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OBSERVATIONS ON THE INFLUENCE OF KEY TREATMENTS ON BEETLE SPECIES IN SUNFLOWER CROPS

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Abstract

The observations were made in 2022 in sunflower crops in the western area of Romania, in the town of Adea, Bihor county. In sunflower crops, Barber traps with 2.5% NaCl solution were used, with harvests being carried out periodically between May and October. The collected material was cleaned, preserved and identified in the laboratory.

In variant 1 (conventional system) 428 specimens of 40 species were collected, the richest harvest being the second (123 specimens), and the least the one from 7.08.2022 (8 specimens). The most abundant species were Pterostichus cylindricus, Dermestes laniarius and Pseudophonus pubescens.

In variant 2 (ecological system) 953 specimens of 72 species were collected, with a maximum at the harvest on 12.06.2022 (237 specimens) and a minimum at the harvest on 2.08.2022 (17 specimens). The dominant species were Pseudophonus pubescens, Harmonia axyridis and Pseudophonus griseus.Overall, the organic variant presented a much higher abundance and diversity compared to the conventional variant, confirming the negative impact of chemical treatments on the coleopteran fauna

Key words**: **Coleoptera, sunflower crops, Barber traps, variants and repetitions

INTRODUCTION

Monitoring arthropod fauna in agroecosystems is an essential tool for assessing the impact of agricultural practices on biodiversity and ecosystem functioning (Southwood & Henderson, 2000; Manu & Bodescu, 2012). Barber traps are frequently used in studying soil beetle communities, being considered an effective method for capturing spatial and temporal variations of populations (Spence & Niemelä, 1994; Băncilă et al., 2011).

In recent decades, interest in comparing conventional and organic systems has increased significantly, with numerous studies showing that agroecological practices favor the maintenance of entomofauna diversity, while chemical treatments reduce it (Hole et al., 2005; Bengtsson et al., 2005). In Romania, research on entomofauna in agroecosystems has highlighted the sensitivity of the coleopteran fauna, especially carabids, to the intensification of agricultural work and the application of pesticides (Teodorescu & Mustață, 2009; Rădac & Fusu, 2015). Coleopterans are considered important bioindicators as they react quickly to microhabitat changes and anthropogenic disturbances (Rainio & Niemelä, 2003; Stănescu, 2018).

In this context, the present study aims to compare the diversity and abundance of coleoptera in a conventional and an organic sunflower farming system, using Barber traps throughout the growing season. The analysis of the number of specimens and species collected allows the assessment of

how agricultural practices influence the structure of coleopteran communities, providing relevant information for the implementation of sustainable crop protection and biodiversity conservation strategies.

MATERIALS AND METHODS

For the collection of biological material, Barber-type soil traps were used, each containing a 2.5% NaCl solution, which served to kill the insects captured in the traps.

The traps were installed in the sunflower fields at the beginning of May and remained functional until October.

Sampling was carried out periodically from May to October at intervals of approximately 13–16 days.

At each sampling, the collected arthropod species were sorted, all plant debris and soil particles were removed, and the entire material was passed through a sieve.

The solution in the traps was replaced with fresh solution at the same concentration used during installation.

The collected material was labeled, then thoroughly washed and preserved in the laboratory in a diluted sanitary alcohol solution with a concentration of 20%.

Specialized identification keys and online entomological resources were used for the identification of the collected beetles.

RESULTS AND DISCUSSIONS

In Variant 1 (Table 1), the first sampling on 15 May 2022 yielded 84 specimens, belonging to the highest number of species for that sampling date.

Table 1

Beetles collected from sunflower variant 1 (with chemical treatments) in 2022

Nr.	Species	First repetition				Total first repetition	Second repetition				Total second repetition	Third repetition				Total third repetition	Total
		C 1	C2	C3	C4		C1	C2	C3	C4		C1	C2	C3	C4		
First Harvest 15.05.2022																	
1	Adalia bipunctata	-	-	-	-	0	2	2	1	-	5	1	-	-	-	1	6
2	Adalia decempunctata	-	-	-	-	0	-	-	-	-	0	-	1	-	-	1	1
3	Cantharis fusca	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
4	Cetonia aurata	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
5	Clytra laeviuscula	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
6	Coccinella quadripunctata	-	2	-	-	2	-	-	-	-	0	-	-	-	-	0	2
7	Coccinella septempunctata	-	-	-	-	0	-	-	-	1	1	-	-	-	1	1	2
8	Dorcadion aethiops	2	-	-	2	4	-	-	1	-	1	-	-	-	-	0	5
9	Dorcadion murrayi	1	-	-	-	1	-	-	-	-	0	-	1	-	-	1	2
10	Dorcadion pedestre	2	-	-	-	2	-	-	1	-	1	-	-	-	-	0	3
11	Harmonia axyridis	-	-	3	3	6	1	-	2	2	5	1	-	1	-	2	13
12	Harpalus distinguendus	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
13	Hister quadrimaculatus	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
14	Onthophagus taurus	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
15	Otiorrhynchus orbicularis	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
16	Pentodon idiota	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
17	Pseudophonus griseus	-	-	-	-	0	-	1	3	1	5	-	-	-	-	0	5
18	Pseudophonus pubescens	4	-	-	1	5	-	2	3	2	7	-	-	2	-	2	14
19	Pterostichus cylindricus	2	2	-	2	6	2	2	2	2	8	-	4	3	-	7	21
20	Pterostichus niger	-	-	-	1	1	-	-	-	-	0	-	-	-	1	1	1
21	Tenebrio opacus	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
Total first harvest		14	5	3	9	31	5	7	15	9	36	2	6	8	2	18	84
Second harvest 29.05.2022																	
1	Adalia bipunctata	1	1	-	-	2	-	-	1	-	1	-	-	-	-	0	3
2	Adalia decempunctata	1	-	-	-	1	-	-	-	-	0	-	-	1	-	1	2

3	Chilocorus bipustulatus	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
4	Dermestes laniarius	11	7	1	2	21	-	-	12	4	16	-	2	2	-	4	41
5	Dermestes lardarius	-	-	-	-	0	-	-	-	-	0	-	1	-	-	1	1
6	Dorcadion aethiops	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
7	Dorcadion pedestre	-	-	-	-	0	-	-	-	-	0	-	1	-	-	1	1
8	Exochomus quadripustulatus	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
9	Harmonia axyridis	2	1	1	-	4	-	-	4	1	5	-	-	-	-	0	9
10	Harpalus distinguendus	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
11	Nebria brevicollis	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
12	Pentodon idiota	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
13	Pseudophonus griseus	3	-	-	-	3	-	-	2	1	3	-	-	-	-	0	6
14	Pseudophonus pubescens	7	5	-	-	12	-	-	5	3	8	-	3	-	-	3	23
15	Pterostichus cylindricus	1	2	4	3	10	2	1	5	2	10	2	2	4	1	9	29
16	Pterostichus niger	-	-	-	1	1	-	-	-	1	1	-	-	-	-	0	2
Total recoltarea II		26	17	6	6	55	2	1	33	12	48	2	9	8	1	20	123
Third harvest 12.06.2022																	
1	Cantharis obscura	-	-	-	1	1	-	-	-	-	0	-	-	-	-	0	1
2	Coccinella 10-punctata	-	-	-	2	2	-	-	-	-	0	-	-	-	-	0	2
3	Dorcadion aethiops	1	-	1	1	3	1	-	-	-	1	-	-	-	-	0	4
4	Dorcadion murrayi	1	-	-	1	2	1	-	-	-	1	-	-	-	-	0	3
5	Harpalus distinguendus	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
6	Pentodon idiota	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
7	Pseudophonus pubescens	-	-	-	4	4	-	-	2	-	2	-	-	-	-	0	6
8	Pterostichus cylindricus	1	1	2	1	5	1	-	2	2	5	1	-	3	3	7	12
9	Pterostichus niger	-	-	-	1	1	-	-	1	-	1	-	-	-	-	0	2
Total third harvest		4	1	3	11	19	3	0	6	2	11	1	0	3	3	7	32
Forth harvest 26.06.2022																	
1	Calathus fuscipes	-	-	-	-	0	-	-	-	2	2	-	-	-	-	0	2
2	Coccinella septempunctata	-	-	-	-	0	-	-	1	-	1	1	-	-	-	1	2
3	Dermestes laniarius	1	4	-	-	5	5	1	3	2	11	-	-	-	-	0	16
4	Dorcadion murrayi	-	-	-	-	0	-	1	-	-	1	-	-	-	-	0	1
5	Dorcadion pedestre	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
6	Harmonia axyridis	2	1	-	-	3	-	-	-	2	2	-	-	-	1	1	6
7	Phytodecta fornicata	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
8	Platynaspis luteorubra	-	-	-	-	0	-	-	-	-	0	-	-	-	1	1	1
9	Pseudophonus griseus	-	-	-	-	0	-	-	3	1	4	-	-	-	-	0	4
10	Pseudophonus pubescens	-	-	-	-	0	-	1	2	1	4	-	-	-	-	0	4
11	Pterostichus cylindricus	1	1	1	2	5	4	3	1	1	9	2	-	1	-	3	17
12	Pterostichus niger	3	-	-	-	3	-	1	1	1	3	-	-	-	-	0	6
Total forth harvest		7	6	1	2	16	9	7	11	12	39	3	0	1	2	6	61
Fifth harvest 10.07.2022																	
1	Adalia bipunctata	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
2	Crypticus quisquilius	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
3	Dermestes laniarius	-	-	-	1	1	-	2	3	1	6	-	-	-	-	0	7
4	Dorcadion murrayi	-	-	-	-	0	-	-	-	-	0	1	-	-	-	1	1
5	Dorcadion pedestre	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
6	Harmonia axyridis	-	-	1	-	1	-	2	1	2	5	1	-	1	-	2	8
7	Pseudophonus pubescens	-	-	-	-	0	-	-	3	-	3	-	-	-	-	0	3
8	Pterostichus cylindricus	2	1	-	-	3	3	1	2	3	9	-	1	2	1	4	16
9	Subcoccinella vigintiquatuorpunctata	-	-	-	1	1	-	-	-	-	0	-	-	-	-	0	1
Total fifth harvest		2	1	1	2	6	3	5	11	6	25	2	1	4	1	8	39
Sixth harvest 24.07.20220																	

1	Coccinella 10-punctata	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
2	Coccinella septempunctata	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
3	Dorcadion aethiops	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
4	Dorcadion murrayi	1	-	1	-	2	-	-	-	-	0	-	-	-	-	0	2
5	Dorcadion pedestre	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
	Galeruca tanaceti	-	-	-	-	0	-	-	1	1	2	-	-	-	-	0	2
6	Harmonia axyridis	-		-	1	1	-	-	-	2	2	-	-	1	-	1	4
7	Hister quadrimaculatus	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
8	Pseudophonus griseus	-	-	-	-	0	-	-	-	-	0	-	1	-	-	1	1
9	Pseudophonus pubescens	1	1	-	-	2	-	-	3	2	5	1	1	2	1	5	12
10	Pterostichus cylindricus	2	2	-	2	6	-	2	1	-	3	-	-	-	-	0	9
11	Scymnus frontalis	-	-	-	1	1	-	-	1	-	1	-	-	-	-	0	2
12	Zabrus tenebrioides	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
Total sixth harvest		4	3	1	4	12	0	2	8	9	19	1	2	3	1	7	38
Seventh harvest 07.08.2022																	
1	Dorcadion aethiops	-	-	1	-	1	-	-	-	-	0	1	-	1	-	2	3
2	Dorcadion pedestre	3	-	-	-	3	-	-	-	-	0	-	-	-	-	0	3
3	Elater nigerrimus	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
4	Pterostichus cylindricus	1	-	1	1	3	-	-	2	3	5	-	-	1	-	1	9
Total seventh harvest		5	0	2	1	8	0	0	2	3	5	1	0	2	0	3	16
Eighth harvest 21.08.2022																	
1	Dorcadion aethiops	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
2	Dorcadion murrayi	-	-	-	-	0	-	1	1	-	2	-	-	-	1	1	3
3	Dorcadion pedestre	1	-	-	-	1	-	1	-	-	1	-	-	-	-	0	2
4	Tenebrio opacus	-	-	1	-	1	-	-	-	1	1	-	-	-	-	0	2
Total eighth harvest		2	0	1	0	3	0	2	1	1	4	0	0	0	1	1	8
Ninth harvest 04.09.2022																	
1	Dorcadion aethiops	2	1	-	1	4	-	-	-	-	0	-	-	-	1	1	5
2	Pseudophonus griseus	-	-	-	-	0	-	-	-	-	0	-	-	-	1	1	1
3	Pseudophonus pubescens	-	-	1	-	1	-	-	-	-	0	-	-	-	-	0	1
4	Pterostichus cylindricus	1	-	2	-	3	-	-	1	-	1	-	-	-	1	1	5
5	Pterostichus niger	-	-	1	-	1	-	-	-	-	0	1	-	1	1	3	4
Total ninth harvest		3	1	4	1	9	0	0	1	0	1	1	0	1	4	6	16
Tenth harvest 18.09.2022																	
1	Dorcadion aethiops	-	-	-	-	0	-	-	1	1	2	-	-	-	1	1	3
2	Dorcadion pedestre	-	-	1	-	1	-	-	-	1	1	-	-	-	-	0	2
3	Pterostichus cylindricus	1	-	-	-	1	-	-	2	1	3	-	-	-	-	0	4
4	Pterostichus niger	-	-	-	-	0	-	-	-	1	1	-	-	1	-	1	2
Total tenth harvest		1	0	1	0	2	0	0	3	4	7	0	0	1	1	2	11
Total harvested coleoptera																	414

The situation is as follows for the repetitions:

In repetition 1, 31 specimens were collected, in the second repetition 36 specimens, and in the third repetition 18 specimens were collected.

In the second variant (Table 2), in the first harvest, 132 specimens were collected, belonging to a number of 25 species.

By repetitions the situation is as follows:

The most specimens, 61, were collected in the first repetition followed by the second with 43 specimens while in the last repetition only 28 specimens were collected.

In variant I, in the second harvest, 123 specimens belonging to a number of 16 species were collected.

The situation in terms of repetitions is as follows: in the first repetition, the largest number of specimens (55) were collected, followed by the second repetition (48) and the third when 20 specimens were collected.

In variant 2, in the second harvest, 152 specimens belonging to a number of 20 species were collected.

The largest number of specimens were collected in the first repetition, totaling 82 specimens.

The largest number of specimens in variant 1 were collected in the second harvest, in the amount of 123 specimens.

In the second variant, the largest number of specimens and species were collected in the third harvest, on 12.06.2022, when 237 specimens belonging to 25 species were recorded. In the other harvests, both the number of specimens and the number of species to which they belong were smaller.

Table 2

Situation of beetles collected on sunflower variant 2 (without chemical treatments) in 2022

No	Species	First harvest					Second harvest				Total second harvest	Third harvest				Total third harvest	Total
		C1	C2	C3	C4		C5	C6	C7	C8		C9	C10	C11	C12		
First harvest 15.05.2022																	
1	Amara similata	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
2	Blaps mortisaga	-	-	-	-	0	1	-	3	-	4	-	-	-	-	0	4
3	Calathus fuscipes	2	1	-	-	3	-	-	-	-	0	-	-	-	-	0	3
4	Cantharis fusca	-	-	-	-	0	-	-	1	-	1	-	-	2	-	2	3
5	Cetonia aurata	-	-	1	-	1	-	-	-	-	0	-	-	-	-	0	1
6	Coccinella 10-punctata	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
7	Dorcadion aethiops	2	-	-	-	2	-	-	1	2	3	-	-	-	1	1	6
8	Dorcadion murrayi	-	3	2	1	6	-	1	2	1	4	1	-	1	-	2	12
9	Dorcadion pedestre	-	-	2	1	3	1	-	-	-	1	-	-	1	-	1	5
10	Drilus flavescens	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
11	Harmonia axyridis	-	5	-	5	10	-	-	-	-	0	-	1	3	1	5	15
12	Harpalus aeneus	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
13	Harpalus distinguendus	1	-	-	1	2	-	-	2	-	2	-	-	-	-	0	4
14	Harpalus tardus	-	-	-	-	0	-	-	1	-	1	-	-	1	-	1	2
15	Hister quadrimaculatus	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
16	Leistus ferrugineus	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
17	Opatrum sabulossum	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
18	Otiorrhynchus corvus	-	-	-	-	0	-	-	2	-	2	-	-	-	-	0	2
19	Pentodon idiota	2	1	-	3	6	1	-	1	2	4	-	-	-	-	0	10
20	Platynus assimilis	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
21	Pseudophonus griseus	2	3	-	3	8	-	-	2	-	2	-	-	3	-	3	13
22	Pseudophonus pubescens	-	5	2	5	12	-	-	4	5	9	-	-	3	-	3	24
23	Pterostichus cylindricus	2	1	3	-	6	4	-	1	1	6	2	3	-	-	5	17
24	Pterostichus niger	-	-	1	-	1	1	-	-	-	1	-	-	-	-	0	2
25	Scymnus frontalis	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
Total first harvest		11	20	11	19	61	8	1	21	13	43	3	4	19	2	28	132
Second harvest 29.05.2022																	
1	Adalia bipunctata	5	-	-	-	5	-	-	-	-	0	-	-	-	-	0	5
2	Adalia decempunctata	-	4	-	-	4	-	-	1	2	3	-	-	-	-	0	7
3	Amara familiaris	-	3	-	-	3	-	-	-	-	0	-	-	-	-	0	3
4	Bembidion ruficorne	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
5	Calathus fuscipes	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
6	Cantharis fusca	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
7	Carabus coriaceus	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
8	Chrysomela haemoptera	-	1	-	-	1	-	-	-	2	2	-	-	-	-	0	3

9	Dorcadion aethiops	1	-	-	-	1	-	-	-	-	0	-	-	1	-	1	2
10	Dorcadion murrayi	1	1	-	2	4	-	-	-	1	1	-	-	-	-	0	5
11	Exochomus quadripustulatus	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
12	Harmonia axyridis	7	5	-	6	18	-	-	8	6	14	2	-	5	-	7	39
13	Harpalus distinguendus	-	-	2	-	2	-	-	-	-	0	-	-	-	-	0	2
14	Ophonus puncticollis	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
15	Otiorrhynchus orbicularis	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
16	Phytodecta fornicata	-	1	-	-	1	-	-	-	1	1	-	-	-	-	0	2
17	Pseudophonus griseus	2	6	2	1	11	12	-	-	6	18	-	-	3	-	3	32
18	Pseudophonus pubescens	8	-	4	5	17	2	-	-	3	5	-	-	4	-	4	26
19	Pterostichus cylindricus	-	5	1	1	7	-	1	2	1	4	-	2	1	2	5	16
20	Scymnus frontalis	-	1	-	2	3	-	-	-	-	0	-	-	-	-	0	3
Total second harvest		25	31	9	17	82	14	1	13	22	50	2	2	14	2	20	152
Third harvest 12.06.2022																	
1	Adalia bipunctata	-	-	-	-	0	-	-	-	1	1	-	-	2	-	2	3
2	Calathus fuscipes	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
3	Carabus coriaceus	-	1	-	-	1	-	-	-	-	0	-	-	1	-	1	2
4	Cetonia aurata	-	1	-	-	1	-	-	-	-	0	-	-	1	-	1	2
5	Chrysomella haemoptera	-	-	-	-	0	-	-	-	2	2	-	-	-	-	0	2
6	Clytra quadripunctata	-	-	-	-	0	-	-	-	-	0	1	-	-	-	1	1
7	Coccinella 10-punctata	1	3	1	2	7	4	1	-	3	8	-	-	8	-	8	23
8	Coccinella septempunctata	-	5	-	2	7	-	-	2	-	2	1	-	2	-	3	12
9	Dorcadion aethiops	-	-	-	1	1	-	-	-	-	0	-	-	1	-	1	2
10	Dorcadion murrayi	1	2	3	-	6	-	-	2	1	3	-	-	2	-	2	11
11	Dorcadion pedestre	-	-	-	1	1	-	-	-	-	0	-	-	-	-	0	1
12	Harmonia axyridis	1	17	4	6	28	-	-	5	8	13	2	-	12	-	14	55
13	Harpalus distinguendus	-	-	2	-	2	-	-	-	-	0	-	-	-	-	0	2
14	Hister quadrimaculatus	-	-	1	-	1	1	-	-	1	2	-	-	-	-	0	3
15	Hylobius abietis	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
16	Mecaspis alternans	-	-	1	-	1	-	1	-	-	1	-	-	-	-	0	2
17	Opatrum sabulosum	-	2	-	-	2	1	-	-	1	2	-	-	1	-	1	5
18	Otiorrhynchus corvus	-	-	-	1	1	-	-	-	1	1	-	-	-	-	0	2
19	Oxythyrea funesta	-	-	-	-	0	-	-	-	1	1	-	-	1	-	1	2
20	Pentodon idiota	-	-	-	1	1	-	-	-	-	0	-	-	-	-	0	1
21	Pseudophonus griseus	-	-	-	-	0	-	-	2	1	3	-	-	-	-	0	3
22	Pseudophonus pubescens	3	18	4	8	33	9	4	7	13	33	5	2	15	3	25	91
23	Pterostichus cylindricus	1	1	1	-	3	-	-	-	-	0	-	-	1	-	1	4
24	Scymnus frontalis	-	2	-	1	3	1	-	-	-	1	-	-	1	-	1	5
25	Subcoccinella 24punctata	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
Total third harvest		7	52	17	23	99	18	6	19	33	76	9	2	48	3	62	237
Forth harvest 26.06.2022																	

1	Cantharis fusca	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
2	Cetonia aurata	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
3	Chrysolina coerulans	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
4	Coccinella 10-punctata	-	-	-	-	0	-	-	2	-	2	-	-	1	1	2	4
5	Coccinella septempunctata	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
6	Dorcadion aethiops	-	-	1	-	1	1	1	1	1	4	-	-	-	1	1	6
7	Dorcadion murrayi	-	1	-	-	1	-	-	-	-	0	-	-	1	-	1	2
8	Galeruca tanaceti	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
9	Harmonia axyridis	-	-	-	-	0	-	3	5	-	8	-	-	2	2	4	12
10	Lucanus cervus	-	1	1	-	2	-	-	-	-	0	-	-	-	-	0	2
11	Meloe rugosus	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
12	Ocypus olens	-	-	-	-	0	-	-	-	-	0	-	-	-	1	1	1
13	Onthophagus fracticornis	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
14	Onthophagus taurus	-	-	-	-	0	-	1	-	-	1	-	-	-	-	0	1
15	Pentodon idiota	-	1	1	-	2	1	-	-	-	1	-	-	-	-	0	3
16	Pseudophonus griseus	-	2	-	-	2	-	-	-	2	2	1	12	4	6	23	27
17	Pseudophonus pubescens	2	-	1	11	4	7	1	2	-	10	3	-	-	-	3	27
18	Pterostichus cylindircus	1	1	1	-	3	-	-	-	-	0	-	-	1	-	1	4
19	Pterostichus lepidus	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
20	Pterostichus niger	-	-	-	-	0	-	-	1	-	1	-	-	2	-	2	3
Total forth harvest		3	9	5	11	28	12	6	12	4	34	4	12	11	11	38	100
Fifth harvest 10.07.2022																	
1	Adalia bipunctata	-	2	2	2	6	2	-	-	3	5	-	2	-	3	5	16
2	Adalia decempunctata	-	3	-	-	3	2	-	-	2	4	-	-	-	1	1	8
3	Dorcadion murrayi	-	3	-	1	4	-	-	-	1	1	-	-	-	1	1	6
4	Dorcadion pedestre	-	-	2	-	2	-	-	-	1	1	-	-	-	3	3	6
5	Harmonia axyridis	-	8	6	8	22	5	-	-	6	11	-	5	-	7	12	45
6	Harpalus distinguendus	-	1	-	-	1	-	-	-	-	0	-	1	-	-	1	2
7	Harpalus tardus	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
8	Oxythyrea funesta	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
9	Ophonus puncticollis	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
10	Pentodon idiota	-	1	1	-	2	-	-	-	2	2	-	-	-	1	1	5
11	Platynaspis luteorubra	-	-	-	-	0	-	-	-	-	0	-	-	-	1	1	1
12	Pseudophonus griseus	1	-	-	2	3	1	-	1	3	5	1	-	-	-	1	9
13	Pseudophonus pubescens	1	9	5	7	22	7	1	2	6	16	-	4	4	2	10	46
14	Pterostichus cylindricus	1	-	1	-	2	-	1	2	-	3	1	1	1	1	4	9
15	Pterostichus lepidus	-	1	1	1	3	-	-	-	-	0	-	-	-	-	0	3
16	Sciaphobus scitulus	-	-	-	-	0	-	-	-	-	0	-	-	-	1	1	1
17	Tanymecus dilaticollis	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
18	Tanymecus palliatus	-	-	-	1	1	-	-	-	-	0	-	-	-	-	0	1
Total fifth harvest		3	30	18	22	73	18	2	5	25	50	2	13	5	21	41	162
Sixth harvest 24.07.2022																	
1	Adalia bipunctata	1	1	-	-	2	-	-	1	-	1	-	-	1	-	1	5

2	Adalia decempunctata	1	1	-	-	2	-	-	-	-	0	-	-	-	-	0	2
3	Coccinella septempunctata	-	-	-	-	0	-	-	-	-	0	1	1	-	-	2	2
4	Dermestes laniarius	1	3	1	-	5	-	4	1	-	5	1	5	5	-	11	21
5	Dorcadion aethiops	-	-	-	-	0	-	-	-	-	0	-	-	1	-	1	1
6	Dorcadion murrayi	1	-	-	-	1	-	1	-	-	1	-	-	1	-	1	3
7	Harmonia axyridis	1	-	1	-	2	-	-	1	-	1	1	1	-	-	2	5
8	Harmonia quadripunctata	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
9	Harpalus distinguendus	-	-	-	-	0	-	-	1	1	2	-	-	-	-	0	2
10	Otiorrhyncus laevigatus	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
11	Pseudophonus griseus	-	-	-	-	0	-	-	3	-	3	-	-	-	-	0	3
12	Pseudophonus pubescens	2	1	-	1	4	1	1	2	2	6	-	1	1	-	2	12
13	Pterostichus cylindricus	2	1	-	2	5	3	1	1	2	7	-	1	1	1	3	15
14	Pterostichus niger	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
15	Tytthaspis sedecimpunctata	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
Total sixth harvest		11	8	2	3	24	4	7	11	5	27	3	9	10	1	23	75
Seventh harvest 07.08.2022																	
1	Bothynoderes punctiventris	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
2	Cantharis fusca	-	-	-	-	0	-	-	-	-	0	1	-	-	-	1	1
3	Dorcadion aethiops	-	-	2	-	2	-	-	1	-	1	-	1	-	1	2	5
4	Dorcadion murrayi	1	-	-	-	1	-	-	-	1	1	-	-	-	-	0	2
5	Lepyrus capucinus	-	-	-	-	0	-	-	-	-	0	-	1	-	-	1	1
6	Opatrum sabulosum	-	-	1	-	1	-	-	-	-	0	1	-	-	1	2	3
7	Otiorrhynchus costipennis	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
8	Pseudophonus griseus	-	-	-	-	0	-	-	1	-	1	-	-	1	-	1	2
9	Pseudophonus pubescens	1	-	-	-	1	-	-	1	1	2	-	-	-	-	0	3
10	Pterostichus cylindricus	1	-	-	1	2	-	-	2	2	4	-	1	1	-	2	8
11	Pterostichus niger	-	-	-	-	0	1	-	-	-	1	-	-	-	1	1	2
12	Tenebrio opacus	-	-	1	-	1	-	-	-	-	0	-	-	-	-	0	1
13	Trichius fasciatus	-	-	-	-	0	-	-	-	-	0	1	-	-	-	1	1
Total seventh harvest		5	0	4	1	10	1	0	5	4	10	3	3	2	3	11	31
Eigtht harvest 21.08.2022																	
1	Cantharis fusca	-	-	-	1	1	-	-	-	-	0	-	-	1	-	1	2
2	Dorcadion murrayi	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
3	Dorcadion pedestre	3	-	-	1	4	-	2	-	-	2	-	1	1	1	3	9
4	Galeruca pomonae	-	-	-	-	0	1	-	-	-	1	-	-	-	-	0	1
5	Opatrum sabulosum	1	-	-	-	1	-	1	-	-	1	-	-	-	-	0	2
6	Otiorrhynchus orbicularis	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
7	Tenebrio opacus	-	-	-	-	0	-	-	-	-	0	-	-	-	1	1	1
Total eighth harvest		5	0	0	2	7	2	3	0	0	5	0	1	2	2	5	17
Ninth harvest 04.09.2022																	
1	Adalia bipunctata	-	-	-	-	0	-	-	1	-	1	-	-	-	-	0	1
2	Agabus nitidus	-	-	-	1	1	-	-	-	-	0	-	-	-	-	0	1
3	Cantharis obscura	-	-	1	-	1	-	-	-	-	0	-	-	-	-	0	1

4	Coccinella septempunctata	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
5	Dorcadion pedestre	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
6	Harmonia axyridis	-	1	-	1	2	-	-	-	-	0	-	-	-	3	3	5
7	Hister quadrimaculatus	-	1	-	-	1	-	-	-	-	0	-	-	-	-	0	1
8	Lixus punctiventris	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
9	Opatrum sabulosum	-	-	-	2	2	-	-	-	-	0	-	-	-	-	0	2
10	Pseudophonus griseus	-	1	-	-	1	2	-	-	1	3	-	-	1	-	1	5
11	Pseudophonus pubescens	1	1	-	-	2	-	-	-	-	0	-	-	-	1	1	3
12	Pterostichus cylindricus	1	1	-	-	2	1	-	-	-	1	-	1	1	2	4	7
13	Pterostichus niger	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
14	Scymnus frontalis	1	-	-	-	1	-	-	-	-	0	-	1	-	-	1	2
Total ninth harvest		6	5	1	4	16	3	0	1	2	6	0	2	2	6	10	32
Tenth harvest 18.09.2022																	
1	Ablattaria laevigata	1	-	-	-	1	-	-	-	-	0	-	-	-	-	0	1
2	Athous niger	-	-	-	-	0	-	-	-	-	0	-	-	-	1	1	1
3	Dorcadion aethiops	-	-	-	-	0	-	-	-	-	0	1	-	-	-	1	1
4	Hister quadrimaculatus	-	-	-	-	0	-	-	-	-	0	1	-	-	-	1	1
5	Otiorrhynchus corvus	-	-	-	-	0	-	-	-	-	0	-	1	-	-	1	1
6	Pseudophonus griseus	-	-	-	-	0	-	-	-	1	1	-	-	1	-	1	2
7	Pseudophonus pubescens	1	-	-	-	1	-	-	-	1	1	-	-	-	1	1	3
8	Pterostichus cylindricus	1	-	-	1	2	-	-	-	-	0	-	-	1	-	1	3
9	Pterostichus niger	-	-	-	-	0	-	-	-	1	1	-	-	-	-	0	1
10	Tenebrio molitor	-	-	-	-	0	-	-	-	-	0	-	1	-	-	1	1
Total tentth harvest		3	0	0	1	4	0	0	0	3	3	2	2	2	2	8	15
Total harvested coleoptera																	953

In variant I, the lowest number of specimens (8) and species (4) were collected on 7.08.2022, at the seventh harvest. In variant 2, the lowest number of specimens (17) and species (7) were collected on the eighth harvest on 2.08.2022.

In variant 1, 428 specimens belonging to 40 species of coleoptera were collected throughout the observations (table 3), while in variant 2, 953 specimens belonging to 72 species were collected throughout the observations (table 4). It is noted that there is a much larger number of specimens and species in variant 2 in the ecological system, compared to variant 1 where chemical treatments were made (conventional system).

Table 3

Centralized situation of sunflower crop collections in the conventional variant

Nr. crt	Species	Harvest										
		I	II	III	IV	V	VI	VII	VIII	IX	X	Total
1.	Adalia bipunctata	6	3	-	-	1	-	-	-	-	-	10
2.	Adalia decempunctata	1	2	-	-	-	-	-	-	-	-	3
3.	Calathus fuscipes	-	-	-	2	-	-	-	-	-	-	2
4.	Cantharis fusca	1	-	-	-	-	-	-	-	-	-	1
5.	Cantharis obscura	-	-	1	-	-	-	-	-	-	-	1
6.	Cetonia aurata	1	-	-	-	-	-	-	-	-	-	1
7.	Chilocorus bipustulatus	-	1	-	-	-	-	-	-	-	-	1

8.	Clytra laeviuscula	1	-	-	-	-	-	-	-	-	-	1
9.	Coccinella 10-punctata	-	-	2	-	-	1	-	-	-	-	3
10.	Coccinella quadripunctata	2	-	-	-	-	-	-	-	-	-	2
11.	Coccinella septempunctata	2	-	-	2	-	1	-	-	-	-	5
12.	Crypticus quisquilius	-	-	-	-	1	-	-	-	-	-	1
13.	Dermestes laniarius	-	41	-	16	7	-	-	-	-	-	64
14.	Dermestes lardarius	-	1	-	-	-	-	-	-	-	-	1
15.	Dorcadion aethiops	5	1	4	-	-	1	3	1	5	3	23
16.	Dorcadion murrayi	2	-	3	1	1	2	-	3	-	-	12
17.	Dorcadion pedestre	3	1	-	1	1	1	3	2	-	2	14
18.	Elater nigerrimus	-	-	-	-	-	-	1	-	-	-	1
19.	Exochomus quadripustulatus	-	1	-	-	-	-	-	-	-	-	1
20.	Galeruca tanaceti	-	-	-	-	-	2	-	-	-	-	2
21.	Harmonia axyridis	13	9	-	6	8	4	-	-	-	-	40
22.	Harpalus distinguendus	1	1	1	-	-	-	-	-	-	-	3
23.	Hister quadrimaculatus	1	-	-	-	-	1	-	-	-	-	2
24.	Nebria brevicollis	-	1	-	-	-	-	-	-	-	-	1
25.	Onthophagus taurus	1	-	-	-	-	-	-	-	-	-	1
26.	Otiorrhynchus orbicularis	1	-	-	-	-	-	-	-	-	-	1
27.	Pentodon idiota	1	1	1	-	-	-	-	-	-	-	3
28.	Phytodecta fornicata	-	-	-	1	-	-	-	-	-	-	1
29.	Platynaspis luteorubra	-	-	-	1	-	-	-	-	-	-	1
30.	Pseudophonus griseus	5	6	-	4	-	1	-	-	1	-	17
31.	Pseudophonus pubescens	14	23	6	4	3	12	-	-	1	-	63
32.	Pterostichus cylindricus	21	29	12	17	16	9	9	-	5	4	122
33.	Pterostichus niger	1	2	2	6	-	-	-	-	4	2	17
34.	Scymnus frontalis	-	-	-	-	-	2	-	-	-	-	2
35.	Subcoccinella vigintiquatuorpunctata	-	-	-	-	1	-	-	-	-	-	1
36.	Tenebrio opacus	1	-	-	-	-	-	-	2	-	-	3
37.	Zabrus tenebrioides	-	-	-	-	-	1	-	-	-	-	1
	Total harvests	84	123	32	61	39	38	16	8	16	11	428

Regarding the species with the largest number of specimens collected in variant 1, these were (table 3): *Pterostichus cylindricus* (122 specimens), *Pseudophonus pubescens* (63 specimens), *Harmonia axyridis* (42 specimens), *Dermestes laniarius* (64 specimens) and *Dorcadion aetiops* (23 specimens), *Pseudophonus griseus* (17 specimens).

In variant 2, the number of specimens collected is presented as follows: (table 4).

Table 4

Centralized situation of sunflower crop collections in the ecological variant

Nr.	Species	Harvest										
		I	II	III	IV	V	VI	VII	VIII	IX	X	Total
1.	Ablattaria laevigata	-	-	-	-	-	-	-	-	-	1	1
2.	Adalia bipunctata	-	5	3	-	16	5	-	-	1	-	30
3.	Adalia decempunctata	1	7	23	4	8	2	-	-	-	-	45
4.	Agabus nitidus	-	-	-	-	-	-	-	-	1	-	1
5.	Amara familiaris	-	3	-	-	-	-	-	-	-	-	3
6.	Amara similata	1	-	-	-	-	-	-	-	-	-	1
7.	Athous niger	-	-	-	-	-	-	-	-	-	1	1
8.	Bembidion ruficorne	-	1	-	-	-	-	-	-	-	-	1
9.	Blaps mortisaga	4	-	-	-	-	-	-	-	-	-	4
10.	Bothynoderes punctiventris	-	-	-	-	-	-	1	-	-	-	1
11.	Calathus fuscipes	3	1	1	-	-	-	-	-	-	-	5
12.	Cantharis fusca	3	1	-	1	-	-	1	2	-	-	8
13.	Cantharis obscura	-	-	-	-	-	-	-	-	1	-	1
14.	Cetonia aurata	1	-	2	1	-	-	-	-	-	-	4
15.	Carabus coriaceus	-	1	2	-	-	-	-	-	-	-	3
16.	Chrysolina coerulans	-	-	-	1	-	-	-	-	-	-	1
17.	Chrysomela haemoptera	-	3	2	-	-	-	-	-	-	-	5
18.	Clytra quadripunctata	-	-	1	-	-	-	-	-	-	-	1
19.	Coccinella septempunctata	-	-	12	1	-	2	-	-	1	-	16

20.	Coccinella 10-punctata	1	-	23	4	-	-	-	-	-	-	28
21.	Dermestes laniarius	-	-	-	-	-	21	-	-	-	-	21
22.	Dorcadion aethiops	6	2	2	6	-	1	5	-	-	1	23
23.	Dorcadion murrayi	12	5	11	2	6	3	2	1	-	-	42
24.	Dorcadion pedestre	5	-	1	-	6	-	-	9	1	-	22
25.	Drilus flavescens	1	-	-	-	-	-	-	-	-	-	1
26.	Exochomus quadripustulatus	-	1	-	-	-	-	-	-	-	-	1
27.	Galeruca pomonae	-	-	-	-	-	-	-	1	-	-	1
28.	Galeruca tanaceti	-	-	-	1	-	-	-	-	-	-	1
29.	Harmonia axyridis	15	39	55	12	45	5	-	-	5	-	176
30.	Harmonia quadripunctata	-	-	-	-	-	1	-	-	-	-	1
31.	Harpalus aeneus	1	-	-	-	-	-	-	-	-	-	1
32.	Harpalus distinguendus	4	2	2	-	2	2	-	-	-	-	12
33.	Harpalus tardus	2	-	-	-	1	-	-	-	-	-	3
34.	Hister quadrimaculatus	1	-	3	-	-	-	-	-	1	1	6
35.	Hylobius abietis	-	-	1	-	-	-	-	-	-	-	1
36.	Leistus ferrugineus	1	-	-	-	-	-	-	-	-	-	1
37.	Lepyrus capucinus	-	-	-	-	-	-	1	-	-	-	1
38.	Lixus punctiventris	-	-	-	-	-	-	-	-	1	-	1
39.	Lucanus cervus	-	-	-	2	-	-	-	-	-	-	2
40.	Mecaspis alternans	-	-	2	-	-	-	-	-	-	-	2
41.	Meloe rugosus	-	-	-	1	-	-	-	-	-	-	1
42.	Ocypus olens	-	-	-	1	-	-	-	-	-	-	1
43.	Onthophagus fracticornis	-	-	-	1	-	-	-	-	-	-	1
44.	Onthophagus taurus	-	-	-	1	-	-	-	-	-	-	1
45.	Ophonus puncticollis	-	-	-	1	1	-	-	-	-	-	2
46.	Opatrum sabulossum	1	-	5	-	-	-	3	2	2	-	13
47.	Otiorrhynchus corvus	2	-	2	-	-	-	-	-	-	1	5
48.	Otiorrhynchus costipennis	-	-	-	-	-	-	1	-	-	-	1
49.	Otiorrhynchus orbicularis	-	1	-	-	-	-	-	1	-	-	2
50.	Otiorrhyncus laevigatus	-	-	-	-	-	1	-	-	-	-	1
51.	Oxythyrea funesta	-	-	2	-	1	-	-	-	-	-	3
52.	Pentodon idiota	10	-	1	3	5	-	-	-	-	-	19
53.	Phytodecta fornicata	-	2	-	-	-	-	-	-	-	-	2
54.	Platynaspis luteorubra	-	-	-	-	1	-	-	-	-	-	1
55.	Platynus assimilis	1	-	-	-	-	-	-	-	-	-	1
56.	Pseudophonus griseus	13	32	3	27	9	3	2	-	5	2	96
57.	Pseudophonus pubescens	24	26	91	27	46	12	3	-	3	3	235
58.	Pterostichus cylindircus	17	16	4	4	9	15	8	-	7	3	83
59.	Pterostichus lepidus	-	-	-	1	3	-	-	-	-	-	4
60.	Pterostichus niger	2	-	-	3	-	1	2	-	1	1	10
61.	Sciaphobus scitulus	-	-	-	-	1	-	-	-	-	-	1
62.	Scymnus frontalis	1	3	5	-	-	-	-	-	2	-	11
63.	Subcoccinella 24rpunctata	-	-	1	-	-	-	-	-	-	-	1
64.	Tanymecus dilaticollis	-	-	-	-	1	-	-	-	-	-	1
65.	Tanymecus palliatus	-	-	-	-	1	-	-	-	-	-	1
66.	Tenebrio molitor	-	-	-	-	-	-	-	-	-	1	1
67.	Tenebrio opacus	-	-	-	-	-	-	1	1	-	-	2
68.	Trichius fasciatus	-	-	-	-	-	-	1	-	-	-	1
69.	Tytthaspis sedecimpunctata	-	-	-	-	-	1	-	-	-	-	1
	Total harvests	133	151	260	105	162	75	31	17	32	15	981

The largest number of specimens, 235, was the species *Pseudophonus pubescens*, followed by the species *Harmonia axyridis* with 176 specimens, *Pseudophonus griseus*, with 96 specimens, *Pterostichus cylindricus*, with 78 specimens and *Dorcadion murrayi*, with 38 specimens.

In both variants, a large number of species had a single specimen.

belonging to 40 species were collected, while in variant 2, in the organic system, where no chemical treatments were applied, 453 specimens belonging to 72 species were collected.

CONCLUSIONS

In variant 1 in the conventional system, where chemical treatments were applied to the seeds and vegetation, 428 specimens

In variant 1, the species with the largest number of specimens collected were *Pterostichus cylindricus* (122 specimens), *Dermestes laniarius* (164 specimens), *Pseudophonus pubescens* (63 specimens), *Harmonia axyridis* (42 specimens), *Dorcadion aetiops* (23 specimens).

In variant 2, the species with the largest number of specimens collected were: *Pseudophonus pubescens* (235 specimens), *Harmonia axyridis* (176 specimens), *Pseudophonus griseus* (96 specimens), and *Pterostichus cylindricus* (78 specimens).

Throughout the observations during the 10 harvests, it was noted that the organic version had a greater number of species and specimens collected, which clearly shows that the chemical treatments had a destructive effect on the beetle species.

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