totaled 248 samples of carabids; It is noted that **the largest number of copies** collected in 2018, was registered variant **V1** (Control variant, existing vegetable carpet), with 320 copies, and the smallest number of copies collected had variant V 3 with 248 samples of carabids.

3. In the year 2019, following the ten harvests, a number of 778 specimens were obtained, in the three experimental variants:• **V1** - (control), totaled 302 copies;• **V2** - (*Lotus corniculatus*), totaled 225 samples of carabids;• **V3** - (*Trifolium repens*) totaled 251 samples of carabids;

4. It is noted that the largest number of copies collected in 2019, was registered also variant V1 with 302 copies, and the smallest number of copies collected had variant V2 with 225 samples of carabids.

REFERENCES

Baban E., 2006 - *Diversitatea coleopterelor (Coleoptera: Carabidae, Silphidae, Scarabidae, Cerambycidae) din ecosistemele forestiere ale Podişului Moldovei Centrale* Teză de doctorat.

Csiki E., 1927 - *Carabidae. Carabinae I. Coleopterorum Catalogus*, vol. 1, pt. 91, Berlin, 1927a, p.1-33

Csiki E., 1927 - *Carabidae. Carabinae II. Coleopterorum Catalogus*, vol. 1, pt. 92, Berlin, 1927b, p.327-621.

Neculiseanu Z., Matalin A., 2000 - *A catalogue of the ground-beetles of Moldova (Insecta, Coleoptera, Carabidae).* Sophia, 164 p.

Panin S., 1951 - *Determinatorul coleopterelor dăunătoare şi folositoare din R. P. R...* Editura de stat pentru literatură ştiinţifică şi didactică.

Reitter E., 1908-1916 – *Fauna Germanica. Die Kafer des Deutschland Reichs Lutz*. Edit.Stuttgardt, 5 vol., 246 p.; 392 p.; 436 p.; 236 p.; 342 p.

Talmaciu M., **2005** – *Observation regarding the structure, dynamics and abundance of the coleoptere species, collected at the luminous trap,* Journal of Central European Agriculture, vol. 7, no.1, ISSN 1332-9049.

Talmaciu M., Talmaciu N., 2005 – *Contribution to the cognition of the faunas of carabidaes (Coleoptera-Carabidae) from the vineyards from the vinegrowing center in Copou-Iassy*. Journal Central European Agriculture, volume 6, no.3, p.269-276, ISSN 1332-9049. https://jcea.agr.hr/articles/259

Tălmaciu M., **Butnariu G., Tălmaciu N., Herea M.**, **2016** - *Observations regarding existing invertebrates from plum orchards,* Current Trends in Natural Sciences, 5(9): 47-54