

RESEARCH REGARDING PEST INSECT FAUNA AND POLYPHAGOUS PREDATORS IN GRAINS CEREAL CROPS IN THE WESTERN PART OF THE COUNTRY

Bucurean Elena*, Marnea Ioana Adriana*

* University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048,
Oradea, Romania, e-mail: elena_bucurean@yahoo.com

Abstract

The following paper presents the results of research regarding both pest fauna and useful fauna in cereal crops. Several plants were used in the study, such as wheat, oats, barley, two-rowed barley, triticale and perennial gramineae plants. The aim was to establish the structure of species present in cereal agro-ecosystems, their number and the frequency of their attack. The tremendous economical importance of predators and parasites in reducing pest populations was taken into account, thus the study monitored their occurrence in crops, and their degree of parasitizing and destroying insect eggs and larvae.

Key words: fauna, insect, entomophagous, cereal.

INTRODUCTION

Throughout history, cereals have been the most important plant group for humans, and they will undoubtedly continue to be essential, given the fact that their production is necessary for feeding people as well as animals; moreover, they constitute raw material for the food industry.

There is no other food product that could satisfy man's nutritional and active needs in a more economical way than wheat bread. About 55% of proteins, 15% of lipids and 70% of carbohydrates, in total 50-55% of calories consumed worldwide come from cereals. Among them, wheat, rice and maize are the most important, but rye and triticale are lately expanding on less productive soils (Ceapoiu, 1987).

These crops can be attacked by over 30 pest species in our country (Bărbulescu Al., 1994). In some situations which greatly depend on conditions related to climate and feeding, populations of specific pests can lead to ecological imbalances and even to the partial or total destruction of crops (Bărbulescu, 1987).

Cereals have a long vegetation period (September-July), they cover the soil entirely and their height can reach 1 meter in full maturity, therefore a certain microclimate is created within crops, which is characterized by a higher relative air humidity, reduced light due to heavy foliage and low aeration because of the high density of plants. The above conditions favor the increase of a specific pest fauna, but also of useful insects, completed by

vertebrate species, mainly birds and mammals that can be useful, but also harmful (Hatman, Bobes, Sapunaru, 1986).

The rational and efficient protection of cereal crops against these pests can be achieved by precisely identifying the harmful species, determining their numerical density and the tendencies in their evolution year after year, so that the best method of fighting can be established. For this reason, the paper presents results obtained in recent years regarding the structure of phytophagous and insectivorous fauna in cereal crops.

MATERIAL AND METHOD

The research was conducted between 2011 and 2012 in Hidişelu de Sus, Bihor County. The study included the cereal crops of several land owners. The seed used for these crops had been treated with various insect fungicide products by seed selling firms.

The insect samples were collected with an insect net, performing 10 surveys/300 simple sweeps diagonally through the lots, every 10 days, for the entire vegetation period.

For the *Agriotes spp.* and *Zabrus* pests, soil surveys were performed in autumn and early spring, the size of the holes being of 25/25 cm. For the wheat thrips pest, 100 wheat ears were collected from each crop and the number of adult thrips and larvae was noted.

Both the methods of collecting insects from plants, soil and wheat ears as well as the phenological phases when the surveys were performed are not completely correspondent to the studied group of insects because many times, the maximum density of pests or useful fauna is not reached.

The insects were preserved in 70° alcohol, they were selected, classified and the obtained results are presented in the tables of this paper.

RESULTS AND DISCUSSION

The pest species of this group of plants belong to different classes, orders and families. They attack the plants during various vegetation phases, and the pest species can be polyphagous, oligophagous or monophagous.

In the structure of the species that were collected and presented in the paper, there were pests with different densities; therefore, the pests that showed a very low density are not mentioned in the tables. For example, the insects collected contained some turnip moth larvae (*Agrotis segetum*), cockchafers and beetles (*Melolontha*, *Anisoplia*), saddle gall midge (*Haplodiplosis marginata*), but the populations of these pests do not cause significant damages to cereal crops in this area.

Moreover, *Anisoplia* adults were present, but their frequency differs from one year to another, whereas the *Cnephasia pasquana* pest, although

abundant in the region, does not cause damages that might result in production losses.

As to pest insect fauna, over the two years of study, a slight increase in the number of pests was noticed. This may be due to the fact that in the area where the study was conducted, treatments are not performed during the vegetation period of cereals, mostly for financial reasons.

Pests that attack during the germination and emergence period, such as *Agriotes spp.* and *Zabrus* are not significant, as they represent only 0.3-0.8% of the collected fauna. The percentage of cabbage flea beetles (*Phyllotreta spp.*) is 14.5%-16.7%, while corn bugs continue to have a low density in the region: 0.6-2.8%.

Oulema melanopus accounted for 10.6% of the collected fauna during the two years of study, although this pest is extremely frequent in the western part of the country. However, this is a hill area, therefore the soil is poorer in nutritional elements; moreover this species is known to prefer well developed and fertilized plants, whereas chemical fertilizers are rarely used here.

The wheat thrips (*Haplothrips tritici*) is quite frequent – 17.2%, but the damage it causes is insignificant. Phytophagous Diptera are perhaps the most common in crops, accounting for 27.8% of the collected fauna. A mention here is that their presence is considered as a total, due to the lack of proper means for identifying specific species. It was noticed that the species of Diptera that attack in autumn after emergence-twinning and in early spring produce the most damage, by destroying either the plant entirely or the twins (Table 1).

Table 1

Structure of pest insect fauna in cereal crops in 2011-2012

Collected species	2011		2012		Average	
	Nr	%	Nr	%	Nr	%
<i>Agriotes lineatus</i>	17	0.7	23	0.8	20	0.8
<i>Zabrus tenebrioides</i>	6	0.2	11	0.4	9	0.3
<i>Phyllotreta atra</i>	520	20.3	375	13.0	448	16.7
<i>Phyllotreta vitulla</i>	317	12.4	475	16.6	396	14.5
<i>Eurygaster maura</i>	67	2.6	83	2.9	75	2.8
<i>Eurygaster austriaca</i>	35	1.4	47	1.6	41	1.5
<i>Aelia acuminata</i>	12	0.5	18	0.6	15	0.6
<i>Oulema melanopus</i>	256	10.0	324	11.2	290	10.6
<i>Haplothrips tritici</i>	426	16.6	510	17.7	468	17.2
<i>Scizaphis graminum</i>	182	7.11	202	7.0	192	7.1
<i>Cephus pygmaeus</i>	8	0.3	14	0.5	11	0.4
<i>Phytophagous diptera</i>	711	27.7	803	27.8	757	27.8
<i>Hadena basilinea</i>	7	0.3	5	0.2	6	0.3
Total of insects	2563	-	2886	-	2728	-

Table 2 presents the frequency of phytophagous insects' attack in cereal crops; the studied plants were wheat, oats, barley, two-rowed barley, triticale and perennial gramineae. The results show that oats continues to be preferred by *Oulema*, the attack reaching 80.7%, wireworms are present in the area with a percentage of 1-2.8%, while corn bug attack was apparent in 3.6% of analyzed plants. These plants were used for the study because animals are bred in the area and perennial gramineae, oats and triticale are frequently cultivated.

Table 2

Frequency of attack of phytophagous insects in cereal crops						
Crop	F% <i>Agriotes</i>	F% <i>Zabrus</i>	F% <i>Eurygaster</i>	F% <i>Oulema</i>	F% <i>Oscinella</i>	Average
Wheat	2.8	1.4	7.8	60.3	10.5	16.6
Oats	1.0	0.8	3.1	80.7	10.3	19.2
Barley	1.3	0.4	2.4	30.4	9.4	8.8
Two-rowed barley	2.0	0.6	2.5	25.7	8.5	7.9
Triticale	1.5	0.3	1.7	17.2	6.9	5.5
Perennial gramineae	2.0	1.1	3.9	40.6	5.5	10.6
Average	1.8	0.8	3.6	42.5	8.5	11.4

Regarding the presence of useful fauna in the area, egg predators *Coccinella septempunctata* and *Nabis ferus* were noticed, as well as the egg parasite *Anaphes flavipes*. In order to establish their influence on pest fauna, ten leaves strongly infested with *Oulema melanopus* were isolated in the crops and the percentage of destruction and parasitizing were calculated, which revealed figures of, on average, 41.8% for *Coccinella*, 40.10% for *Anaphes* and 4.8% for *Nabis*.

Table 3

Influence of polyphagous parasites and predators on <i>Oulema melanopus</i> egg-laying			
Analyzed leaves	% of destruction <i>Coccinella 7punctata</i>	% of parasitizing <i>Anaphes flavipes</i>	% of destruction <i>Nabis ferus</i>
1	50.0	33.1	11.1
2	54.5	32.2	8.3
3	100.0	50.0	3.5
4	25.5	57.1	1.6
5	28.6	50.0	0.3
6	33.0	40.0	10.7
7	21.0	26.0	1.9
8	33.0	50.0	1.3
9	25.0	12.5	2.4
10	47.1	50.0	6.9
Average	41.8	40.1	4.8

It is worth mentioning that, out of all predator species of Coleoptera, Coccinellidae are of particular importance for cereal crops in this part of the country, as they are present on all cereals since spring until the period of ear formation, after which they move to corn crops, where they feed on aphids.

Parasitic and predator Hymenoptera insects were less present, although in 1988, Szabolcs stated that there were three different Hymenoptera families in Hungary, which parasitized *Oulema melanopus* larvae, reducing the density of this pest by 73-78%.

It is advisable to support the spreading of such parasites and predators in crops, because this would lead to a decrease in the necessity of applying chemical treatments, this reduction having direct consequences in protecting the environment.

CONCLUSIONS

1. The structure of pest fauna is dominated by phytophagous Diptera insects (27.8%), wheat thrips (17.2%), cabbage flea beetles (16.7%) and the cereal leaf beetle (10.6%).

2. Some insects are less numerous in the area: the cereal ground beetle (0.3%), the wheat-stem sawfly (0.4%), the wheat cutworm (0.3%), the Bishop's mitre shieldbug (0.6%).

3. Regarding the frequency of phytophagous insects' attack, the study revealed that it reaches 19.2% in oats, due to the abundance of *Oulema melanopus*, 16.6% in wheat and 10.6% in perennial gramineae crops; pest fauna is less numerous in triticale crops – 5.5%.

4. Useful insect fauna is mainly represented by *Coccinella septempunctata*, with 41.8% and the parasite *Anaphes* – 40.1%.

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