

## STRUCTURE, DYNAMICS AND ABUNDANCE OF CARABID SPECIES COLLECTED IN CORN FIELDS

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### Abstract

Corn agricultural agroecosystems is considered unstable ecosystems, with specific interdependencies between different food chains that natural factors play a role. A large number of insects are living in the maize agroecosystem, being a species community and each species has a particular place in the food chains. If a lot of studies were done, in Romania about biology, ecology and control of corn insect pest, there are little knowledge about epigeal fauna captured fauna in pitfall traps (Barber). Experiences from 2011-2012 had the main objective to observe the potential impact of GMO-maize on the epigeal fauna. (39.7%), *Pterostichus vulgaris* L. 1758 = [*P. (Morphnosoma) melanarius* Illiger 1798] (32.5%), *Carabus coriaceus* L. 1758 (18.3%), *Pterostichus melas* Creutzer 1799 (5.3%), *Pseudophonus (Harpalus) rufipes* De Geer 1774 (2.2%) and *Pterostichus cupreus* L. 1758 (2.0%). Cultivation of genetically modified corn, has no influence on epigeal fauna, field cultivated with this type of plants has no observed differences regarding fauna biodiversity. Data obtained regarding resemblance of whole insect fauna from those cultural variant, taken into consideration, represented by value of Sorensen index, confirm idea that corn hybrids containing transformation event has no evident influence on epigeal carabid insect fauna from corn field.

**Key words:** Transgenic corn hybrids, epigeal fauna, Carabidae.

### INTRODUCTION

In recent years concerns have been supported to identify animal species existing in different cultures (Baicu, 1980; Barbulescu et al., 1993; Muresan et al., 1973; Voicu et al., 1993). Corn agricultural agroecosystems is considered unstable ecosystems, with specific interdependencies between different food chains. If a lot of studies were done, in Romania about biology, ecology and control of corn insect pest (Barbulescu et al., 2000; Costea et al., 2011 a, b), Few data are known about, generally on useful fauna, especially on predatory fauna existing in corn fields in Romania (Perju et al., 1988; Rosca, 2004; Rosca and Istrate, 2004). After the Ionescu (1962) family Carabidae beetles includes only land insects with rapid movement, which live generally at the soil surface, rarely climb on trees (*Calosoma*). In the world are over 40,000 species known, of which 2,700 are reported in Europe ([www.en.wikipedia.org/wiki/Ground\\_beetle](http://www.en.wikipedia.org/wiki/Ground_beetle)). In Europe 328 genera are known and in Romania 125 ([www.faunaeur.org/](http://www.faunaeur.org/)). Their systematic is complicated, but in general allowed the existing

website Iowa State University (<http://bugguide.net>), which includes 14 subfamilies and 47 tribes. Almost all Carabidae are predatory to invertebrates, some are specialized for a particular type of food, some are phytophagous other omnivore. Carabidae density in ecocenosis, varies from 1 to 1000/m<sup>2</sup> depending on ecosystem and wintering place. Most are nocturnal carabid species (60%) than diurnal (20%), nocturnal populations, are in general more numerous having a darknes coloration of the body, in the meantime those diurnal have iridescent colors. *Pterostichus cupreus*, species that runs on the ground in search of food, has two characteristic ways of looking for food (aphids fallen from the plant), and when he finds them change their behavior climbing on plant for food (Matalin, 2008). Structure and size of populations of different species of Carabidae analyzed ecosystem depends of course but also analyzed period (years and/or period) (Carlan and Varvara, 1999; Donescu and Varvara, 1999; Talmaciu, 1996; Varvara and Brudea, 1983; Varvara et al., 1989, 1991 Bažok et al., 2007).

## MATERIALS AND METHODS

Researches were made during two years (2011 and 2012), each year starting from May to October. The entomologic material for the study was collected in centre for variety testing and registration Troian, where were 14 corn cultivars [7 conventional corn hybrids and 7 hybrids containing transformation events (glyphosate-tolerant, corn rootworm protected, resistant to Lepidopteran and with two of transformation events)]. Variants were in 4 replications, each corn plot had 4 rows and plot's area was 20.3 m<sup>2</sup>. Sowing time was 16 May in 2011 and 22 May in 2012. Specimens of epigeal fauna were collected with 16 Barber soil traps (Figure 1), 4/replication (2 in area of conventional corn hybrids and 2 in area of corn hybrids containing transformation events). There were used yogurt plastic jars protected by lid, with a 1000 ml volume, 12.5 cm width and 13.0 cm height. Diluted acetic acid 50% was used as fixing and preserving liquid, a few drops of detergent were put in the traps to reduce surface tension. The traps were opened for 48 hours and specimens captured there were collected and labeled. The samples labeled were protected from sunlight and transported to the laboratory for analysis and determination. Soil Barber traps were installed at the emergence of corn seedlings (middle of May), harvested and replaced, the material was collected biweekly (in 2011 on 31 May; 14, 28 June; 12, 26 July; 9, 23 August; 6 September, in 2012 on 29 May; 12, 26 June; 10, 24, July; 7, 21 August; 4 September).



Figure 1. Soil traps Barber type

Samples of biological material collected were taken to the laboratory where they were subject

to inventory and were cleaned and then collected insects were determined. Determination of the material was performed using entomological key books, with a stereomicroscope, a binocular magnifier and using inventory provided by the discipline of Entomology of the USAMV-Bucharest.

## RESULTS AND DISCUSSIONS

There are collected in total 626 Carabid specimens, 11 species were determinate, from those we consider that only those over 10 specimens are representative, thus only 6 Carabid specimens collected belong to this category (457 specimens), most common being *Harpalus distinguendus* (<http://eol.org/> and [www.faunaeur.org/](http://www.faunaeur.org/)). Taking into consideration the number of Carabid specimens captured in conventional corn field versus those from fields cultivated with corn hybrids containing transformation events it was the remark that there is no significant differences (295 respective 331 specimens). A comparison was made in terms of animal community structure obtained by similarity index 'Sörensens' by comparing two different fauna by the formula:  $Is = 2c/a + b \times 100$ . Where:  $Is$  = Sörensens index  $c$  = number of species common to the two faunas compared,  $a$  = number of fauna species existing only in first evaluated by comparison,  $b$  = number of species existing only in the second fauna evaluated by comparison. 100% means that there are no differences between fauna and 1% means that the two are completely different fauna. Sörensens index value (96.55%), obtained on whole insect fauna of Carabidae from these two variables investigated (fauna observed in maize fields with conventional and with genetic transformation elements) confirming the idea that fauna is not significantly different in plots with conventional corn from the GM.

## CONCLUSIONS

Our data confirm generally supposition that predator Carabid fauna from corn fields has no so many species than other ecosystems.

There are no differences on the structure and quantity of wildlife common Carabidae between different types of corn hybrids [conventional and those containing

transformation events (glyphosate-tolerant, corn rootworm protected, resistant to Lepidopteran and with two of transformation events)].

Table 1. Structure of Carabid species captured in Barber soil traps

Nr. crt.	Corn hybrids Species and classification	Conventional corn hybrids	Corn hybrids containing transformation events*
	Order Coleoptera		
	Superfamily CARABOIDEA		
	Subfamily CARABINAE		
	Tribe CARABINI		
1	<i>Calosoma</i> (Weber 1801) spp.	8	12
2	<i>Carabus glabratus</i> Paykull, 1790	1	
3	<i>Carabus coriaceus</i> L. 1758	36	47
	Tribe CICINDELINI		
4	<i>Cicindela campestris</i> L. 1758	3	1
	Subfamily HARPALINAE		
	Tribe HARPALINI		
5	<i>Harpalus distinguendus</i> Duftschmidt 1812	85	96
6	<i>Pseudoophonus griseus</i> Panzer 1797	1	2
7	<i>Pseudoophonus</i> ( <i>Harpalus</i> ) <i>rufipes</i> De Geer 1774	4	7
	Subfamily PLATYNINAE		
	Tribe SPHODRINI		
8	<i>Dolichus halensis</i> Schaller 1783	1	4
	Subfamily PTEROSTICHINAE		
	Tribe PTEROSTICHINI		
9	<i>Abax</i> (Bonelli 1810) spp.	16	14
10	<i>Pterostichus vulgaris</i> L. 1758 = <i>P.</i> ( <i>Morphnosoma</i> ) <i>melanarius</i> Illiger 1798	77	71
11	<i>Pterostichus</i> ( <i>Poecilus</i> ) <i>cupreus</i> L. 1758	5	5
12	<i>Pterostichus melas</i> Creutzer 1799	9	15
	Tribe ZABRINI		
13	<i>Amara</i> (Bonelli 1810) spp.	20	24
	Subfamily SCARITINAE		
	Tribe CLIVININI		
14	<i>Clivina fossor</i> L. 1761	1	4
	Subfamily TRECHINAE		
	Tribe BEMBIDIINI		
15	<i>Bembidion</i> Latreille 1802	5	3
	<b>Total specimens</b>	<b>295</b>	<b>331</b>

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