

## RESEARCH ON THE STRUCTURE AND ABUNDANCE OF BEETLES (ORD. COLEOPTERA) FROM SOME CORN CROPS IN NORTHERN MOLDOVA-ROMANIA

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### Abstract

The observations were made in a corn crop from Ghigoiesti station, Neamț County, Romania. Within this station, three experimental variants were initiated that targeted the preceding culture. Therefore, the variants studied were: V1 maize in monoculture; V2 corn after sunflower; V3 corn after wheat;

Barber-type soil traps were used to collect biological material, they worked continuously from April to July 2021, where a number of 5 collections were made for each variant. Barber traps consist of plastic containers of approx. 10-12 centimeters high and about 8-10 centimeters in diameter in which I used a salt solution (NaCl) with a concentration of about 20% as fixing liquid. Six traps were used for each experimental variant.

Samples were collected at 12-15 day intervals when we changed the fixative – saline solution, replenished or, if necessary, replaced.

The collected species were cleaned of all plant remains, other impurities, and then the coleoptera species were selected separately, and with the help of determinants they were identified.

The structure, dynamics and abundance of coleopteran species were then determined according to each experimental variant, and the most frequently collected were: *Tanymecus dilaticollis*, *Epicometis hirta*, *Coccinella 7- punctata*, *Harpalus calceatus*, *Harpalus distinguendus* *Formicomus pedestris*, *Phyllotreta vittula*, *Opatrum sabulosum* and *Pentodon idiota*.

**Key words:** Coleopters, ground traps, corn, preceding plants

### INTRODUCTION

The species of this order are largely entomophagous, but there are also myxophagous or phytophagous species. In agricultural crops, many species of coleoptera are important ecological indicators, responding immediately to some interventions such as: pesticides, which cause paralysis or even death of adult insects or larvae shortly after the application of treatments.

Because of this, many species of coleoptera have dwindled, are on the verge of extinction or have even disappeared.

A decisive factor is also the anthropization of nature, excessive pollution, not

forgetting the special situation of the last decades of acid rain, whose general harmful effects are not yet well known, and man's attitude to save life and the planet is more superficial. In this context of great importance are the ecological research carried out on insects, which still have a special role in ensuring the stability of the biosphere, and approximately 90% of them perform useful functions for humans (Meissle 2009).

The knowledge of harmful and useful entomofauna in corn agroecosystems contributes to the support of global attitudes towards the environment for a sustainable exploitation of natural

resources. The management of resistance to insecticides through their rational use is a continuous concern of all participants in the field (researchers, farmers, manufacturers of plant protection products, authorities, etc.) (Sin 2002).

The need for a clear reasoning about the relationships observed in nature forces us to use experimental methods in ecological research, and each group of insects requires a separate approach and specific research methods.

## MATERIALS AND METHODS

Along with the increase in the areas with corn, the challenges that this crop encounters have also increased. In addition to unfavorable climatic conditions and possible technological mistakes, the attack of pests also contributes to the reduction of the biological production potential of corn hybrids.

The not very complicated technology, the multitude of uses, the ease of selling the goods, make the corn culture a very profitable one per surface unit (ha). For this reason, the cultivated areas increase year by year, without respecting the technological recommendations of crop rotation, a fact that has led to an increase in the number of pests that attack corn ecosystems. Researchers state that with the intensification of agriculture, conditions have become very favorable for the development of certain pest species (Trotus 2011).

A good knowledge of populations, species, their number and diversity gives us a lot of information about the stability of that agrosystem.

The purpose of the conducted research was to identify the entomofauna of coleoptera from the station under study, its composition, abundance and diversity, as well as its distribution in conventional work systems and the extraction of technological recommendations for the qualitative and

quantitative improvement of production (Talmaciu 2007).

In addition to direct observations in the culture, the collection methods, being also very important in obtaining information of a quantitative (number of individuals), qualitative (state of the individuals: flight, stationary, copula, feeding, etc.) or ecological (host plant, weather conditions, habitat, etc.).

The entomological material was collected with the help of Barber type soil traps, the traps were installed in the field respecting a distance of 5 m between them and 6 were mounted for each variant (Andrici 2015).

The Barber-type soil trap method was used in 2021 to collect harmful and useful epigeal fauna of coleoptera species from the corn crop, from the Ghigoiești station, Neamț county, on the three experimental variants depending on the preceding crop as follows:

- V1 corn in monoculture;
- V2 corn after sunflower;
- V3 corn after wheat;

## RESULTS AND DISCUSSIONS

During the observation period in 2021, a number of 1198 specimens belonging to a number of 44 species of coleoptera were collected at the 6 ground traps.

The species *Epicometis hirta* has the highest abundance with a number of 172 individuals collected, followed by *Agriotes lineatus*, with 140 individuals collected, *Dermestes laniarius* (102 specimens), *Formicomus pedestris* (105 specimens), *Tanymecus dilaticollis* (83 specimens), but also the presence of the species *Harpalus aeneus* (37 specimens), *Pterostichus cupreus* (73 specimens), *Opatrum sabulosum* (67 specimens), the rest of the collected species had values between 48 and 1 specimen (Table 1).

Out of the total of 1198 specimens collected in this variant, 33.43%, respectively 461 specimens, are represented by antagonists, which belong to 16 species. The following species have the highest value: *Formicomus pedestris*

(22,78), *Dermestes lanarius* (23,13%), *Pterostichus cupreus* (15,84%) and *Harpalus distinguendus* (10,41%), the rest of the species (11%) have had values between 6,51 and 0,65%.

Table 1. Structure and abundance of the coleopters species collected at variant V1

No.	Name of species	Date of collection					TOTAL
		29.Apr	17.May	29.May	13.Jun	01.Jul	
1	<i>Agriotes lineatus</i>	85	30	18	3	4	140
2	<i>Anisodactylus binotatus</i>	0	0	5	2	5	12
3	<i>Anthicus humilis</i>	7	7	2	0	0	16
4	<i>Aphodus fimetarius</i>	0	13	0	0	0	13
5	<i>Bembidion humerale</i>	4	4	0	0	0	8
6	<i>Bembidion quadripustulatus</i>	5	5	0	0	0	10
7	<i>Cantharis fusca</i>	2	4	3	0	0	9
8	<i>Cassida nobilis</i>	19	7	6	0	0	32
9	<i>Cetonia aurata</i>	8	8	0	0	0	16
10	<i>Ceutorrhynchus sulcicollis</i>	2	0	0	0	0	2
11	<i>Coccinela 7- punctata</i>	0	0	0	1	5	6
12	<i>Corymbites latus</i>	0	0	5	5	7	17
13	<i>Dermestes lanarius</i>	66	26	0	5	5	102
14	<i>Diabrotica virgifera virgifera</i>	0	0	0	10	8	18
15	<i>Dorcadion fulvum</i>	1	0	0	1	1	3
16	<i>Dorcadion pedestre</i>	3	0	0	0	0	3
17	<i>Epicometis hirta</i>	130	37	2	3	0	172
18	<i>Formicomus pedestris</i>	100	5	0	0	0	105
19	<i>Genocephalum pusillum</i>	0	5	0	0	0	5
20	<i>Harpalus aeneus</i>	0	0	3	0	3	6
21	<i>Harpalus calceatus</i>	0	0	8	7	15	30
22	<i>Harpalus distinguendus</i>	14	0	7	10	17	48
23	<i>Harpalus tenebrosus</i>	0	0	0	2	2	4
24	<i>Hippodamia variegata</i>	0	0	9	0	9	18
25	<i>Hister merdarius</i>	2	1	0	0	0	3
26	<i>Meloe sp.</i>	1	0	0	0	0	1
27	<i>Opatrum sabulosum</i>	48	10	8	1	0	67
28	<i>Orchestes uercus</i>	16	2	16	1	0	35
29	<i>Otiorrhynchus gemmatus</i>	2	0	0	0	0	2
30	<i>Pedimus feromonalis</i>	0	2	0	0	0	2
31	<i>Pentodon idiota</i>	0	6	9	1	0	16
32	<i>Phyllotreta nemorum</i>	12	11	0	0	0	23
33	<i>Pleurophorus caesus</i>	15	0	0	0	0	15
34	<i>Polyphilla fullo</i>	1	0	0	0	0	1
35	<i>Protaetia cuprea</i>	0	0	1	0	1	2
36	<i>Pseudocleonus cinereus</i>	13	1	0	0	0	14
37	<i>Pseudophonus rufipes</i>	0	0	6	0	6	12
38	<i>Psylliodes attenuata</i>	2	32	0	0	0	34
39	<i>Pterostichus cupreus</i>	24	19	8	9	13	73
40	<i>Pterostichus melas</i>	4	2	0	0	0	6
41	<i>Pterostichus niger</i>	0	0	0	3	3	6
42	<i>Rhynchites aeneovinems</i>	1	5	0	0	0	6
43	<i>Tanymecus dilaticollis</i>	15	45	7	16	0	83
44	<i>Valgus hemipterus</i>	2	0	0	0	0	2
	<b>Total</b>	<b>604</b>	<b>287</b>	<b>123</b>	<b>80</b>	<b>104</b>	<b>1198</b>

At the 6 traps, at the 5 harvests, 803 specimens were collected belonging to a

number of 42 species, and the largest number of specimens were collected:

Agriotes lineatus with 179 specimens collected. Then: *Tanymecus dilaticollis* (96 specimens), *Epicometis hirta* (68 specimens), *Pterostichus cupreus* (55 specimens), *Opatrum sabulosum* (52 specimens), the other species recorded between one and 48 specimens (tab. 2).

If we refer to antagonists (useful fauna) from the total of 803 specimens collected, 25,85% is represented by this.

Thus, 265 specimens belonging to 21 species were collected. Three species (taxa) had the largest share, *Pterostichus cupreus* (20,75%), *Harpalus distinguendus* (18,11%). The rest of the species (18) had values between 0.38 and 7,55%

Table 2. Structure, dynamics and abundance of the coleopters species collected on V2 variant

No.	Name of species	Date of collection					Total
		29.Apr	17.May	29.May	13.Jun	01.Jul	
1	<i>Agriotes lineatus</i>	52	24	46	57	0	179
2	<i>Anisodactylus binotatus</i>	1	0	0	0	0	1
3	<i>Anisodactylus signatus</i>	1	0	0	0	0	1
4	<i>Anthicus antherimus</i>	14	10	0	0	0	24
5	<i>Anthicus floralis</i>	4	0	0	0	0	4
6	<i>Anthicus humilis</i>	0	6	8	2	0	16
7	<i>Aphthona euphorbiae</i>	0	1	0	0	0	1
8	<i>Bembidion humerale</i>	0	1	0	0	0	1
9	<i>Bembidion humerale</i>	0	0	1	2	0	3
10	<i>Bembidion meridianus</i>	1	0	0	0	0	1
11	<i>Bothynoderes punctiventris</i>	2	0	0	0	0	2
12	<i>Cantharis fusca</i>	0	0	5	2	0	7
13	<i>Cassida nobilis</i>	9	4	7	11	0	31
14	<i>Carabus scabriusculus</i>	2	0	0	0	0	2
15	<i>Cetonia aurata</i>	1	0	8	2	0	11
16	<i>Coccinella 7 punctata</i>	0	0	0	0	1	1
17	<i>Cryptophagus dentatus</i>	6	1	1	1	0	9
18	<i>Dermestes lanarius</i>	11	0	1	1	3	16
19	<i>Diabrotica virgifera virgifera</i>	0	0	3	7	0	10
20	<i>Dorcadion fulvum</i>	8	1	0	0	0	9
21	<i>Dorcadion pedestre</i>	20	4	0	0	0	24
22	<i>Epicometis hirta</i>	41	14	8	5	0	68
23	<i>Formicomus pedestris</i>	2	2	2	1	0	7
24	<i>Harpalus aeneus</i>	1	0	0	0	0	1
25	<i>Harpalus distinguendus</i>	20	19	3	6	0	48
26	<i>Hister merdarius</i>	0	0	1	3	0	4
27	<i>Longitarsus anchusae</i>	5	2	0	0	0	7
28	<i>Opatrum sabulosum</i>	20	0	10	22	0	52
29	<i>Pedimus feromonalis</i>	0	0	2	2	0	4
30	<i>Pentodom idiota</i>	3	6	5	6	0	20
31	<i>Phyllotreta nemorum</i>	0	6	1	1	0	8
32	<i>Phyllotreta vittula</i>	10	0	0	0	0	10
33	<i>Pseudocleanus cinereus</i>	13	0	1	3	0	17
34	<i>Psylliodes attenuate</i>	0	0	2	2	0	4
35	<i>Pseudophonus rufipes</i>	1	0	3	0	16	20
36	<i>Pterostichus melas</i>	0	0	2	3	0	5
37	<i>Pterostichus lepidus</i>	0	3	0	0	0	3
38	<i>Pterostichus cupreus</i>	9	10	3	2	31	55
39	<i>Rhizophagus parvulus</i>	2	0	0	0	0	2
40	<i>Silpha obscura</i>	15	0	0	0	0	15
41	<i>Tanymecus dilaticollis</i>	7	16	55	18	0	96
42	<i>Tanymecus palliatus</i>	4	0	0	0	0	4
	<b>Total</b>	<b>285</b>	<b>130</b>	<b>178</b>	<b>159</b>	<b>51</b>	<b>803</b>

At the 6 traps, with the 5 harvests, 835 specimens were collected belonging to a number of 51 species of coleoptera, and the largest number of specimens collected being: *Agriotes lineatus* (153 specimens), *Tanymericus dilaticollis* (82 specimens), *Epicometis hirta* (76 specimens), *Dermestes lanarius* (70 specimens), the other species recorded between one and 46 specimens. Among the species collected, a number of 43 recorded between one and nine specimens. (tab. 3)

Referring to the number of traps in which each species of antagonists was collected, in the year 2021 in the V3 variant, it is found that the highest percentage in terms of the number of specimens of the species compared to the total number of specimens had species: *Agriotes lineatus* (16,96%), *Tanymericus dilaticollis* (9,09%), *Epicometis hirta* (8,43%), *Dermestes lanarius* (7,76%), *Harpalus distinguendus* (5,1%). The other species had a percentage between 0,11% and 4,99%.

Table 3. Structure, dynamics and abundance of the coleoptera species collected, in V3 variant

No.	Name of species	Date of collection					Total
		29.Apr	17.May	29.May	13.Jun	01.Jul	
1	<i>Chromoderus fasciatus</i>	0	1	0	0	0	1
2	<i>Abax ovalis</i>	0	0	0	2	0	2
3	<i>Agriotes lineatus</i>	69	55	13	12	4	153
4	<i>Amara eurytona</i>	4	0	0	0	0	4
5	<i>Anisoplia spp.</i>	5	0	0	3	0	8
6	<i>Anthicus antherinus</i>	39	2	2	2	0	45
7	<i>Amara aenea</i>	0	0	0	0	2	2
8	<i>Anthicus humilis</i>	0	0	0	2	0	2
9	<i>Baris spp.</i>	1	0	1	0	0	2
10	<i>Bembidion lampros</i>	2	0	0	0	0	2
11	<i>Bothynoderes punctiventris</i>	3	0	0	0	0	3
12	<i>Bothynoderes punctiventris</i>	2	0	0	0	0	2
13	<i>Cantharis fusca</i>	5	0	3	0	0	8
14	<i>Carabus coriaceus</i>	0	0	0	3	1	4
15	<i>Cetonia aurata</i>	3	0	1	3	0	7
16	<i>Chromoderus fasciatus</i>	1	1	0	0	0	2
17	<i>Coccinella 7-punctata</i>	0	9	0	0	8	17
18	<i>Colodera nigrita</i>	0	0	2	0	0	2
19	<i>Carabus scabriusculus</i>	8	0	0	0	0	8
20	<i>Cassida nobilis</i>	4	0	0	0	0	4
21	<i>Dermestes lanarius</i>	44	17	2	0	7	70
22	<i>Diabrotica virgifera virgifera</i>	0	0	1	5	1	7
23	<i>Dolichus halensis</i>	0	0	0	0	2	2
24	<i>Dorcadion fulvum</i>	6	0	0	0	0	6
25	<i>Dorcadion pedestre</i>	23	6	0	0	0	29
26	<i>Emphilus glaber</i>	0	0	2	0	0	2
27	<i>Epicometis hirta</i>	54	17	5	0	0	76
28	<i>Formicomus pedestris</i>	20	0	0	0	0	20
29	<i>Harpalus tardus</i>	0	0	2	0	0	2
30	<i>Harpalus distinguendus</i>	16	17	3	3	7	46
31	<i>Harpalus aeneus</i>	5	0	0	0	0	5
32	<i>Lema melanopa</i>	0	0	0	1	0	1
33	<i>Longitarsus anchlussae</i>	6	0	2	0	0	8
34	<i>Metabletus truncatellus</i>	3	2	0	0	0	5
35	<i>Opatrum sabulosum</i>	25	4	0	12	0	41
36	<i>Oyporus rufus</i>	0	0	1	0	0	1
37	<i>Pedinus femoralis</i>	0	0	0	4	0	4
38	<i>Pentodon idiota</i>	9	2	1	0	0	12
39	<i>Phyllotreta undulata</i>	5	5	0	0	0	10

40	<i>Phyllotreta vittula</i>	21	0	0	6	0	27
41	<i>Phyllotreta atra</i>	1	3	0	0	0	4
42	<i>Pseudocleonus cinereus</i>	14	0	0	0	0	14
Continued Table 3							
43	<i>Pseudophonus griseus</i>	0	0	0	0	5	5
44	<i>Pseudophonus rufipes</i>	2	0	0	0	12	14
45	<i>Pterostichus cupreus</i>	2	7	0	0	9	18
46	<i>Sepedophilus bipunctatus</i>	2	0	0	0	0	2
47	<i>Silpha obscura</i>	20	0	0	0	0	20
48	<i>Tanymecus dilaticollis</i>	32	19	6	25	0	82
49	<i>Tanymecus palliatus</i>	7	0	6	1	0	14
50	<i>Zabrus blapoides</i>	0	0	1	3	2	6
51	<i>Zabrus tenebrioides</i>	1	3	0	0	0	4
	<b>TOTAL</b>	<b>464</b>	<b>170</b>	<b>54</b>	<b>87</b>	<b>60</b>	<b>835</b>

## CONCLUSIONS

Following the five harvests in all three variants that were carried out between April and July 2021, a total of 2836 specimens of coleoptera were collected.

The situation of collections by variants is as follows:

► at V1 (maize in monoculture) a number of 11 species were collected with a total of 1198 specimens.

► at V2 (maize after sunflower) a number of 42 species were collected with a total of 803 specimens.

► at V3 (maize after wheat) a number of 51 species with a total of 835 specimens were collected.

From the point of view of the abundance of the number of species collected, in all three variants it can be observed that the species: *Agriotes lineatus*, *Epicometis hirta*, *Formicomus pedestris*, *Tanymecus dilaticollis* and *Dermestes lanarius* registered the highest number of specimens collected during the entire observation period.

The most frequent and common species of coleoptera were *Tanymecus dilaticollis*, *Epicometis hirta*, *Coccinella 7-punctata*, *Harpalus calceatus*, *Harpalus distinguendus*, *Formicomus pedestris*, *Phyllotreta vittula*, *Opatrum sabulosum* and *Pentodon idiota*.

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