

## OBSERVATIONS CONCERNING THE HARMFUL ENTOMOFAUNA FROM WINTER RAPESEED CROPS IN THE CONDITIONS OF CENTRAL OF MOLDAVA, BETWEEN YEARS 2014-2017

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**Abstract:** During 2014-2017, 22 species were identified in the yellow bowl trap type installed in winter rapeseed crops established at A.R.S.D. Secuieni. Of these, 11 species are specific to winter rapeseed crops and 11 species were accidental identified because of the proximity with different agricultural crops (maize, sunflower, grain cereals). The highest abundance was registered by *Epicometis hirta* Poda species which accounted 914 specimens collected during the analyzed period. The species were integrated into classes of dominance ((D1 - subrecedent species, D2 - recedent species, D3 - subdominant species, D4 - dominant species and D5 - eudominant species). *Meligethes aeneus* F., *Ceuthorrhynchus napi* Gyll. and *Epicometis hirta* Poda. being considered eudominant species belonging to the D5 class. The *Ceuthorrhynchus napi* Gyll., *Meligethes aeneus* F., *Epicometes hirta* Poda., *Psylliodes chrysocephala* L., *Subcoccinella 24 punctata* L., *Oulema melanopa* L. species were classified in the constancy class - C4 - euconstant species. *Meligethes aeneus* F., *Epicometis hirta* Poda and *Ceuthorrhynchus napi* Gyll. species recorded the highest values for the index of ecological significance (W %) and were classified in the W5 class - characteristic species. The collected entomofauna belongs to five orders: *Coleoptera*, *Heteroptera*, *Lepidoptera*, *Diptera* and *Hymenoptera*. The highest number of species (17 species) and the highest number of collected specimens (3246 specimens) belonged to the *Coleoptera* order.

**Keywords:** winter rapeseed crops, harmful entomofauna, ecological indicators, yellow bowl trap type

### 1. INTRODUCTION

Rapeseed crops involves a careful plant surveillance because it is one of the most susceptible crop to pest attack through the phenological development of plants. Knowing the harmful species, which by attacking the different plant organs (leaves, stem, floral buds, flowers) leads to low productions of poor quality, it is important because theoretical knowledge combined with practical knowledge ensure the establishment of the suitable treatment moment [1-7].

The researches conducted to identify the pest attack correlated with influence of zonal agroecological factors has led to the establishment of the climate changes impact on winter rapeseed crops entomofauna. The drought which appears more frequently in the spring and summer months, the succession of high temperatures and low

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rainfall periods, especially in the winter months, determine the insect hibernation period to shorten causing great problems through the aggressive attacks and high densities of the key species.

In this paper we present data regarding the entomofauna collected from rapeseed crops in the conditions of Central of Moldova.

## 2. EXPERIMENTAL SETUP

The researches were conducted at the Agricultural Research – Development Station Secuieni – Neamt on the rapeseed crops. during 2014-2017 and consisted on collecting the harmful entomofauna from winter rapeseed crops, determining it and establishing of some ecological parameters represented by abundance, species dominance, constancy and index of ecological significance.

In spring, were installed yellow bowl trap type in the winter rapeseed crops, aiming to collect the harmful organisms, between the stem elongation phenophase until the end of seed ripening phenophase. The biological material was collected in Petri dishes, clear of vegetable remanins and analyzed in the laboratory at microscope, then grouped on species and orders.

The collected material was subjected to a mathematical analysis, obtaining a number of ecological parameters: abundance (A), dominance (D), constancy (C) and index of ecological significance (W), wich highlight the characteristics of the analyzed biocenoses.

The **abundance (A %)** represents the total number of individuals of a species in the catch from a certain place on a given date. Based on the value of this indicator, the other indicators are calculated.

The **dominance (D %)** shows the participation percentage of each species in the catch. Explains the relationship of a species herd with the sum of the individuals of the other associated species. This indicator is calculated according to the equation (1):

$$D_A = \frac{N_A \cdot 100}{N_1} \quad (1)$$

where:

D is dominance;

A - species abundance;

$N_A$  - the total number of individuals of A species;

$N_1$  - the total number of individuals of the collected species.

Dominance classes include species whose spread percentage falls within the following values:

- D1-subrecedent species  $P < 1.0\%$ ;
- D2-recedent species  $P = 1.1-2.0\%$ ;
- D3-subdominant species  $P = 2.1-5.0\%$ ;
- D4-dominant species  $P = 5.1-10.0\%$ ;
- D5-eudominant species  $P > 10.1\%$ .

The **constancy (C %)** expresses the continuity of a species occurrence in the analyzed biotope. This characteristic is a structural indicator because it shows the participation proportion of a species in the biocenosis structure. The higher the value of the indicator, the more the species is better adapted to the conditions offered by the biotope.

The constancy is calculated according to the equation (2):

$$C_A = \frac{n_p \cdot A}{N_p} \cdot 100 \quad (2)$$

where:

$C_A$  represent the constancy of A species;

$n_p \cdot A$  - the number of samples in which the A species occurs;  
 $N_p$  - total number of collected samples.

Depending on the value of this indicator, the species are classified as follows:

- C1- accidental species(1-25%);
- C2- accessories species(25.1-50%);
- C3- constant species(50.1-75%);
- C4- euconstant species(75.1-100%).

The **index of ecological significance (W %)** represents the relationship between the structural indicator (C) and the productive indicator (D) and is calculated using equation (3):

$$W_A = \frac{C_A \cdot D_A \cdot 100}{10000} \quad (3)$$

where:

$W_A$  are the ecological significance index of A species;  
 $C_A$  - constancy of A species;  
 $D_A$  - dominance of A species.

Depending on the values obtained. the species are divided into the following classes:

- W1- accidental species ( $W < 0.1\%$ )
- W2- accessories species ( $W = 0.1 - 1.0\%$ )
- W3- accessories species ( $W = 1.1\% - 5.1\%$ )
- W4- characteristic species ( $W = 5.1\% - 10\%$ )
- W5- characteristic species ( $W > 10.1\%$ )

### 3. RESULTS AND DISCUSSION

From the observations and determinations carried out on the entomofauna collected from winter rapeseed crops, it was found that it was made up of 22 species that totalized over the entire observation period (2014-2017) 3447 specimens (Table 1).

In 2016 were registered 1502 specimens and it was the year with the highest number of specimens collected, in 2015 were collected 1038 specimens, followed by the year 2014 with 618 specimens, and the lowest number of insects collected was recorded in 2017 - 289 specimens.

During the analyzed period, it was found that the identified species had values ranging from one specimen at *Agriotes* spp. species to 914 specimens at *Epicomites hirta* Poda species. The highest number of collected specimens was recorded in the following species *Meligethes aeneus* F. (621 sp), species of *Phyllotreta* (494 sp). *Ceuthorrhynchus napi* Gyll. (406 sp), *Ceuthorrhynchus assimillis* Payk.(270 sp), *Psylliodes chrysocephala* L. (179 sp), *Baris chlorizans* Germ. (142 sp) and *Athalia rosea* L.(52 sp) (Table 1).

There were found other species of insects, which have been categorized as accidental species coming from proximity crops (maize, sunflower, grain cereals): *Ostrinia nubilalis* Hbn., *Chlorops pumilionis* Bjerk., *Tanyemecus dilaticollis* Gyll., *Crepidodera ferruginea* Scopoli., *Oscinella frit* L., *Oulema melanopa* L., *Eurygaster* spp., but also entomophagus species (*Subcoccinella 24 punctata* L.).

Table 1. The collected entomofauna from the winter rapeseed crops at A.R.D.S. Secuieni during 2014-2017.

No.	Species	Order	Collected entomofauna				Total specimens 2014-2017
			2014	2015	2016	2017	
1	<i>Meligethes aeneus</i> F.	<i>Coleoptera</i>	204	272	122	23	621
2	<i>Phyllotreta atra</i> Goeze	<i>Coleoptera</i>	37	158	95	0	290
3	<i>Phyllotetra nemorum</i> L	<i>Coleoptera</i>	12	142	29	0	183
4	<i>Phyllotreta nigripes</i> Fabr.	<i>Coleoptera</i>	1	0	20	0	21

5	<i>Psylliodes chrysocephala</i> L.	Coleoptera	2	140	35	2	179
6	<i>Baris chlorizans</i> Germ.	Coleoptera	12	71	59	0	142
7	<i>Ceuthorrhynchus napi</i> Gyll.	Coleoptera	10	99	269	28	406
8	<i>Ceuthorrhynchus assimillis</i> Payk.	Coleoptera	122	0	135	13	270
9	<i>Ceuthorrhynchus pleurostigma</i> Marsh.	Coleoptera	1	0	3	0	4
10	<i>Epicomites hirta</i> Poda	Coleoptera	81	75	573	185	914
11	<i>Oulema melanopa</i> L.	Coleoptera	2	3	11	16	32
12	<i>Athalia rosea</i> L.	Hymenoptera	0	33	15	4	52
13	<i>Lygus pratensis</i> L.	Coleoptera	3	1	54	0	58
14	<i>Oscinella frit</i> L.	Diptera	3	0	0	0	3
15	<i>Tanymecus dilaticollis</i> Gyll.	Coleoptera	0	0	4	0	4
16	<i>Crepidodera ferruginea</i> Scopoli	Coleoptera	5	0	0	0	5
17	<i>Harpalus spp.</i>	Coleoptera	3	28	23	0	54
18	<i>Subcoccinella 24 punctata</i> L.	Coleoptera	21	5	26	10	62
19	<i>Eurygaster spp.</i>	Heteroptera	0	0	29	8	37
20	<i>Agriotes spp.</i>	Coleoptera	0	1	0	0	1
21	<i>Ostrinia nubilalis</i> Hbn.	Lepidoptera	0	10	0	0	10
22	<i>Chlorops pumilionis</i> Bjerk..	Diptera	99	0	0	0	99
<b>Total</b>			<b>618</b>	<b>1038</b>	<b>1502</b>	<b>289</b>	<b>3447</b>

From Table 2, it can be noted that the collected species were classified in dominance classes as follows:

- nine species belong to **D1** class - **subrecedent species** with a spreading percentage below 1.0 %;
- three species were classified to **D2** class – **recedent species** with a spreading rate ranging from 1.2 % - 2.0 %;
- two species were classified in **D3** class – **subdominant species** whose spreading rates were between 2.1 % - 5.0 %;
- four species belong to **D4** class – **dominant species** with spreading rates between 5.1 % - 10 %;
- three species were classified in **D5** class – **eudominant species** whose spread percentage was higher than 10.1%.

Table 2. The classification on dominance classes of the species collected from the rapeseed crops at A.R.D.S. Secuieni.

No.	D1 - subrecedent species < 1.1 %	D2 – recedent species 1.2 % - 2.0 %	D3 – subdominant 2.1 % - 5.0 %	D4 – dominant species 5.1 % - 10 %	D5 – eudominant species > 10.1 %
1	<i>Agriotes spp.</i>	<i>Athalia rosea</i> L.	<i>Baris chlorizans</i> Germ.	<i>Phyllotetra nemorum</i> L.	<i>Ceuthorrhynchus napi</i> Gyll.
2	<i>Oscinella frit</i> L.	<i>Harpalus spp.</i>	<i>Chlorops pumilionis</i> Bjerk	<i>Psylliodes chrysocephala</i> L.	<i>Meligethes aeneus</i> F.
3	<i>Tanymecus dilaticollis</i> Gyll.	<i>Lygus pratensis</i> L.		<i>Ceuthorrhynchus assimillis</i> Payk	<i>Epicomites hirta</i> Poda
4	<i>Crepidodera ferruginea</i> Scopoli			<i>Phyllotreta atra</i> Goeze	
5	<i>Ceuthorrhynchus pleurostigma</i> Marsh				
6	<i>Ostrinia nubilalis</i> Hbn				
7	<i>Phyllotreta nigripes</i> Fabr.				
8	<i>Eurygaster spp.</i>				
9	<i>Oulema melanopa</i> L.				
Total	9 species	3 species	2 species	4 species	3 species

Calculating the percentage of harmful entomofauna on dominance classes it was found that in D1 class, species with sporadic spreading were recorded 3.46 % of the collected species. From D2 class, species with low spreading, belong 4.84 % from the identified species. In D3 class, species with middle spread, were recorded 7.12 % of the total, 27.34 % belong to D4 class, dominant species, and in D5 class, eudominant species, were recorded 57.34 % from the collected species (Figure 1).

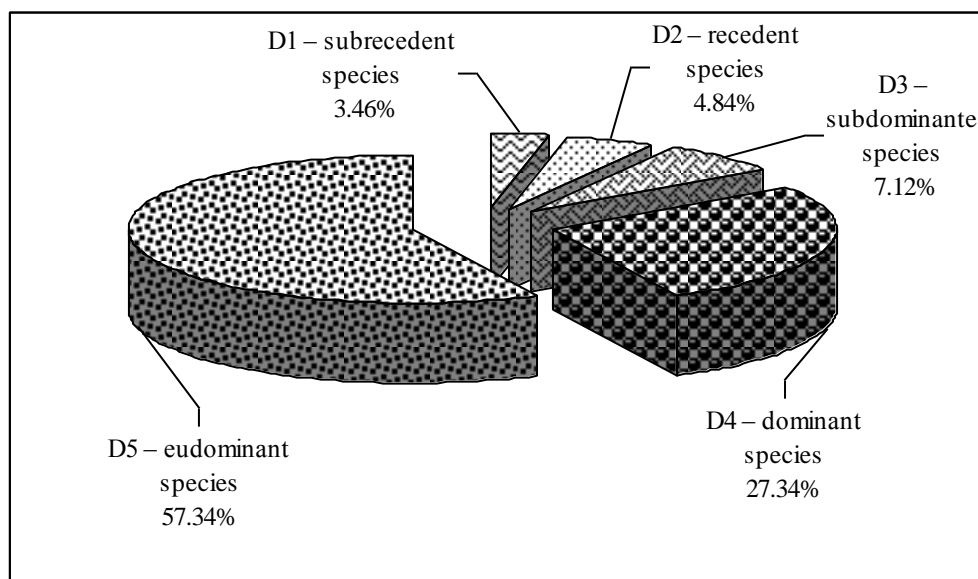


Fig. 1. The share of harmful species collected on dominance classes.

The species were distributed by constancy classes according to the obtained values (Table 3):

- six species had the constancy values between 1 and 25% belonging to **C1 class - accidental species** (*Crepidodera ferruginea* Scopoli., *Tanymecus dilaticollis* Gyll., *Agriotes spp.*, *Ostrinia nubilalis* Hbn., *Chlorops pumilionis* Bjerck., *Oscinella frit* L);
- in **C2 class - accessories species** (25 % and 50 %) there were three species (*Phyllotreta nigripes* Fabr., *Ceuthorrhynchus pleurostigma* Marsh., *Eurygaster spp.*);
- to **C3 class - constant species** (50.1 %-75 %). belong seven species (*Ceuthorrhynchus assimillis* Payk., *Phyllotreta atra* Goeze, *Phyllotetra nemorum* L., *Baris chlorizans* Germ., *Athalia rosea* L., *Lygus pratensis* L., *Harpalus spp.*);
- six species belong to **C4 class - euconstant species** (75.1 %-100 %) (*Ceuthorrhynchus napi* Gyll., *Meligethes aeneus* F., *Epicomites hirta* Poda, *Psylliodes chrysocephala* L., *Subcoccinella 24 punctata* L., *Oulema melanopa* L.).

Table 3. The classification of the species collected in the yellow bowl trap type on constancy classes.

No.	Constancy classes			
	C <sub>1</sub> – accidental species (1-25 %)	C <sub>2</sub> – accessories species (25.1-50 %)	C <sub>3</sub> – constant species (50.1-75 %)	C <sub>4</sub> – euconstant species (75.1-100 %)
1	<i>Agriotes spp.</i>	<i>Ceuthorrhynchus pleurostigma</i> Marsh	<i>Ceuthorrhynchus assimillis</i> Payk	<i>Ceuthorrhynchus napi</i> Gyll.
2	<i>Oscinella frit</i> L.	<i>Phyllotreta nigripes</i> Fabr.	<i>Phyllotreta atra</i> Goeze	<i>Meligethes aeneus</i> F.
3	<i>Tanymecus dilaticollis</i> Gyll.	<i>Eurygaster spp</i>	<i>Baris chlorizans</i> Germ.	<i>Epicomites hirta</i> Poda
4	<i>Crepidodera ferruginea</i> Scopoli		<i>Phyllotetra nemorum</i> L	<i>Psylliodes chrysocephala</i> L.
5	<i>Ostrinia nubilalis</i> Hbn		<i>Athalia rosea</i> L.	<i>Subcoccinella 24 punctata</i> L.
6	<i>Chlorops pumilionis</i> Bjerck.		<i>Harpalus spp.</i>	<i>Oulema melanopa</i> L.
7			<i>Lygus pratensis</i> L.	
Total	6 species	3 species	7 species	6 species

Depending on the **index of ecological significance (W)**, the species were classified as follow (Table 4):

- six species (*Agriotes spp.*, *Oscinella frit* L., *Tanymecus dilaticollis* Gyll., *Crepidodera ferruginea* Scopoli., *Ostrinia nubilalis* Hbn., *Ceuthorrhynchus pleurostigma* Marsh.) are part of **W1 class** (<0.1%);
- in **W2 class** (0.1-1.0 %) belong four species (*Phyllotreta nigripes* Fabr., *Chlorops pumilionis* Bjerck., *Eurygaster spp.*, *Oulema melanopa* L.);
- six species (*Athalia rosea* L., *Harpalus spp.*, *Lygus pratensis* L., *Subcoccinella 24 punctata* L., *Baris chlorizans* Germ., *Phyllotetra nemorum* L.) belong to **W3 class** (1.1-5.0 %);
- three species (*Ceuthorrhynchus assimillis* Payk., *Psylliodes chrysocephala* L., *Phyllotreta atra* Goeze) were recorded to **W4 class** (5.1-10.0 %);
- from **W5 class** (>10.0 %) are three species (*Meligethes aeneus* F., *Epicomites hirta* Poda, *Ceuthorrhynchus napi* Gyll.).

Table 4. The classification of the species collected in the yellow bowl trap type according to the index of ecological significance (W) classes.

No.	Index of ecological significance (W) classes				
	W <sub>1</sub> < 0.1 %	W <sub>2</sub> – 0.1-1.0 %	W <sub>3</sub> – 1.1-5.0 %	W <sub>4</sub> – 5.1-10.0 %	W <sub>5</sub> – > 10.0 %
1	<i>Agriotes spp.</i>	<i>Phyllotreta nigripes</i> Fabr.	<i>Athalia rosea</i> L.	<i>Psylliodes chrysocephala</i> L.	<i>Ceuthorrhynchus napi</i> Gyll.
2	<i>Oscinella frit</i> L.	<i>Eurygaster spp</i>	<i>Harpalus spp.</i>	<i>Ceuthorrhynchus assimillis</i> Payk	<i>Meligethes aeneus</i> F.
3	<i>Tanymecus dilaticollis</i> Gyll.	<i>Chlorops pumilionis</i> Bjerck.	<i>Lygus pratensis</i> L.	<i>Phyllotreta atra</i> Goeze	<i>Epicomites hirta</i> Poda
4	<i>Crepidodera ferruginea</i> Scopoli	<i>Oulema melanopa</i> L.	<i>Subcoccinella 24 punctata</i> L.		
5	<i>Ceuthorrhynchus pleurostigma</i> Marsh		<i>Baris chlorizans</i> Germ.		
6	<i>Ostrinia nubilalis</i> Hbn		<i>Phyllotetra nemorum</i> L.		
Total	6 specii	4 specii	6 specii	3 specii	3 specii

Grouping the collected species on systematic orders showed that the analyzed entomofauna classified in five orders: *Coleoptera*, *Heteroptera*, *Lepidoptera*, *Diptera* and *Hymenoptera* (Figure 2).

From *Coleoptera* order were registered most of the species spread in the rapeseed crops, respectively 17 species, to *Diptera* order belongs tow species and the *Heteroptera*, *Lepidoptera* and *Hymenoptera* orders were represented by one species each (table 5).

Table 5. The distribution of collected species from rapeseed crops on systematic orders.

No.	<i>Coleoptera</i>	<i>Heteroptera</i>	<i>Lepidoptera</i>	<i>Diptera</i>	<i>Hymenoptera</i>
1	<i>Meligethes aeneus</i> F.	<i>Eurygaster spp</i>	<i>Ostrinia nubilalis</i> Hbn.	<i>Oscinella frit</i> L.	<i>Athalia rosea</i> L.
2	<i>Phyllotreta atra</i> Goeze			<i>Chlorops pumilionis</i> Bjerck..	
3	<i>Phyllotetra nemorum</i> L.				
4	<i>Phyllotreta nigripes</i> Fabr.				
5	<i>Psylliodes chrysocephala</i> L.				
6	<i>Baris chlorizans</i> Germ.				
7	<i>Ceuthorrhynchus napi</i> Gyll.				

8	<i>Ceuthorrhynchus assimillis</i> Payk.				
9	<i>Ceuthorrhynchus pleurostigma</i> Marsh.				
10	<i>Epicomites hirta</i> Poda				
11	<i>Oulema melanopa</i> L.				
12	<i>Lygus pratensis</i> L.				
13	<i>Tanymecus dilaticollis</i> Gyll.				
14	<i>Crepidodera ferruginea</i> Scopoli				
15	<i>Harpalus</i> spp.				
16	<i>Subcoccinella 24 punctata</i> L.				
17	<i>Agriotes</i> spp.				
Total	17 species	one species	one species	2 species	one species

By calculating the percentage of orders after the number of species it was found that: *Coleoptera* order had the maximum share of 77.4 %, followed by *Diptera* order which had a share of 9.1 % and then by *Hymenoptera*, *Heteroptera* and *Lepidoptera* orders with 4.5 % each (Figure 2).

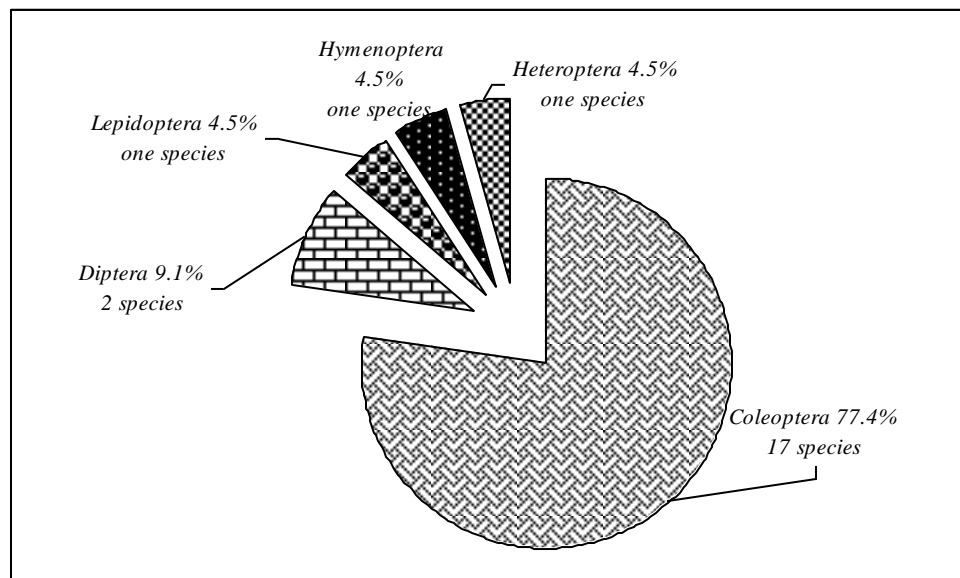


Fig. 2. The orders share depending on the number of species collected from rapeseed crops.

Within the *Coleoptera* order the highest share of 28.07 % belongs to *Epicomites hirta* Poda species, followed by *Meligethes aeneus* F. with 19.02 % and *Ceuthorrhynchus napi* Gyll. with 12.47%. The lowest shares were recorded by the species: *Agriotes* spp. with 0.03 %, *Tanymecus dilaticollis* Gyll with 0.12 % and *Crepidodera ferruginea* Scopoli with 0.15 % (Figure 3).

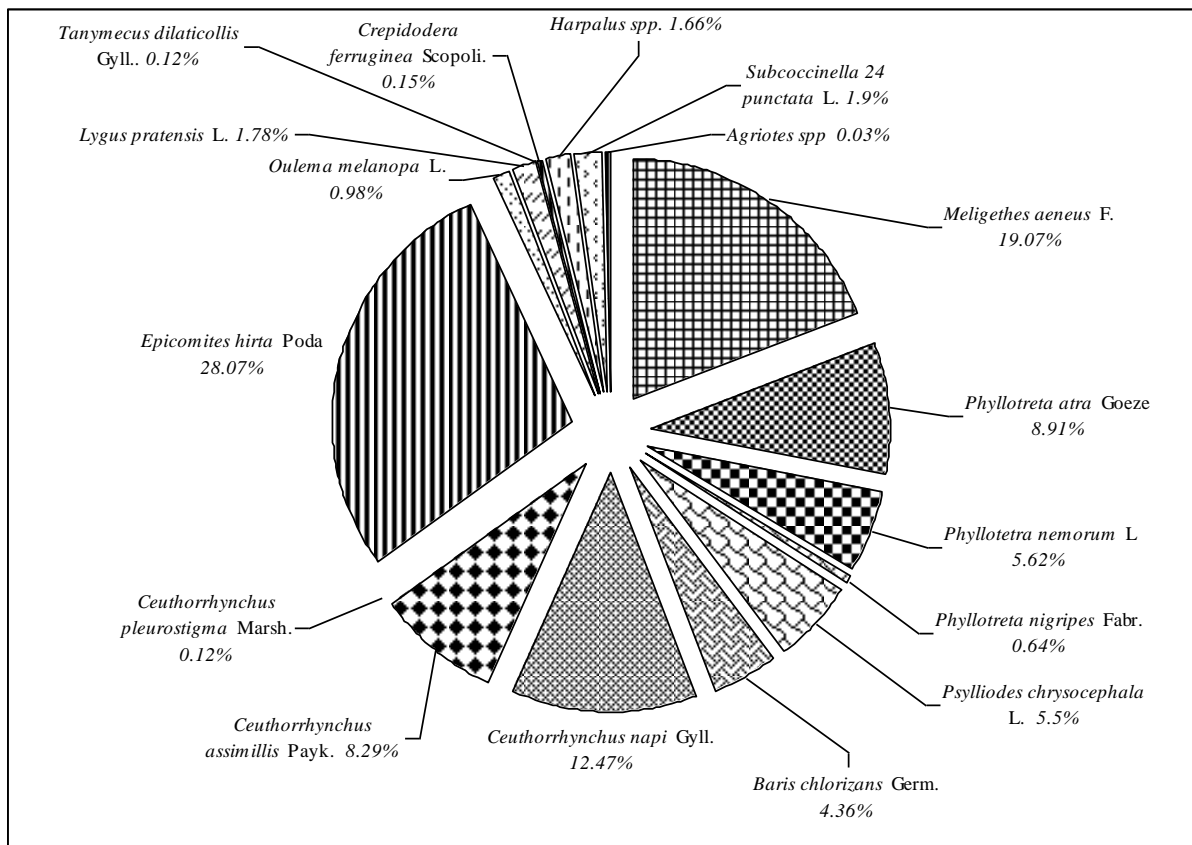


Fig. 3. The species share from *Coleoptera* order in rapeseed crops.

#### 4. CONCLUSIONS

During 2014-2017 were identified 22 species using the yellow bowl trap type installed in winter rapeseed crops established at A.R.S.D. Secuieni.

Of these, 11 species are specific to winters rapeseed crops and 11 species were accidental identified due to their proximity to different agricultural crops (maize, sunflower, grain cereals).

The highest abundance was recorded by *Epicometis hirta* Poda species with 914 specimens collected during the analyzed period.

The species were classified into dominance classes ((D1 - subrecedent species. D2 - recedent species. D3 - subdominant species. D4 - dominant species and D5 - eudominant species). *Meligethes aeneus* F., *Ceuthorrhynchus napi* Gyll. and *Epicometis hirta* Poda. being considered as eudominant species belonging to D5 class.

The *Ceuthorrhynchus napi* Gyll., *Meligethes aeneus* F., *Epicomites hirta* Poda, *Psylliodes chrysocephala* L., *Subcoccinella 24 punctata* L., *Oulema melanopa* L., species have been classified into C4 constancy class - euconstant species.

*Meligethes aeneus* F., *Epicometis hirta* Poda and *Ceuthorrhynchus napi* Gyll. species recorded the highest values on the ecological significance index (W%) and were classified in W5 class - characteristic species.

The analyzed entomofauna belongs to five orders: *Coleoptera*, *Heteroptera*, *Lepidoptera*, *Diptera* and *Hymenoptera*. The highest number of species (17 species) and the highest number of collected specimens (3246 specimens) belonged to the *Coleoptera* order



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