OBSERVATIONS ON THE STRUCTURE, DYNAMICS AND ABUNDANCE OF ARTHROPOD SPECIES FROM POTATO CROPS IN RĂDĂUTI AREA, SUCEAVA COUNTY

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ABSTRACT

The collection of the material was done with the help of Barber pitfall traps in a potato crop in the NE area of Romania, in the town of Rădăuti. Suceava county. The observations were made in 2022 in an autumn potato crop, the Gared variety using 3 experimental variants:
- V1- potato grown in ecological system (with treatments approved in ecological agriculture);
- V2- potato grown in a conventional system (with chemical treatments);
- V3- potato cultivated without treatments.
For each variant, 12 traps were used placed on two rows at a distance of 10-12m between traps per row and at 6-8m between rows. The material was collected from May to September, making a total of 4 collections. The determination of the collected material was done with the help of determinants and specialized sources on the Internet. The collected arthropods belong to the following groups: insects and mites. Among the insects collected, Coleoptera, Hymenoptera, Diptera and Heteroptera species were most frequently collected. Coleoptera were determined to species level. the other arthropods were determined to order level. Among the more numerous coleoptera were species of carabids, chrysomelids, elaterids and staphylinids.

INTRODUCTION

The potato is a crop of significant importance for human nutrition, animal feed, and industrial processing.

The average production of 15 tons per hectare recorded between 2010 and 2020 is three times lower than the average production achieved in European Union member states. The main reason for the low production levels is that most growers use uncertified planting material.

Inadequate control of potato crops concerning disease pathogens, as well as the presence of pests, often leads to low and uneconomical yields (Anuj, B. 2009).

The timely application of treatments is recommended through warning bulletins, and a delay of 4-5 days in treatment application reduces the treatment's effectiveness by 70-80%.

The number of treatments varies from year to year, depending on the variety and the cultivation area. Good results are obtained when products are alternated between treatments.

The potato also presents several agronomic advantages: it makes good use of light soils in cool and humid regions, produces a significant amount of dry matter per unit area, helps stagger agricultural work, is an excellent precursor crop, and has a theoretical yield potential of 134 tons per hectare, which can be achieved by following proper cultivation technology.

In Romania, only small quantities of potatoes are processed industrially, around 20,000 tons, which represents 1% of the total production. This is primarily for producing potato flakes, flour, semolina, and to a lesser extent for products like French fries, extruded products, and chips.

MATERIAL AND METHODS

The research was conducted in 2022 on a potato crop in the Rădăuți-Suceava area at the Varieties Testing Center, under the State Institute for Varieties Testing and Registration, Bucharest. The study was carried out on an autumn potato crop, of the Gared variety, during the vegetation cycle from May to September.

The material collection was done using Barber pitfall traps (Fig. 1). This method is used to collect harmful and useful epigeal fauna in potato crops (Rotari Elena, 2011). In each variant, 12 traps were used, placed in two rows, with a distance of 10-12 meters between traps in a row and 6-8 meters between rows.

The traps were placed on ridges in each of the three variants, with two repetitions per variant:

• V1 – Potatoes cultivated in an organic system (with treatments approved for organic farming)

• V2 – Potatoes cultivated in a conventional system (with chemical treatments)

• V3 – Potatoes cultivated without treatments.

Figure 1. Pitfall traps Barber (original)

In each trap, was used a 20% salt solution. A total of four collections were carried out at intervals of 15-20 days. For each collection, the biological material from the traps was placed in containers with alcohol and labeled. (Gurr G.M et al. 2004) The labels included information such as the station, the variant, the date of collection, and the cultivation method (chemical, organic, or untreated).

The material collected in this way was then brought to the laboratory for analysis and identification.

RESULTS AND DISCUSSIONS

In the first collection on May 25, 2022 (table 1), arthropods belonging to the following classes were collected: Arachnida, Hexapoda, and Myriapoda.

The species collected from the class Arachnida belong to two orders: the order Acari and the order Aranea, with a total of 27 specimens. From the class Myriapoda, 4 specimens were collected, all belonging to the order Diplopoda.

The majority of the specimens collected belong to the class Hexapoda, which is represented by the following orders: Coleoptera, Diptera, Hemiptera, and Hymenoptera.

Within this class, the best-represented order, both in terms of the number of species (44) and the number of specimens collected (71), is Coleoptera, accounting for 50,36% of the total arthropods collected during this collection.

All Coleoptera species had a relatively low number of specimens, ranging between 1 and 8. The other hexapods—Diptera, Hemiptera, and Hymenoptera—had a total of 39 specimens, representing 27,66% of the total arthropods collected in this sampling.

Table 1

Structure and abundance of arthropod species collected on May 25, 2022

No	Class	Order	Species	Total samples
1	Arachnida	Acari	Mites	10
		Araneae	Spiders	17
	Total arahnids			27
2.	Hexapoda	Coleoptera	Acupalpus dorsalis	1
			Acupalpus suturalis	1
			Aleochara laevigata	2
			Altica palustris	1
			Anthribus variegatus	1
			Aphthona euphorbiae	4
			Badister sodalis	1
			Baris lepidii	1
			Bembidion assimile	1
			Bembidion bipunctatum	1
			Bembidion minimum	1
			Bembidion saxatile	2
			Cantharis fusca	2
			Cicindela campestris	1
			Corticaria gibbosa	2
			Drasterius bimaculatus	1
			Harpalus distinguendus	1
			Hister cadaverinus	1
			Hister terricola	1
			Lathrobium brunnipes	1
			Leptinotarsa decemlineata	1
			Liodes badia	1
			Longitarsus brunneus	1
			Longitarsus luridus	1
			Miscodera artica	1
			Mycetophagus quadriguttatus	1
			Orchestes pratensis	2
			Oxytelus rugosus	6

No	Class	Order	Species	Total samples
	Hexapoda	Coleoptera	Phyllotreta atra	8
			Phyllotreta nigripes	1
			Phyllotreta vittula	4
			Podagrica malvae	1
			Polydrasus amoenus	1
			Pterostichus cupreus	1
			Pterostichus lepidus	2
			Pterostichus vulgaris	1
			Pteryngium crenatum	1
			Quedium humeralis	1
			Rizophagus nitidulus	1
			Sclerophaedon carniolicus	1
			Scophaeus sulcicollis	2
			Sipalia circellaris	3
			Tachyporus abdominalis	1
			Tachyporus nitidulus	1
		Total coleopters	44 species	71
		Diptera	Flies	5
		Hemiptera	Aphids	5
		Hymenoptera	Ants	22
			Wasp	6
			Parasitic wasp	1
		Total himenopters		29
	Total hexapods			110
3.	Miriapoda	Diplopoda	Miriapods	4
	Total samples of arthropods			**141**

During the second collection on June 9, 2022 (table 2), arthropods belonging to three classes were collected: Hexapoda, Arachnida, and Myriapoda.

The class Hexapoda had a total of 96 specimens, representing 96.57% of the total arthropods collected.From the class Hexapoda, the collected species belong to the following orders: Coleoptera, Hymenoptera, and Hemiptera.

The order Coleoptera was represented by 14 species, totaling 44 specimens, accounting for 41.5% of the total arthropods collected during this sampling.The collected Coleoptera species had a relatively small number of specimens, ranging from one to six specimens.

Table 2

Structure and abundance of arthropod species collected on June 9, 2022

No.	Class	Order	Name of species	Total samples
1.	Hexapoda	Coleoptera	Atheta brunnea	4
			Coccinella septempunctata	6
			Ityocara rubens	3
			Lathrobium brunnipes	2
			Longitarsus anchusae	3
			Longitarsus luridus	2
			Othius melanocephalus	2
			Oxytelus rugosus	6
			Phyllotreta atra	2
			Phyllotreta nigripes	2
			Phylonthus fuscus	3

No.	Class	Order	Name of species	Total samples
			Pterostichus marginalis	1
			Pterostichus niger	5
			Sipalia Circellaris	3
		Total Coleopters 14 species		44
		Hymenoptera	Bees	2
			Parasitic wasp	13
		Total Hymenopters		15
		Hemiptera	Aphids	36
			Stink bug	1
		Total Hemiptera		37
	Total Hexapods			96
2.	Arachnida	Acari	Mites	5
		Araneae	Spider	3
	Total Arahnide			8
3.	Myriapoda		miriapode	2
Total samples of arthropods				106

In the third collection, conducted on June 25, 2022 (table 3), a total of 226 specimens of arthropods belonging to four classes were collected: Hexapoda, Arachnida, Myriapoda, and Crustacea.

The class Hexapoda was the best represented, accounting for 87.17% of the total arthropods collected on this date. The order Coleoptera was represented by 22 species, totaling 83 specimens.

Table 3

Structure and abundance of arthropod species collected on June 25, 2022

No.	Class	Order	Name of species	Total samples
1	Hexapoda	Coleptera	Anisodactylus binotatus	3
			Anthicus antherinus	6
			Aphodius granarius	1
			Aphthona euphorbiae	16
			Aphthona fuscicollis	2
			Clivina fossor	3
			Corticaria crenulata	1
			Drypta dentata	1
			Epicometis hirta	2
			Haltica pusilla	1
			Harpalus distinguendus	2
			Leptinotarsa decemlineata	5
			Metabletus truncatellus	2
			Phylonthus discoideus	8
			Phylonthus fuscus	4
			Phylonthus lepidus	5
			Phylonthus splendidus	3
			Phylotreta undulata	3
			Phyllotreta vittula	3
			Poecilus cupreus	5
			Pseudophonus pubescens	3
			Quedius molochinus	4
		Total coleopters	22 species	83
		Hemiptera	aphids	33

No.	Class	Order	Name of species	Total samples
			Stink bug	3
		Total hemipters		36
		Diptera	Flies	8
		Hymenoptera	Wasp	1
			Parasitic wasp	55
			Ants	22
		Total himenopters		78
	Total hexapods			197
2.	Arachnida	Araneae	Mites	4
		Acari	Spider	16
	Total arahnids			20
3.	Miriapoda	Diplopoda	Miriapods	5
4.	Crusatace	Isopoda	Armadilidium vulgare	4
	Total samples of arthropods			226

In the fourth collection (table 4), conducted on July 19, 2022, a total of 176 specimens of arthropods belonging to three classes were collected: Hexapoda, Arachnida, and Crustacea.

The class Hexapoda is represented by the following orders: Coleoptera, Hemiptera, Diptera, Hymenoptera, and Thysanoptera, with a total of 151 specimens, accounting for 85.8% of the total arthropods collected on this date.

Among the hexapods, the order Coleoptera was the best represented, both in terms of the number of species (25) and the number of specimens (78).

The number of specimens for the collected Coleoptera species ranged from 1 to 12 specimens.

Table 4

Structure and abundance of arthropod species collected on July 19, 2022

No	Class	Order	Species	Total samples
1	Hexapoda	Colepotera	Agriotes ustulatus	1
			Amarochara forticornis	2
			Aphthona euphorbiae	4
			Bembidion lampros	2
			Cicindela sylvicola	1
			Coccinella 11-punctata	4
			Cratarea suturalis	1
			Formicomus pedestris	1
			Halizia 14punctata	1
			Harpalus distinguendus	7
			Leptinotarsa decemlineata	5
			Longitarsus apicalis	1
			Longitarsus luridus	2
			Longitarsus tabidus	1
			Olibrus pygmaeus	1
			Oxytelus rugosus	4
			Philonthus fulvipes	2
			Phloeopora corticallis	1
			Phyllotreta vittula	12
			Polydrosus amoenus	1
			Pterostichus cupreus	5

No	Class	Order	Species	Total samples
			Pterostichus cylindricus	2
			Pterostichus marginalis	8
			Pterostichus vulgaris	4
			Sipalia circellaris	5
		Total coleopters	25 species	78
		Hymenoptera	Bees	1
			Ants	39
			Wasp	19
		Total himenopters		59
		Hemiptera	Cicads	7
			Stink bug	1
		Total hemipters		8
		Diptera	Flies	4
		Thysanoptera	Trips	2
	Total hexapods			151
2.	Arachnida	Araneae	Mites	15
		Acari	Spiders	9
	Total arahnids			24
3.	Crustacea	Isopoda	Armadilidium vulgare	1
	Total samples of arthropods			176

In the fifth collection (table 5), conducted on July 28, 2022, a total of 136 specimens belonging to four classes were collected: Hexapoda, Arachnida, Myriapoda, and Crustacea.

The class Hexapoda was represented by the following four orders: Coleoptera, Hymenoptera, Diptera, and Hemiptera. Among this class, the order Coleoptera was the best represented, with specimens ranging from 1 to 19.

The collected beetles belong to 17 species, totaling 53 specimens, which accounted for 38.97% of the total arthropods collected on this date.

Table 5

Structure and abundance of arthropod species collected on July 28, 2022

No.	Class	Order	Species	Total samples
1.	Hexapoda	Coleoptera	Anthicus anterimus	1
			Anthicus floralis	1
			Badister sodalis	1
			Coccinella 11punctata	1
			Coccinella septempunctata	3
			Harpalus distinguendus	1
			Leptinotarsa decemlineata	1
			Necrophorus vespillo	1
			Oxytelus rugosus	6
			Pseudophonus pubescens	1
			Pterostichus cupreus	19
			Pterostichus cylindricus	5
			Pterostichus marginalis	1
			Pterostichus niger	3
			Sparia circellaris	3
			Tachyporus chrysomelinus	3
			Tachyporus hypnorum	2
		Total coleopters	17 species	53

No.	Class	Order	Species	Total samples
		Hymenoptera	Ants	21
			Wasp	5
		Total himenopters		26
		Diptera	Flies	4
		Hemiptera	Cicads	6
			Aphids	33
			Stink bug	2
		Total hemipters		41
	Total hexapods			124
2.	Arachnida	Araneae	Mites	5
		Acari	Spiders	5
	Total arahnids			10
3.	Miriapoda	Diplopoda	Miriapods	1
4.	Crustacea	Isopoda	Armadilidium Vulgare	1
	Total samples of arthropods			136

In the sixth collection, conducted on August 4, 2022 (table 6), a total of 134 specimens of arthropods belonging to two classes were collected: Hexapoda and Arachnida.

The class Hexapoda had 127 specimens, representing 94.78% of the total arthropods collected.

Within the class Hexapoda, the order Coleoptera was the best represented in terms of both the number of specimens and the number of species. This order was represented by 26 species and 66 specimens, accounting for 49.26% of the total arthropod species collected.

The species of the order Coleoptera had a relatively small number of specimens, ranging from one to eight.

Table 6

Structure and abundance of arthropod species collected on august 4, 2022

No.	Class	Order	Name of species	Total samples
1.			Anisodactylus binotatus	1
			Anthicus floralis	1
			Atheta angustula	1
			Atheta brunnea	4
			Atheta longicornis	1
			Carabus violaceus	1
			Ceutorhynchus litura	1
			Coccinella 11 punctata	1
			Corticaria gibbosa	1
	Hexapoda	Coleoptera	Harpalus calceatus	7
			Harpalus griseus	3
			Harpalus pubescens	5
			Leptinotarsa decemlineata	3
			Longitarsus anchusae	1
			Longitarsus luridus	1
			Longitarsus suturalis	1
			Othius punctulatus	1
			Oxytelus rugosus	3

No.	Class	Order	Name of species	Total samples
			Phyllotreta vittata	4
			Poecilus cupreus	8
			Pterostichus cylindricus	1
			Pterostichus lepidus	1
			Pterostichus marginalis	6
			Pterostichus niger	6
			Pterostichus vulgaris	2
			Sipalia circellaris	1
		Total coleopters	26 species	66
		Hemiptera	Aphids	9
			Cicads	15
		Total hemipters		24
		Hymenoptera	Ants	24
			Wasp	9
			Parasitic wasp	1
		Total himenopters		34
		Diptere	Flies	3
	Total Hexapods			127
2.	Arachnida	Acari	Mites	4
		Araneae	Spiders	3
	Total arahnids			7
	Total Samples of arthropods			134

In total, across the six collections (Table 7), 926 specimens of arthropods belonging to four classes were collected: Hexapoda, Arachnida, Myriapoda, and Crustacea.

The highest number of arthropod specimens was collected during the third collection on June 25, with a total of 226 specimens. The fewest specimens were collected during the second collection on June 9, with a total of 106 specimens

Table 7

Structure and abundance of arthropod species collected in 2022

No.	Name of species/Taxon	Total samples
1.	Ceutorhynchus litura	1
2.	Quedius molochinus	4
3.	Tachyporus hypnorum	2
4.	Acupalpus dorsalis	1
5.	Acupalpus suturalis	1
6.	Agriotes ustulatus	1
7.	Aleochara laevigata	2
8.	Altica palustris	1
9.	Amarochara forticornis	2
10.	Anisodactylus binotatus	4
11.	Anthicus anterimus	7
12.	Anthicus floralis	2
13.	Anthribus variegatus	1
14.	Aphodius granarius	1

No.	Name of species/Taxon	Total samples
15.	Aphthona euphorbiae	24
16.	Aphthona fuscicollis	2
17.	Armadilidium vulgare	6
18.	Atheta angustula	1
19.	Atheta brunnea	8
20.	Atheta longicornis	1
21.	Badister sodalis	2
22.	Baris lepidii	1
23.	Bembidion minimum	1
24.	Bembidion assimile	1
25.	Bembidion bipunctatum	1
26.	Bembidion lampros	2
27.	Bembidion saxatile	2
28.	Cantharis fusca	2
29.	Carabus violaceus	1
30.	Cicindela campestris	1
31.	Cicindela sylvicola	1
32.	Clivina fossor	3
33.	Coccinella 11punctata	6
34.	Coccinella septempunctata	9
35.	Corticaria crenulata	1
36.	Corticaria gibbosa	3
37.	Cratarea suturalis	1
38.	Drasterius bimaculatus	1
39.	Drypta dentata	1
40.	Epicometis hirta	2
41.	Formicomus pedestris	1
42.	Halizia 14punctata	1
43.	Haltica pusilla	1
44.	Harpalus calceatus	7
45.	Harpalus distinguendus	11
46.	Harpalus griseus	3
47.	Harpalus pubescens	5
48.	Hister cadaverinus	1
49.	Hister terricola	1
50.	Ityocara rubens	3
51.	Lathrobium brunnipes	3
52.	Leptinotarsa decemlineata	15
53.	Liodes badia	1
54.	Longitarsus anchusae	4
55.	Longitarsus apicalis	1
56.	Longitarsus brunneus	1
57.	Longitarsus luridus	6
58.	Longitarsus suturalis	1
59.	Longitarsus tabidus	1
60.	Metabletus truncatellus	2

No.	Name of species/Taxon	Total samples
61.	Miscodera artica	1
62.	Mycetophagus quadriguttatus	1
63.	Necrophorus vespillo	1
64.	Olibrus pygmaeus	1
65.	Orchestes pratensis	2
66.	Othius melanocephalus	2
67.	Othius punctulatus	1
68.	Oxytelus rugosus	25
69.	Philonthus fulvipes	2
70.	Phloeopora corticallis	1
71.	Phyllotreta atra	10
72.	Phyllotreta nigripes	3
73.	Phyllotreta vittata	23
74.	Phylonthus discoideus	8
75.	Phylonthus fuscus	7
76.	Phylonthus lepidus	5
77.	Phylonthus splendidus	3
78.	Phylotreta undulata	3
79.	Podagrica malvae	1
80.	Poecilus cupreus	13
81.	Polydrasus amoenus	2
82.	Pseudophonus pubescens	4
83.	Pterostichus cupreus	25
84.	Pterostichus cylindricus	8
85.	Pterostichus lepidus	3
86.	Pterostichus marginalis	16
87.	Pterostichus niger	14
88.	Pterostichus vulgaris	7
89.	Pteryngium crenatum	1
90.	Quedium humeralis	1
91.	Rizophagus nitidulus	1
92.	Sclerophaedon carniolicus	1
93.	Scophaeus sulcicollis	2
94.	Sipalia circellaris	15
95.	Tachyporus abdominalis	1
96.	Tachyporus chrysomelinus	3
97.	Tachyporus nitidulus	1
TOTAL COLEOPTERS		**401**
98.	Wasp	40
99.	Parasitic wasp	70
100.	Trips	2
101.	Mites	49
102.	Flies	24
103.	Aphids	116
104.	Bees	3
105.	Cicads	27

No.	Name of species/Taxon	Total samples
106.	Miriapods	12
107.	Spiders	47
108.	Stink bug	7
109.	Ants	128
Total other artropods		**525**
	Total samples of artropods	**926**

During the entire observation period, a total of 96 species of beetles were collected from Barber traps, amounting to 401 specimens, which represent 43,3% of the total. The remaining 525 specimens belong to other species of arthropods, accounting for 56,7% of the total specimens collected.

Among the beetle species, the highest number of specimens were: Oxytelus rugosus and Poecilus cupreus, each with 25 specimens, Aphtona euphorbiae with 24 specimens, and Phyllotreta vittata with 23 specimens.

CONCLUSIONS

The collection of arthropods was conducted using pitfall traps in a potato crop in the Radauti-Suceava area during the year 2022.

The collected arthropods belong to the following classes: Hexapoda, Arachnida, Myriapoda, and Crustacea.

The class Hexapoda was the best represented, both in terms of the number of specimens and the number of species.

The highest number of arthropod specimens (226) was collected during the third collection on June 25 in 2022.

Among the Hexapoda, beetles (Coleoptera) were the most frequently collected and had the highest number of species and specimens.

Throughout the observation period, a total of 926 arthropod specimens were collected, of which 43, 3% belong to the order Coleoptera.

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