OBSERVATIONS ON ARTHROPOD SPECIES PRESENT IN WHEAT CROPS

OBSERVAȚII PRIVIND SPECIILE DE ARTROPODE EXISTENTE ÎN CULTURILE DE GRÂU

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Abstract.
These observations were made in a wheat crop located within Ezăreni Teaching and Research Station (Ion Ionescu de la Brad University of Life Sciences in Iași).
The material was collected using entomological nets using the mowing method, and direct observations were also made on the plants throughout the vegetation period.
During 2025, 9 nettings were made at intervals of 12-17 days from April to August.
The material collected from the field was labeled, cleaned of plant debris (leaves, soil particles, etc.), brought to the laboratory, preserved in a 40% ethyl alcohol solution, and then the arthropod species were identified.
Among the more common arthropod species were: aphids, dipterans (Chloropidae, Cecidomyiidae, Muscidae), cicadas, Formicomus pedestris, Haplothrips tritici, Stenamma debile, Necremnus leucarthos, etc.
The most common useful species were: spiders from the Lycosidae family, Necremnus leucarthos and Aphanogmus abdominalis.
Key words: parasites, predators, pests

Rezumat.
Aceste observații au fost realizate într-o cultură de grâu amplasată în cadrul Stațiunii de cercetare și practică studențească Ezăreni aparținând USV Ion Ionescu de la Brad din Iași.
Materialul a fost colectat cu ajutorul fileului entomologic prin metoda cosirii de asemeni s-au realizat observații directe asupra plantelor pe tot parcursul perioadei de vegetație.
În cursul anului 2025 la un interval de 12-17 zile au fost realizate 9 filetări din luna aprilie pâna în luna august.
Materialul colectat din câmp a fost etichetat, curățat de resturi vegetale (frunze, particule de sol, etc.), adus în laborator, conservat

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în soluție de alcool etilic 40% și apoi au fost identificate speciile de artropode.

Dintre speciile de artropode mai frecvente au fost: afide, diptere (Chloropidae, Cecidomyiidae, Muscidae), cicade, Formicomus pedestris, Haplothrips tritici, Stenamma debile, Necremnus leucarthos, etc.

Cele mai frecvente specii utile au fost: păianjenii din familia Lycosidae, Necremnus leucarthos și Aphanogmus abdominalis.

Cuvinte cheie: paraziți, prădători, insecte dăunătoare

INTRODUCTION

Grain cereals (wheat, barley, oats and rye) have had and continue to have a special importance for human society, representing some of the most valuable groups of cultivated plants. They constitute the basis of human and animal nutrition, while also providing the raw material necessary for obtaining animal products, such as meat, milk and eggs. In this context, achieving high, stable and superior quality production, especially in the case of wheat cultivation, is a permanent concern, with major implications for food security and the development and sustainability of the agri-food industry.

Insect pests have a significant impact on agricultural crops, causing significant damage by disrupting plant metabolism, especially essential physiological processes, which is reflected in both quantitative and qualitative production losses [Amarghioalei, 2025]. To limit these negative effects, various control measures are applied, which include the use of pesticides in chemical control, as well as the implementation of biological control strategies, based on the use of biological agents - fungi, pathogenic bacteria, viruses and protozoa - along with parasites and natural predators of harmful species [Alhadidi, 2019; Tiziano, 2025]. In this context, the present work aims to highlight the diversity of arthropods associated with a wheat crop and to emphasize the role of useful species in reducing the pressure exerted by pests.

MATERIAL AND METHOD

The observations were carried out in a wheat crop located within the perimeter of the Ezăreni Teaching and Research Station, belonging to the "Ion Ionescu de la Brad" University of Life Sciences in Iași. The biological material was collected with the help of entomological netting, using the mowing method, being complemented by direct observations on the plants throughout the vegetation period. In 2025, at intervals of 12–17 days, nine netting sessions were carried out, carried out between April and August [Tălmaciu, 2024].

The material collected from the field was labelled, cleaned of residual plant debris and preserved in 40% ethyl alcohol solution [Sipos, 2024]. The collected arthropods were determined using a binocular magnifying glass and specialized determiners [Goulet and Huber, 1993], additionally using electronic resources and updated taxonomic keys [***8.https://www.antwiki.org], [***9.https://sites.google.com/view/mikes-insect-keys], [***10.https://eng-encyclopedie-pucerons.hub.inrae.fr],[***11.https://www.britishbugs.org.uk;],[***12.https://www.janva

nduinen.nl]. The identification process targeted both phytophagous taxa of economic importance and the complex of entomophagous arthropods (predators and parasitoids) involved in the processes of natural regulation of pest populations [Barascou, 2022].

Fig.1. Data preprocessing in the lab

RESULTS AND DISCUSSIONS

Analysing the data in Table 1, we can see a considerable variability in both the abundance and diversity of arthropods collected during the nine threadings carried out in the wheat crop in 2025. The threading of 03.06.2025 stands out for the largest number of individuals (379), representing over a third of the total material collected (36%). This abundance is explained by the dominance of aphids which recorded a number of 254 specimens, confirming the pressure exerted by this pest in the intermediate stages of the wheat crop when adults attack the fully developed plant. Diptera (51 specimens) and the species Haplothrips tritici (36 specimens) complete the picture of harmful insects on mature wheat plants.

The threading with the highest diversity was the fourth (24.06.2025) which presents 16 taxa and a high total abundance, a total of 281 specimens (26% of the total arthropods collected). This situation reflects an intermediate phenological phase in which the crop is a favorable environment for the development of harmful insects, supported by the presence of large numbers of dipterans, cicadas and aphids.

The threads that presented the greatest taxonomic diversity were the IV threading, carried out on 24.06.2025, and the IX threading, from 21.08.2025, each recording 16 taxa. From a quantitative point of view, the IV threading stood out with a total of 281 specimens collected, compared to the 63 specimens recorded in the IX threading. Within the IV threading, dipterans were the dominant group, totalling 178 specimens, followed by aphids, with 55 specimens, thus highlighting a community structure strongly influenced by the presence of these two orders.

In the case of the 9th threading, the faunal structure was dominated by the species *Stenamma debile*, which recorded the highest number of specimens, namely 15 individuals, followed by *Phyllotreta nemorum* with 10 specimens. This distribution highlights a more pronounced representation of these two species during the analysed period, suggesting favourable conditions for their presence and activity within the investigated ecosystem.

Table 1

Rapeseed sweeping data situation in 2025

Taxon number	Taxon	Nr of individuals
First sweep 28.04.2025		
1.	*Anaphes flavipes*	4
2.	*Cantharis obscura*	1
3.	*Coccinella septempunctata*	1
4.	*Diptera*	63
5.	*Haplothrips tritici*	2
6.	*Oulema melanopus*	5
7.	*Pseudocleonus cinereus*	1
8.	*Psylliodes chrysocephala*	4
Total	8 Taxons	81
Second sweep 15.05.2025		
1.	Aphids	2
2.	*Bibio hortulanus*	3
3.	*Cephus pygmaeus*	1
4.	*Diptera*	47
5.	*Haplothrips tritici*	2
6.	*Meligethes aeneus*	5
7.	*Nabis ferus*	1
8.	*Oulema melanopus*	1
9.	*Pseudocleonus cinereus*	1
10.	*Valenzuela flavidus*	5
Total	10 taxons	68
Third sweeps 03.06.2025		
1.	*Aelia acuminata*	2
2.	Aphids	254
3.	*Anisodactylus signatus*	1
4.	*Apion confluens*	1
5.	*Atomaria diluta*	2
6.	*Diptera*	51
7.	*Froghoppers*	10
8.	*Froghoppers (Cercopis sanguinolenta)*	2
9.	*Haplothrips tritici*	36
10.	*Hypera postica*	1
11.	*Necremnus leucarthos*	12
12.	*Nabis ferus*	1
13.	*Sminthurus viridis*	6
Total	13 taxons	379
Forth sweep 24.06.2025		
1.	Aphids	55
2.	*Agriotes ustulatus*	1

Taxon number	Taxon	Nr of individuals
3.	*Aphidius rhopalosiphi*	2
4.	*Coccinella septempunctata*	5
5.	*Dentrocerus carpenteri*	3
6.	*Diptera*	178
7.	*Eurygaster integriceps*	1
8.	*Froghoppers*	22
9.	*Ichneumonidae*	2
10.	*Lasius niger*	2
11.	*Nabis ferus*	1
12.	*Necremnus leucarthos*	2
13.	*Necremnus tidius*	2
14.	*Rhagonicha fulva*	1
15.	*Spiders (Lycosidae)*	1
16.	*Trissolcus grandis*	3
Total	16 taxons	281
Fifth sweep 07.07.2025		
1.	*Aphanogmus abdominalis*	2
2.	*Chrysoperla carnea*	2
3.	*Coccinella septempunctata*	1
4.	*Diptera*	11
5.	*Froghoppers*	3
6.	*Formicomus pedestris*	2
7.	*Nabis ferus*	1
8.	*Paianjeni*	
9.	*Platycleis affinis*	1
10.	*Propylea quatuordecimpunctata*	1
11.	*Psylliodes attenuata*	3
12.	*Sitona inops*	1
13.	*Spiders (Lycosidae)*	12
14.	*Stenamma debile*	4
15.	*Torymus sp.*	3
Total	13 taxons	47
Sixth sweep 14.07.2025		
1.	*Aphanogmus abdominalis*	2
2.	*Aphelinus abdominalis*	1
3.	*Atomaria diluta*	6
4.	*Diptera*	16
5.	*Necremnus tidius*	5
6.	*Phyllotreta nemorum*	3
7.	*Psylliodes attenuata*	2
8.	*Pteromalidae*	3
9.	*Sericus brunneus*	2
10.	*Sicocoris sp.*	1
11.	*Stenomalina gracilis*	6
12.	*Trissolcus grandis*	3
13.	*Valenzuela flavidus*	1
Total	13 taxons	80
Seventh sweep 22.07.2025		
1.	*Aphelinus abdominalis*	1

Taxon number	Taxon	Nr of individuals
2.	*Aphtona euphorbiae*	1
3.	*Diptera*	11
4.	*Froghoppers*	16
5.	*Melanotus rufipes*	1
6.	*Pezotettix giornae*	2
7.	*Spiders (Lycosidae)*	2
8.	*Stenamma debile*	1
9.	*Trybliographa rapae*	1
Total	9 taxons	36
Eighth sweep 02.08.2025		
1.	*Aphanogmus abdominalis*	2
2.	*Diptera*	3
3.	*Froghoppers*	18
4.	*Orthoptera*	1
5.	*Psylliodes attenuata*	3
6.	*Stenamma debile*	2
Total	6 taxons	29
Ninth sweep 21.08.2025		
1.	*Aphanogmus abdominalis*	2
2.	*Aphelinus abdominalis*	2
3.	*Diptera*	5
4.	*Froghoppers*	4
5.	*Heteroptera*	4
6.	*Lepidoptera*	1
7.	*Odonata*	2
8.	*Ortoptera*	1
9.	*Phyllotreta nemorum*	10
10.	*Psylliodes attenuata*	1
11.	*Psylliodes dulcamarae*	4
12.	*Spiders (Lycosidae)*	2
13.	*Stenamma debile*	15
14.	*Torymus sp.*	2
15.	*Trybliographa rapae*	6
16.	*Tytthaspis sedecimpunctata*	2
Total	16 taxons	63
Total		1064

The analysis by repetitions highlights significant variations in the abundance of collected specimens. Thus, 81 specimens were recorded in threading I, followed by 68 specimens in threading II and 379 specimens in threading III. Threading IV totalled 281 specimens, while threading V and VI totalled 47 and 80 specimens, respectively. Threading VII collected 36 specimens, and threading VIII, 29 specimens. Threading IX contributed 63 specimens. In total, 1064 specimens belonging to 60 taxa were collected (table 2), reflecting a notable variability in the faunal composition between repetitions.

Table 2

Harvest situation with the help of entomological nets in rapeseed in 2025

No	Taxons	28.04	15.05	03.06	24.06	07.07	14.07	22.07	02.08	21.08	Total
1.	*Aelia acuminata*	-	-	2	-	-	-	-	-	-	2
2.	*Agriotes ustulatus*	-	-	-	1	-	-	-	-	-	1
3.	*Anaphes flavipes*	4	-	-	-	-	-	-	-	-	4
4.	*Anisodactylus signatus*	-	-	1	-	-	-	-	-	-	1
5.	*Aphanogmus abdominalis*	-	-	-	-	2	2	-	2	2	8
6.	*Aphidius rhopalosiphi*	-	-	-	2	-	-	-	-	-	2
7.	Aphids	-	2	254	55	-	-	-	-	-	311
8.	*Aphelinus abdominalis*	-	-	-	-	-	1	1	-	2	4
9.	*Aphtona euphorbiae*	-	-	-	-	-	-	1	-	-	1
10.	*Apion confluens*	-	-	1	-	-	-	-	-	-	1
11.	*Atomaria diluta*	-	-	2	-	-	6	-	-	-	8
12.	*Bibio hortulanus*	-	3	-	-	-	-	-	-	-	3
13.	*Cantharis obscura*	1	-	-	-	-	-	-	-	-	1
14.	*Cephus pygmaeus*	-	1	-	-	-	-	-	-	-	1
15.	*Chrysoperla carnea*	-	-	-	-	2	-	-	-	-	2
16.	*Coccinella septempunctata*	1	-	-	5	1	-	-	-	-	7
17.	*Decticus albifrons*	-	-	-	-	-	2	-	-	-	2
18.	*Dentrocerus carpenteri*	-	-	-	3	-	-	-	-	-	3
19.	*Diptera*	63	47	51	178	11	16	11	3	5	385
20.	*Eurydema ornata*	-	-	-	-	-	2	-	-	-	2
21.	*Eurygaster integriceps*	-	-	-	1	-	1	-	-	-	2
22.	*Froghoppers*	-	-	10	22	3	21	16	18	4	94
23.	*Froghoppers (Cercopis sanguinolenta)*	-	-	2	-	-	-	-	-	-	2
24.	*Formicomus pedestris*	-	-	-	-	2	-	-	-	-	2
25.	*Haplothrips tritici*	2	2	36	-	-	-	-	-	-	40
26.	*Heteroptera*	-	-	-	-	-	-	-	-	4	4
27.	*Hypera postica*	-	-	1	-	-	-	-	-	-	1
28.	*Ichneumonidae*	-	-	-	2	-	-	-	-	-	2
29.	*Lasius niger*	-	-	-	2	-	-	-	-	-	2
30.	*Lepidoptera*	-	-	-	-	-	-	-	-	2	2
31.	*Melanotus rufipes*	-	-	-	-	-	-	1	-	-	1
32.	*Meligethes aeneus*	-	5	-	-	-	-	-	-	-	5
33.	*Nabis ferus*	-	1	1	1	1	2	-	-	-	6
34.	*Necremnus leucarthos*	-	-	12	2	-	-	-	-	-	14
35.	*Necremnus tidius*	-	-	-	2	-	5	-	-	-	7
36.	*Odonata*	-	-	-	-	-	-	-	-	1	1
37.	*Orthoptera*	-	-	-	-	-	-	-	1	1	2
38.	*Oulema melanopus*	5	1	-	-	-	-	-	-	-	6
39.	*Pezotettix giornae*	-	-	-	-	-	-	2	-	-	2
40.	*Phyllotreta nemorum*	-	-	-	-	-	3	-	-	10	13
41.	*Platycleis affinis*	-	-	-	-	1	-	-	-	-	1
42.	*Propylea quatuordecimpunctata*	-	-	-	-	1	-	-	-	-	1
43.	*Pseudocleonus cinereus*	1	1	-	-	-	-	-	-	-	2
44.	*Psylliodes attenuata*	-	-	-	-	3	2	-	3	1	9

No	Taxons	28.04	15.05	03.06	24.06	07.07	14.07	22.07	02.08	21.08	Total
45.	*Psylliodes chrysocephala*	4	-	-	-	-	-	-	-	-	4
46.	*Psylliodes dulcamarae*	-	-	-	-	-	-	-	-	4	4
47.	*Pteromalidae*	-	-	-	-	-	3	-	-	-	3
48.	*Rhagonicha fulva*	-	-	-	1	-	-	-	-	-	1
49.	*Sericus brunneus*	-	-	-	-	-	3	-	-	-	3
50.	*Sciocoris sp.*	-	-	-	-	-	1	-	-	-	1
51.	*Sitona inops*	-	-	-	-	1	-	-	-	-	1
52.	*Sminthurus viridis*	-	-	6	-	-	-	-	-	-	6
53.	*Spiders (Lycosidae)*	-	-	-	1	12	-	2	-	2	17
54.	*Stenamma debile*	-	-	-	-	4	-	1	2	15	22
55.	*Stenomalina gracilis*	-	-	-	-	-	6	-	-	-	6
56.	*Torymus sp.*	-	-	-	-	3	-	-	-	2	5
57.	*Trissolcus grandis*	-	-	-	3	-	3	-	-	-	6
58.	*Trybliographa rapae*	-	-	-	-	-	-	1	-	6	7
59.	*Tytthaspis sedecimpunctata*	-	-	-	-	-	-	-	-	2	2
60.	*Valenzuela flavidus*	-	5	-	-	-	1	-	-	-	6
Total	*60 taxons*	81	68	379	281	47	80	36	29	63	1064

Among the identified taxonomic groups, dipterans, with a total of 385 specimens, aphids, with 311 specimens, and cicadas, with 94 specimens, recorded the highest abundance values, highlighting the dominance of these groups in the faunal structure of the collected material.

The lowest number of specimens was recorded for the species *Agriotes ustulatus, Anisodactylus signatus, Aphtona euphorbiae, Apion confluens, Cantharis obscura, Cephus pygmaeus, Hypera postica, Melanotus rufipes, Platycleis affinis, Propylea quatuordecimpunctata, Rhagonicha fulva, Sciocoris sp.* and *Sitona inops,* as well as for the representatives of the order Odonata, each being present with a single specimen. This distribution indicates a low frequency of these taxa within the collected material, suggesting a sporadic presence or unfavourable ecological conditions for their development during the analysed period.

Among the species considered useful, several groups with an important role in regulating pest populations were identified, among which the spiders of the Lycosidae family, a species with polyphagous behaviour, as well as the species *Aphidius rhopalosiphi* and the wasp of the genus *Dendrocerus,* parasitic on the genus Aphidius, stand out. The species *Necremnus tidius, Necremnus leucarthos, Stenomalina gracilis, Trissolcus grandis, Trybliographa rapae, Aphanogmus abdominalis* were also recorded, along with the bedbug *Nabis ferus* and the neuropter *Chrysoperla carnea*. In total, these species total 108 specimens, representing approximately 10% of the total arthropods collected (Fig.2), which indicates a moderate presence of useful entities in the analyzed faunal structure.

The presence of the springtail *Sminthurus viridis*, the hyperparasitic wasp *Dendrocerus carpenteri*, as well as the species *Valenzuela flavidus* (order Psocodea) constitutes an indicator of the proper functioning of the ecosystem,

suggesting the maintenance of balanced trophic relationships and a specific diversity associated with a healthy ecological environment.

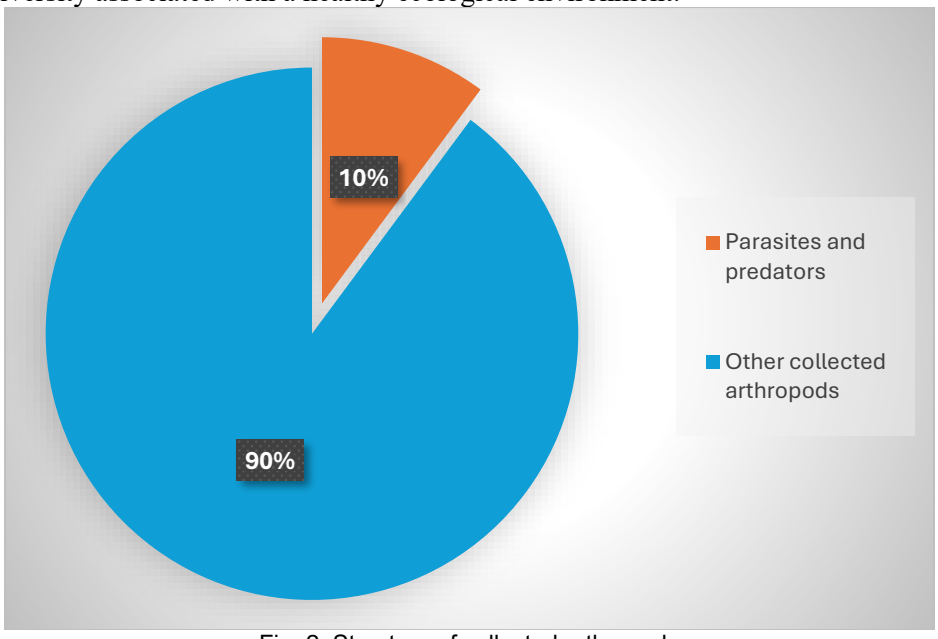

Fig. 2. Structure of collected arthropods

From a taxonomic point of view, most of the collected parasitic and predatory arthropods are classified in the order *Hymenoptera,* which totals 13 taxa, followed by the order *Coleoptera*, with 4 taxa. In contrast, the orders *Araneae, Hemiptera*, *Neuroptera* and *Odonata* are each represented by a single taxon (table 3), which highlights the dominance of hymenoptera in the useful faunal structure of the analysed ecosystem.

Table 3

Centralization of parasitic and predatory species and their hosts/prey

Order	Family	Taxon	Prey/Host	The stage at which it is consumed	Total samples
Araneae	*Lycosidae*	-	Polyphagous species	Larvae, adults	17
Coleoptera	*Coccinelidae*	*Coccinella septempunctata*	Aphids	Adults	7
		Tytthaspis sedecimpunctata	Aphids	Adults	2
		Propylea quatuordecimpunctata	Aphids	Adults	1
	Carabidae	*Anisodactylus signatus*	Polyphagous species	Larvae adults	1
Hemiptera	*Nabiidae*	*Nabis ferus*	Aphids	Adults	6
Hymenoptera	*Braconidae (Aphidiinae)*	*Aphidius rhopalosiphi*	Aphids	Adults	2
	Ichneumonidae	-	Polyphagous species	Larvae, adults	2

Order	Family	Taxon	Prey/Host	The stage at which it is consumed	Total samples
	Ceraphronidae	*Aphanogmus abdominalis*	Dasineura brassicae si Dassineura odorate	Larvae	8
	Megaspilidae	*Dendrocerus carpenteri*	Aphidius	Adults	3
	Figitidae	*Trybliographa rapae*	Diptera (Delia sp)	Larvae	7
	Scelionidae	*Trissolcus grandis*	Eurygaster integriceps	Eggs	6
	Aphelinidae	*Aphelinus abdominalis*	Aphids	Adults	4
	Eulophidae	*Necremnus tidius*	Ceutorhynchus obstrictus, C. napi	Adults	7
		Necremnus leucarthos	-	-	14
	Mymaridae	*Anaphes flavipes*	Oulema melanopus	Eggs	4
	Pteromalidae	*Stenomalina gracilis*	Diptera, Curculionidae	Larvae	6
		-	Polyphagous species	?	3
	Torymidae	*Torymus* sp	Diptera, Cecidomyiidae	Larvae	5
Neuroptera	*Chrysopidae*	*Chrysoperla carnea*	Polyphagous species	Adults, larvae	2
Odonata	*Libelullidae*	-	Polyphagous species	Larvae, adults	1
Total					108

Of these useful species, 16% are represented by members of the *Lycosidae* family, 13% by *Necremnus leucarthos*, and 7% by *Aphanogmus abdominalis* (Fig.3), a distribution that highlights the predominance of these taxa in the structure of the group of identified beneficial arthropods.

According to Fig. 3, the largest share of taxa is represented by polyphagous parasites and predators, followed by taxa associated with aphids, as well as those specific to diptera and curculionids. Among the parasitic and polyphagous arthropods of particular importance, the odonates, spiders belonging to the *Lycosidae* family, the coleopteran *Anisodactylus signatus*, the neuropteran *Chrysoperla carnea*, wasps from the I*chneumonidae* family stand out.

Among the most important natural antagonists of aphids are the parasitoid wasps *Aphidius rhopalosiphi* (*Hymenoptera, Braconidae*) and *Aphelinus abdominalis (Hymenoptera, Aphelinidae*), along with the ladybirds *Coccinella septempunctata, Tytthaspis sedecimpunctata* and *Propylea quatuordecimpunctata*, as well as the predatory bug *Nabis ferus*.

The dominance of the parasitoid *Aphanogmus abdominalis (Hymenoptera: Ceraphronidae)*, together with the consistent presence of the parasitoid wasps

Trybliographa rapae, Stenomalina gracilis and *Torymus* sp., indicates the presence of a complex system of regulation of harmful dipteran populations.

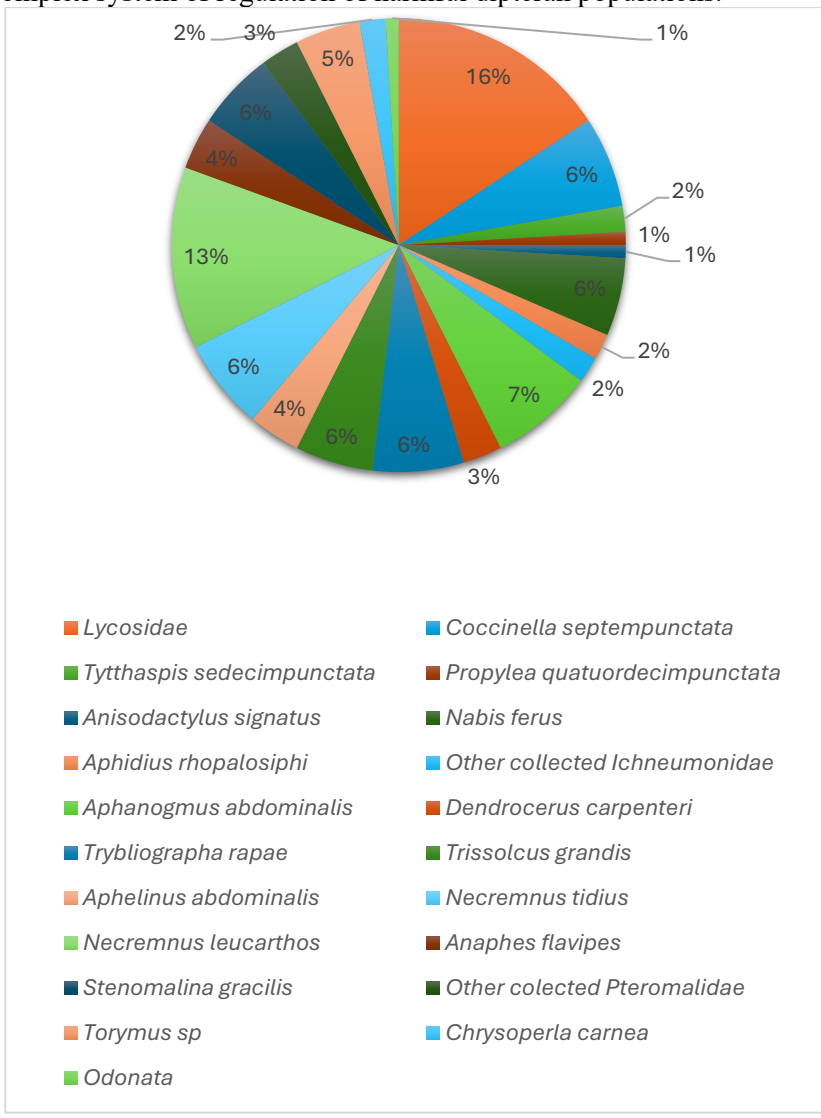

Fig.3. The structure of parasitic and predatory arthropods

CONCLUSIONS

The analysis of the complex of beneficial arthropods highlighted a trophic structure dominated by parasitoids from the order *Hymenoptera,* which recorded a diversity of 13 taxa, and specific abundance. The species with major impact on phytophagous were: *Necremnus leucarthos, Aphanogmus abdominalis* and *Necremnus tidius*, which recorded values of 14, 8 and 7 specimens, respectively. These results show a uniform pressure on both harmful dipterans and weevils.

The predatory component was predominantly represented by *Coleoptera: Coccinelidae* (3 taxa) included species specialized in aphid consumption (*Coccinella septempunctata, Tytthaspis sedecimpunctata and Propylea quatuordecimpunctata*), suggesting an abundant trophic supply. Generalist predators such as: *Lycosidae* (*Araneae*), *Chrysoperla carnea* (*Neuroptera: Chrysopidae*) and *Nabis ferus* (*Hemiptera: Nabidae*) complete the functional spectrum contributing to the stability of antagonistic interactions.

The threadings with the largest number of taxa were the IV threading on 24.06.2025 where the largest number of specimens was represented by diptera with 178 specimens followed by aphids with 55 specimens and the IX threading on 21.08.2025 with 16 taxa each where the largest number of specimens was represented by diptera with 178 specimens followed by aphids with 55 specimens, in total 281 specimens at the IV threading and 63 at the IX threading.

The dominance of the parasitoid *Aphanogmus abdominalis* (*Hymenoptera: Ceraphronidae*), together with the constant presence of the parasitoid wasps *Trybliographa rapae, Stenomalina gracilis* and *Torymus* sp., highlights the existence of a complex system of biological regulation of harmful dipteran populations, suggesting a functional balance between phytophagous organisms and useful entomofauna within the studied agroecosystem.

Overall, the 108 identified specimens outline a well-structured entomofaunal complex, characterized by a high level of functional diversity and trophic complementarity. This organization reflects a significant potential of natural biological control mechanisms in the analysed agroecosystem and highlights the essential role of parasitoids and predators in maintaining the balance of pest populations.

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