

## STUDY REGARDING USEFUL FAUNA ON CORN PLANTS

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### *Abstract*

*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 few knowledge about useful fauna or "non target organisms" [non target organism = an organism which is affected by an interaction (for example, a pesticide application) for which it was not the intended recipient]. Beneficial organisms include various insects and mites that feed on or parasitize corn pest species. During 2010-2011 there were counted arthropod fauna from corn plants, taking into consideration "transgenic" corn hybrids and conventional Romanian hybrids. Foliar non-target arthropod abundance was assessed using visual counting. Variants were in 4 replications, each corn plot had 4 rows and plot's area was 20.3 m<sup>2</sup>. Arthropods collected during animal visual counting on corn plants, for identification, were preserved in 700 alcohols and determined in the laboratory. Taking into consideration that not all specimens have been determined at species level, part of them were determined till the level of the genus, family, order or class. Possible impact of pesticide and GMOs crops on the trophic chains in agrocoenoses is of concern to farmers, to policy makers and to organizations and societies interested in environment conservation. The evaluation of hazards connected with the creation and release of GMOs should consider, among other things, their environmental impact. In terms of main species of arthropods captured, that are living on corn plants, the most abundant groups of insects belong to species of order Heteroptera, Coleoptera-Coccinellidae, Neuroptera and to spiders from arachnids. Between cultivars taken into consideration there are no significant differences from point of view of species structure or number of specimens on corn plants.*

**Key words:** *transgenic corn hybrids, foliar non-target arthropod.*

## INTRODUCTION

As a basic concept, biological diversity or biodiversity refers to the variety of life forms: the different plants, animals and micro organisms, the genes they contain, and the ecosystems they form [6]. The concept emphasizes the interrelated nature of the living world and its processes and is usually considered at main level, species diversity, Species diversity has two parts. Richness refers to the number of species found in a community and evenness refers to the relative abundance of each species [3]. The simplest measure of diversity is to count number of species in an area (species richness), but the major problem in species richness measurement is that species richness does not take into account species abundance and is highly influenced by sample size [6]. Ecosystem relationships resemble a web of connections from one living thing to many other living and non-living things. Due to

the complex nature of ecosystem relationships, the removal or disturbance of one part of the ecosystem could affect the functioning of many other components of the ecosystem. Our knowledge of these relationships is incomplete, and the results of disturbance are thus to some extent unpredictable [7]. In this respect we approach our research, referring to corn agroecosystem in connection with corn cultivars. There are not enough data about the presence of different insect species in corn fields in most European countries. The distribution and abundance of different species depends on various factors (microclimate, fertilizing, organic matter content, previous crop, previous insecticide use, presence of weeds, etc.). If a lot of studies were done, in Romania about biology, ecology and control of corn insect pest, there are few knowledge about useful fauna or "nontarget organisms" [1, 2, 4]. Corn agricultural agroecosystems is considered unstable ecosystems, with specific interdependencies between different food

chains that natural factors play a role. Imbalance of the number of different populations, the man some considered harmful, others useful, usually called "natural enemies of pests", requires a change in pest control strategy, which aims to maximize the natural factors of control and routing measures intervention by clean methods, men\support biodiversity [5].

## MATERIAL AND METHOD

Foliar non-target arthropod abundance was assessed using visual counting. Variants were in 4 replications, each corn plot had 4 rows and plot's area was 20.3 m<sup>2</sup>. The observations were done on Tuesday in 2009-2010, as visual count (4 x 10 maize plants per each cultivars) was used to register all specimen fauna (once, in May and September or twice in June, July and August on Tuesday in 2009 and on Wednesday in 2010), especially natural enemies on plants. Arthropods collected during animal visual counting on corn plants, for identification, were preserved in 700 alcohols and determined in the laboratory. Taking into consideration that not all specimens have been determined at species level, part of them were determined till the level of the genus, family, order or class. The preliminary studies were done in 2009-2010 searching corn plants for all fauna existing on 27 corn cultivars (6 conventional corn hybrids and 21 hybrids containing transformation events (glyphosate-tolerant, corn rootworm protected, resistant to Lepidopteran and with two of transformation events).

## RESULTS AND DISCUSSIONS

Useful arthropods observed by predilection, either in 2009 or 2010 were spiders, *Coccinellids* (larvae and adults), *Heteroptera* (*Nabis* spp., *Anthocoris* spp., *Orius* spp.) and *Chrysopidae* (larvae and adults) (Table 1 and 2).

The most abundant fauna, observed in our research belong to group of homopterous (27.3/2009, 27.5/2010), spiders are relatively frequent (7.1/2009, 5.6/2010), other groups are relatively common (17.3/2009, 15.3/2010). From our point of interest, useful fauna

belonging to groups *Coleoptera* (*Coccinellidae*), *Neuropteran*, *Diptera* (*Syrphids*) and *Heteroptera* is well represented in corn agrocoenoses, (12.8/2009, 14.9/2010; 5.1/2009, 5.7/2010; 8.8/2009, 10.0/2010 respectively 6.0/2009, 7.5/2010). There are, of course the representatives of spiders searching for food on corn plants, together with those which made their net on corn plants or between plants are most common together with few strong or large species as *Tibicina haematodes* Scop. (*Homopterous*), *Tettigonia viridissima* L., *Tettigonia caudata* Charp. (*Orthoptera*).

Table 1. Fauna of arthropods identified in corn agrocoenoses in 2009

Groups of fauna registered	No. exemplars	Percentage
<i>Arachnids</i>	259	7.1
<i>Orthoptera</i> (grasshoppers and locusts)	130	3.6
<i>Coleoptera</i> ( <i>Coccinellidae</i> )	466	12.8
<i>Homopterous</i> ( <i>Cicadelids</i> )	993	27.3
<i>Heteroptera</i>	219	6.0
<i>Hymenoptera</i> ( <i>Formicidae</i> )	437	12.0
<i>Neuropteran</i>	187	5.1
<i>Diptera</i> ( <i>Syrphids</i> )	321	8.8
Other groups	630	17.3
<b>TOTAL</b>	<b>3642</b>	<b>100.0</b>

Table 2. Fauna of arthropods identified in corn agrocoenoses in 2010

Groups of fauna registered	No. exemplars	Percentage
<i>Arachnids</i>	232	5.6
<i>Orthoptera</i> (grasshoppers and locusts)	109	2.6
<i>Coleoptera</i>	619	14.9
<i>Homopterous</i> ( <i>Cicadelids</i> )	1141	27.5
<i>Heteroptera</i>	310	7.5
<i>Hymenoptera</i> ( <i>Formicidae</i> )	447	10.8
<i>Neuropteran</i>	237	5.7
<i>Diptera</i> ( <i>Syrphids</i> )	414	10.0
Other groups	633	15.3
<b>TOTAL</b>	<b>4142</b>	<b>100.0</b>

Taking into account the whole arthropod fauna there is a large variation either between on different fauna components or during the period of observation time, but what is more important there are no significant differences between total observed arthropod fauna on plant either on conventional corn hybrids or corn hybrids containing transformation events in 2009 (8.113 exemplars/plant respectively 8.071) and 2010 (9.171 exemplars/plant respectively 9.243) (Table 3 and 4).

Corn fields contain a lot of specimens, especially insects, which could give to us the image of complexity of corn ecosystem and this kind of studies, are very useful for better understanding of corn ecosystem and the role of

each species in the ecosystem, is the first step in finding key species for a specific agroecosystem.

Taking into consideration only three most important groups of insects found on corn plants during of observed period (Coccinellids-60.14%, Heteroptera-24.56% and Neuropteran-15.30%), even they are no most common species, but are easier to identify till the species level. The most common species of Coccinellids is *Propylea quattuordecimpunctata* (49.13%), followed by *Psyllobora vigintiduopunctata* (36.92%),

*Coccinella septempunctata* (8.43%) and *Adalia bipunctata* (5.52%). Even they are no to visible, Heteroptera species are relatively frequently, main species being *Nabis pseudoferus* (33.81%), *Nabis feroides* (27.40%), *Orius* spp. (18.15%), *Nabis rugosus* (11.03%), *Nabis ferus* (7.43%) and *Anthocoris* spp. (4.98%). At the end we have to underline that in Neuropteran populations the most spread is *Chrysoperla carnea* (68.57%), *Osmylus fulvicephalus* (25.71%) and *Drepanopteryx phalaenoides* (5.71%) (Table 5).

Table 3. Fauna of arthropods structure (exemplars/plant) identified in corn agroecosystems in 2009

		Exemplars/plant								
		18-V	08-VI	29-VI	13-VII	27-VII	10-VIII	24-VIII	07-IX	TOTAL
Conventional corn hybrids	<i>Arachnids</i>	0.017	0.021	0.033	0.146	0.175	0.133	0.075	0.117	<b>0.717</b>
	<i>Orthoptera</i> (grasshoppers and locusts)	0.000	0.004	0.021	0.100	0.117	0.063	0.017	0.008	<b>0.329</b>
	<i>Coleoptera</i>	0.046	0.108	0.204	0.163	0.321	0.233	0.167	0.038	<b>1.279</b>
	<i>Homopterous</i> (Cicadelids)	0.150	0.213	0.250	0.608	0.513	0.242	0.154	0.075	<b>2.204</b>
	<i>Heteroptera</i>	0.038	0.067	0.113	0.096	0.083	0.029	0.021	0.029	<b>0.475</b>
	<i>Hymenoptera</i> (Formicidae)	0.046	0.038	0.154	0.221	0.283	0.063	0.054	0.004	<b>0.863</b>
	<i>Neuropteran</i>	0.000	0.025	0.104	0.063	0.092	0.033	0.038	0.004	<b>0.358</b>
	<i>Diptera</i> (Syrphids)	0.008	0.067	0.179	0.138	0.083	0.079	0.175	0.029	<b>0.758</b>
	Other groups	0.046	0.138	0.171	0.188	0.208	0.225	0.108	0.046	<b>1.129</b>
	<b>TOTAL</b>	<b>0.350</b>	<b>0.679</b>	<b>1.229</b>	<b>1.721</b>	<b>1.875</b>	<b>1.100</b>	<b>0.808</b>	<b>0.350</b>	<b>8.113</b>
Hybrids containing transformation events	<i>Arachnids</i>	0.014	0.033	0.043	0.052	0.100	0.076	0.071	0.024	<b>0.414</b>
	<i>Orthoptera</i> (grasshoppers and locusts)	0.014	0.019	0.029	0.033	0.052	0.043	0.024	0.029	<b>0.243</b>
	<i>Coleoptera</i>	0.043	0.057	0.133	0.138	0.119	0.124	0.100	0.043	<b>0.757</b>
	<i>Homopterous</i> (Cicadelids)	0.200	0.152	0.148	0.743	0.529	0.243	0.124	0.071	<b>2.210</b>
	<i>Heteroptera</i>	0.033	0.043	0.076	0.124	0.090	0.052	0.048	0.033	<b>0.500</b>
	<i>Hymenoptera</i>	0.052	0.057	0.210	0.262	0.286	0.200	0.024	0.005	<b>1.095</b>
	<i>Neuropteran</i>	0.005	0.052	0.086	0.100	0.133	0.048	0.048	0.010	<b>0.481</b>
	<i>Diptera</i> (Syrphids)	0.010	0.052	0.152	0.129	0.114	0.052	0.090	0.062	<b>0.662</b>
	Other groups	0.152	0.214	0.186	0.233	0.324	0.262	0.190	0.148	<b>1.710</b>
	<b>TOTAL</b>	<b>0.524</b>	<b>0.681</b>	<b>1.062</b>	<b>1.814</b>	<b>1.748</b>	<b>1.100</b>	<b>0.719</b>	<b>0.424</b>	<b>8.071</b>

Table 4. Fauna of arthropods identified in corn agroecosystems in 2010

		Exemplars/plant								
		18-V	08-VI	29-VI	13-VII	27-VII	10-VIII	24-VIII	07-IX	TOTAL
Conventional corn hybrids	<i>Arachnids</i>	0.004	0.008	0.029	0.088	0.133	0.104	0.092	0.046	<b>0.504</b>
	<i>Orthoptera</i> (grasshoppers and locusts)	0.004	0.013	0.017	0.038	0.046	0.033	0.029	0.025	<b>0.204</b>
	<i>Coleoptera</i>	0.154	0.050	0.229	0.242	0.408	0.279	0.179	0.046	<b>1.588</b>
	<i>Homopterous</i> (Cicadelids)	0.146	0.229	0.267	0.838	0.442	0.271	0.179	0.092	<b>2.463</b>
	<i>Heteroptera</i>	0.050	0.079	0.133	0.158	0.129	0.050	0.033	0.063	<b>0.696</b>
	<i>Hymenoptera</i> (Formicidae)	0.075	0.075	0.179	0.275	0.350	0.050	0.042	0.008	<b>1.054</b>
	<i>Neuropteran</i>	0.004	0.017	0.063	0.046	0.125	0.050	0.058	0.008	<b>0.371</b>
	<i>Diptera</i> (Syrphids)	0.004	0.083	0.221	0.171	0.092	0.108	0.221	0.058	<b>0.958</b>
	Other groups	0.046	0.133	0.179	0.229	0.279	0.258	0.133	0.075	<b>1.333</b>
	<b>TOTAL</b>	<b>0.488</b>	<b>0.688</b>	<b>1.317</b>	<b>2.083</b>	<b>2.004</b>	<b>1.204</b>	<b>0.967</b>	<b>0.421</b>	<b>9.171</b>
Hybrids containing transformation events	<i>Arachnids</i>	0.019	0.019	0.038	0.086	0.133	0.100	0.090	0.043	<b>0.529</b>
	<i>Orthoptera</i> (grasshoppers and locusts)	0.014	0.019	0.024	0.038	0.071	0.052	0.038	0.029	<b>0.286</b>
	<i>Coleoptera</i>	0.067	0.081	0.210	0.181	0.243	0.167	0.119	0.067	<b>1.133</b>
	<i>Homopterous</i> (Cicadelids)	0.195	0.224	0.233	0.948	0.471	0.271	0.176	0.100	<b>2.619</b>
	<i>Heteroptera</i>	0.043	0.052	0.133	0.148	0.124	0.081	0.052	0.048	<b>0.681</b>
	<i>Hymenoptera</i>	0.071	0.071	0.152	0.233	0.314	0.043	0.029	0.010	<b>0.924</b>
	<i>Neuropteran</i>	0.014	0.081	0.105	0.152	0.195	0.081	0.062	0.014	<b>0.705</b>
	<i>Diptera</i> (Syrphids)	0.014	0.076	0.210	0.143	0.148	0.081	0.119	0.086	<b>0.876</b>
	Other groups	0.095	0.195	0.148	0.248	0.281	0.229	0.176	0.119	<b>1.490</b>
	<b>TOTAL</b>	<b>0.533</b>	<b>0.819</b>	<b>1.252</b>	<b>2.176</b>	<b>1.981</b>	<b>1.105</b>	<b>0.862</b>	<b>0.514</b>	<b>9.243</b>

Table 5. Fauna of Coccinellids, Heteroptera and Neuropteran insects identified in corn agroecosystems during 2009-2010

Group	Species	2009	2010	TOTAL	Percentage
COLEOPTERA	<i>Propylea quattuordecimpunctata</i>	162	176	338	49,13
	<i>Coccinella septempunctata</i>	26	32	58	8,43
	<i>Adalia bipunctata</i>	18	20	38	5,52
	<i>Psyllobora vigintiduopunctata</i>	101	153	254	36,92
	<b>Total Coccinellids</b>	307	381	688	<b>60,14</b>
HETEROPTERA	<i>Orius spp.</i>	15	36	51	18,15
	<i>Anthocoris spp.</i>	5	9	14	4,98
	<i>Nabis pseudoferus</i>	42	53	95	33,81
	<i>Nabis feroides</i>	36	41	77	27,40
	<i>Nabis ferus</i>	6	7	13	7,43
	<i>Nabis rugosus</i>	10	21	31	11,03
	<b>Total Heteroptera</b>	114	167	281	<b>24,56</b>
NEUROPTERAN	<i>Chrysoperla carnea</i>	62	58	120	68,57
	<i>Osmylus fulvicephalus</i>	19	26	45	25,71
	<i>Drepanapteryx phalaenoides</i>	5	5	10	5,71
	<b>Total Neuropteran</b>	86	89	175	<b>15,30</b>
	<b>No. of total specimens identified</b>	<b>507</b>	<b>637</b>	<b>1144</b>	-

## CONCLUSIONS

The most abundant fauna, observed in our research belong to group of homopterous, spiders are relatively frequent, other groups are relatively common.

Taking into account the whole arthropod fauna there is a large variation either between on different fauna components or during the period of observation time, but what is more important there are no significant differences between total observed arthropod fauna on plant either on conventional corn hybrids or corn hybrids containing transformation events in 2009 and 2010.

From point of interest, useful fauna belonging to groups Coleoptera (Coccinellidae), Neuropteran, Diptera (Syrphids) and Heteroptera is well represented in corn agroecosystems during of observed period (Coccinellids represents 60.14%, Heteroptera 24.56% and Neuropteran-15.30%).

The most common species of Coccinellids is *Propylea quattuordecimpunctata*, followed by *Psyllobora vigintiduopunctata*, *Coccinella septempunctata* and *Adalia bipunctata* (5.52%), Heteroptera species are relatively frequently, main species being *Nabis pseudoferus*, *Nabis feroides*, *Orius spp.*, *Nabis rugosus*, *Nabis ferus* and *Anthocoris spp.*, in Neuropteran insect populations the most spread is *Chrysoperla carnea*, *Osmylus fulvicephalus* and *Drepanapteryx phalaenoides*.

Corn fields contain a lot of specimens, especially insects, which could give to us the

image of complexity of corn ecosystem and this kind of studies, are very useful for better understanding of corn ecosystem and the role of each species in the ecosystem, is the first step in finding key species for a specific agroecosystem.

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