

CONTRIBUTIONS TO THE KNOWLEDGE OF THE STRUCTURE AND ECOLOGICAL INDICES OF COLEOPTERS POPULATIONS IN THE WALNUT ORCHARDS

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Abstract

The observations were made during 2019 and 2020 in a walnut orchard from Sârca farm, in Iasi County. The material was collected using Barber-type soil traps during the two years of research, at a time interval between 10 and 14 days from May to August inclusive, thus integrating a number of 10 or 8 harvests in 2019 and 2020. The biological material collected was cleaned of plant debris and then prepared for identification, at the level of order, and for the specimens of beetles we made the determination up to the species level. From the analysis of the collected material it results that the collected specimens belong to the Hexapoda Class, the Coleoptera order. The species of coleopters insects collected belong to the species: Anysodactylus binotatus, Harpalus pubescens, Otiorrhynchus pinastri, Dermestes lanarius, Harpalus tenebrosus, Amara crenata, Paramalus paralelipedus, Colodera aethiops, Phyllotreta atra, Harpalus calceatus

Keywords: Barber traps, coleopters fauna, walnul orchard.

1. INTRODUCTION

Among the most important insect families belonging to both the useful and harmful entomofauna belong to the Order of Insecta (Coleoptera), which includes species spread around the globe. The species of this order have a trophic regime to a large extent entomophagous, but there are also species of mixed-phage or phytophagous (few species) (Granja,2013). In agricultural crops, in fruit plantations and even in forest areas, many of the species are particularly important ecological indicators, responding immediately to some human interventions, such as pesticides, which cause the paralysis or even the death of adult insects or larvae at shortly after treatment.

This paper presents some research results on the bumblebee population of a walnut tree plantation, where the fruits are destined for consumption.

2. MATERIALS AND METHODS

The material was collected during to 2019- 2020, with the help of soil trap type Barber.

In the stationary from Sarca- Iași, there were effectuated a number of 10 harvesting in 2019 at the followings dates: 18.05; 24.05; 07.06; 18.06; 22.06; 06.07; 21.07; 02.08; 11.08 and 30.08 and 8 harvesting in 2020 as followings dates: 25.04; 04.05; 15.05; 25.05; 08.06; 15.06; 04.07 and 28.07.

The species of coleopters entomofauna were collected with the help of the soil traps type Barber using the salt solution with 20 %. (Talmaciu, 2011) The biological materials from the trap were collected every 7-10 days. At each harvest, the solution was completed or replaced, if necessary. The collected material was brought in the laboratory where we separated the species and determined them.

In the walnut orchards from Sarca, in the research period there were placed a number of 42 Barber soil traps. Depending on the number of collections each year, and depending on the climatic conditions and the state of the traps, in 2019, we realized 10 harvestings of the biological material, and we were collected only 371 traps, while in 2020 in the 8 harvests we have totalized a number of 332 of traps.

3. RESULTS AND DISCUSSIONS

In 2019, from walnut plantation belonging to farm from Sarca, Iași county, there were effected a number of 10 harvestings, there were collected 15 species of coleopters (Table 1).

In 2019 the species with largest number of sample collected were: *Harpalus calceatus* (225 samples) *Anysodactylus binotatus* (150 samples) *Harpalus tenebrosus* (129 samples) *Harpalus distinguendus* (100 samples) *Harpalus pubescens* (96 samples) *Harpalus griseus* (64 samples) *Otiorrhynchus pinastri* (33 samples) *Harpalus tardus* (17 samples).

The research from Sârca Farm, in 2020 (table 2), in the walnut orchards the largest number of samples were collected was belonging at: *Anysodactylus binotatus* (640 samples), *Harpalus distinguendus* (477 samples), *Dermestes lanarius* (323 samples), *Otiorrhynchus pinastri* (179 samples), *Harpalus calceatus* (115 samples), *Harpalus tenebrosus* (93 samples), *Metabletus truncatulus* (62 samples), *Tachyusa coarctata* (60 samples), *Oxypora vittata* (58 samples), *Epicometis hirta* (36 samples), *Amara crenata* (35 samples), *Paramalus paralelipipedus* (35 samples), *Colodera aethiops* (34 samples).

The taxonomic-ecological aspect (Reiter, 1908) of an agroecosystem is the first step towards knowing its structure. To determine the structure and dynamics of a biocenosis, of the collected material undergoes a mathematical analysis, estimating a series of indicators that highlight the characteristics of the ecosystem. To achieve this goal, the sinecological analysis of *Coleoptera* fauna from the walnut orchards was performed to assess the ratio of each species in the analyzed biocenosis.

During the research period 2019-2020 the data obtained from the Barber method was presented in Table 1 for 2019 and Table 2, for 2020.

The material obtained from the observations was mathematically processed to obtain a value of ecological indicators (Herea, 2010, 2011) (table 3 and table 4): abundance (A), dominance (D), constancy (C) and ecological significance index (W).

The abundance (A) in 2019 had values ranging between 225 specimens (*Harpalus calceatus*) and 3 specimens (*Harpalus aeneus*). In 2020 abundance recorded values between 640 (*Anysodactylus binotatus*) and 11 (*Phyllotreta atra*).

Dominance (D) according to the calculated percentage value, the species is distributed in dominant classes.

Table 1. The structure and abundance species of coleopters epigeous entomofauna collecting from the walnut orchard belonging to farm of Sarca, in 2019

No	Species	18.05	24.05	07.06	18.06	22.06	06.07	21.07	02.08	11.08	30.08	Total
1.	<i>Harpalus calceatus</i>	29	56	32	32	17	33	5	9		12	225
2.	<i>Anysodactylus binotatus</i>	22	49	24	29		2	22		1	1	150
3.	<i>Harpalus tenebrosus</i>		42	12		30	28	17	10			129
4.	<i>Harpalus distinguendus</i>	11	11	12	20	11	4	1	6	22	2	100
5.	<i>Harpalus pubescens</i>	11	14	23	2		17	17	7	1	4	96
6.	<i>Harpalus griseus</i>	11	27	10			2	2	12			64
7.	<i>Otiorrhynchus pinastris</i>	3	10	9		3	4	4		1		33
8.	<i>Harpalus tardus</i>	4					6	7				17
9.	<i>Oxyptera vittata</i>		6								1	7
10.	<i>Metabletus truncatellus</i>	1	1	3	1							6
11.	<i>Hister purpurascens</i>					3	3					6
12.	<i>Coccinella 7 punctata</i>		3						2		1	6
13.	<i>Harpalus azureus</i>	1						1	3			5
14.	<i>Scymnus auritus</i>		1		2						1	4
15.	<i>Harpalus aeneus</i>		1	1			1					3

Table 2. The structure and abundance species of coleopters epigeous entomofauna collecting from the walnut orchard belonging to Sarca farm, in 2020

No.	Species	25.04	04.05	15.05	25.05	08.06	15.06	04.07	28.07	Total
1.	<i>Anysodactylus binotatus</i>	89	187	229	49	2	27	13	44	640
2.	<i>Harpalus distinguendus</i>	74	172	115	54	2	19	41		477
3.	<i>Dermestes lanarius</i>	33	76	111	22	52	14		15	323
4.	<i>Otiorrhynchus pinastris</i>	51		5	11	42	46	13	11	179
5.	<i>Harpalus calceatus</i>	1	11	39	6	2	25	5	26	115
6.	<i>Harpalus tenebrosus</i>	48		4	20			21		93
7.	<i>Metabletus truncatellus</i>	7		7	11	6	16	4		62
8.	<i>Tachyusa coarctata</i>		16	8		14		22		60
9.	<i>Oxyptera vittata</i>		8		7	14	6	23		58
10.	<i>Epicometis hirta</i>	17		14			5			36
11.	<i>Amara crenata</i>	8	5		4	18				35
12.	<i>Paramalus paralelipipedus</i>		10		18	7				35
13.	<i>Colodera aethiops</i>		11						23	34
14.	<i>Harpalus griseus</i>			9	6				10	25
15.	<i>Harpalus pubescens</i>			5	5			10		20
16.	<i>Aphthona euphorbiae</i>	4	10	5						19
17.	<i>Harpalus tardus</i>					14	3			17
18.	<i>Monotoma picipes</i>	9			6					15
19.	<i>Harpalus aeneus</i>	2	5					2	4	13
20.	<i>Sipalia circealis</i>							13		13
21.	<i>Epurea obsoleta</i>	12								12
22.	<i>Phylotreta atra</i>							11		11

Table 3. Structure, abundance, dominance, constant and ecological index of species collected in 2019

No.	Species	A	D	C	W
1.	<i>Harpalus pubescens</i>	96	11.307	10.609	1.199
2.	<i>Harpalus calceatus</i>	225	26.501	44.878	11.893
3.	<i>Harpalus distinguendus</i>	100	11.778	15363	1.809
4.	<i>Anysodactylus binotatus</i>	150	17.667	25.47	4.499
5.	<i>Harpalus griseus</i>	64	7.538	4.830	0.36
6.	<i>Harpalus azureus</i>	5	0.588	0.040	0.02
7.	<i>Harpalus tenebrosus</i>	129	15.194	15.646	2.377
8.	<i>Harpalus tardus</i>	17	2.002	0.504	0.01
9.	<i>Harpalus aeneus</i>	3	0.353	0.024	0.008
10.	<i>Metabletus truncatulus</i>	6	0.706	0.080	0.0056
11.	<i>Hister purpurascens</i>	6	0.706	0.032	0.022
12.	<i>Otiorrhynchus pinastris</i>	33	3.886	2.134	0.082
13.	<i>Scymnus auritus</i>	4	0.471	0.043	0.002
14.	<i>Coccinella 7 punctata</i>	6	0.706	0.097	0.006
15.	<i>Oxypora vittata</i>	7	0.824	0.056	0.046
Total		849	-	-	-

Table 4. Structure, abundance, dominance, constant and ecological index of species collected in 2020

No.	Species	A	D	C	W
1.	<i>Harpalus pubescens</i>	20	0.835	0.411	0.0034
2.	<i>Harpalus calceatus</i>	115	4.805	6.947	0.333
3.	<i>Harpalus distinguendus</i>	477	19.933	47.209	9.41
4.	<i>Anysodactylus binotatus</i>	640	26.744	78.971	21.12
5.	<i>Harpalus griseus</i>	25	1.044	0.578	0.006
6.	<i>Harpalus tenebrosus</i>	93	3.886	4.303	0.167
7.	<i>Harpalus tardus</i>	17	0.71	0.240	0.003
8.	<i>Harpalus aeneus</i>	13	0.543	0.2	0.001
9.	<i>Metabletus truncatulus</i>	62	2.59	3.347	0.086
10.	<i>Otiorrhynchus pinastris</i>	179	7.48	15.645	1.169
11.	<i>Tachyusa coarctata</i>	60	2.507	2.853	0.07
12.	<i>Aphthona euphorbiae</i>	19	0.793	0.39	0.003
13.	<i>Dermestes lanarius</i>	323	13.497	35.704	4.815
14.	<i>Amara crenata</i>	35	1.462	1.259	0.02
15.	<i>Epurea obsoleta</i>	12	0.501	0.107	0.001
16.	<i>Oxypora vittata</i>	58	2.423	2.683	0.06
17.	<i>Colodera aethiops</i>	34	1.42	0.83	0.016
18.	<i>Epicometis hirta</i>	36	1.504	1.11	0.02
19.	<i>Monotoma picipes</i>	15	0.626	0.25	0.002
20.	<i>Sipalia circularis</i>	13	0.543	0.167	0.001
21.	<i>Paramalus paralelipipedus</i>	35	1.462	1.214	0.02
22.	<i>Phylotreta atra</i>	11	0.459	0.127	0.001
23.	<i>Aleochara moerens</i>	20	0.835	0.282	0.0036
24.	<i>Aleochara ruficornis</i>	19	0.793	0.293	0.0033
25.	<i>Aleochara laevigata</i>	12	0.501	0.123	0.002
26.	<i>Onthophagus semicornis</i>	25	1.044	0.385	0.003
Total		2368	-	-	-

In the year 2019 there were 7 species are subordinated, they had values below 1.1%; 2 species are subdomains and had values between 2.1-5% 1 species is dominant with the value ranging from 5.1-10.0%, 5 species are eudominant with the value over 10%

In 2020 there were: 11 species were subordinated, they had values below 1.1%; 5 species are subdomains and had values between 2.1-5%; 1 species is dominant with a value in the range of 5.1-10.0%; 3 species are eudominant with the value above 10%

Constance (C) - depending on the value of this indicator, the species is distributed in the following classes:

In 2019, the species mostly collected were accidental species, only two species were included in the accessory category.

In 2020, the species recorded on which most of the calculations were made fall into the group of accidental species, only three species are included in the accessory category, and only one species is constant.

Ecological significance index (W) is the relationship between structural (C) and productive (D). Depending on the percentage value calculated in the two years of study, the species are distributed in the following classes: with values below 0.1% of the by-species; with values between 0.1-1.0% of the accessory species; with values between 1.1 and 5.0% of the accessory species; with values between 5.1-10.0% of the characteristic species; with values above 10.0% of the characteristic species.

Regarding the common species gathering process in 2019-2020 as it follows: *Harpalus calceatus* (225 samples in 2019) (115 samples in 2020) *Anysodactylus binotatus* (150 samples in 2019) (640 samples in 2020) *Harpalus tenebrosus* (129 samples in 2019) (93 samples in 2020) *Harpalus distinguendus* (100 samples in 2019) (477 samples in 2020).

4. CONCLUSIONS

1. The soil traps of Barber type were used for collecting of the entomofauna which moves on the soil surface, out of which the coleoptera species were kept, these traps worked from May to September.

2. There were effected a number of 10 harvesting in the year 2019, and 8 harvesting in 2020 after taking the collected material from the traps and simultaneously it was change or completed the solution of formol of 3-4% concentration.

3. In 2019 it was collected in totality 849 samples of *Coleoptera* belonging to: *Harpalus calceatus*, *Anysodactylus binotatus*, *Harpalus tenebrosus*, *Harpalus distinguendus*, *Harpalus pubescens*, *Harpalus griseus*, *Otiorrhynchus pinastris*, *Harpalus tardus*.

4. In 2020 it was collected in totality 2368 samples of *Coleoptera* belonging to: *Anysodactylus binotatus*, *Harpalus distinguendus*, *Dermestes lanarius*, *Otiorrhynchus pinastris*, *Harpalus calceatus*, *Harpalus tenebrosus*, *Metabletus truncatulus*, *Tachyusa coarctata*, *Oxypora vittata*, *Epicometis hirta*, *Amara crenata*, *Paramalus paralelipipedus*, *Colodera aethiops*.

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