THE ECOLOGICAL INDICATORS ANALYSIS OF THE HARMFUL INSECTS COLLECTED FROM THE RAPE FIELDS IN A.R.D.S. SECUIENI CONDITIONS

ANALIZA INDICILOR ECOLOGICI A SPECIILOR DE INSECTE DĂUNĂTOARE COLECTATE DIN CULTURILE DE RAPIȚĂ ÎN CONDIȚIILE DE LA S.C.D.A. SECUIENI

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Abstract: *The rape currently occupies a very important place in the global economy as a source of vegetable oils used in food industry and especially in industry by creating some alternative energy solutions. At A.R.D.S. Secuieni, during 2010 – 2012, were conducted researches, which aimed to determine the pests which affect the rape crops from Moldavian Central Plateau, the application of some phytosanitary measures and the analysis of the ecological parameters of the harmful insect species from this crop.*
Key words: *rape, abundance, dominance, constancy, index of ecological significance.*

Rezumat. *Rapița ocupă în prezent, un loc deosebit de important în economia mondială, ca sursă de uleiuri vegetale cu utilizare în alimentație şi mai ales în industrie prin crearea unor soluții alternative de energie. La S.C.D.A. Secuieni, în perioada 2010 – 2012, s-au efectuat cercetări, care au avut drept scop determinarea dăunătorilor care afectează culturile de rapiță din zona Podişului Central Moldovenesc, aplicarea unor măsuri fitosanitare şi analiza parametrilor ecologici a speciilor de insecte dăunătoare din această cultură.*
Cuvinte cheie: *rapiță, abundența, dominanța, constanța, indicele de semnificație ecologică.*

INTRODUCTION

Successful establishment of oilseed rape crops and ensuring the production is conditioned by compliance with all technological links for plant protection against harmful organisms, which commonly reduce production by up to 35%, in some cases leading to losses of over 60% (Geană, 2011; Raranciuc et al., 2007).

The knowledge of harmful insects presents special practical interest, because the time of the attack is difficult to discern due to the small size, sometimes milimeter of phytophagous species and their stages, and due to the specific parasite attacks hidden within or between plant tissues, in soi land sometimes blurred by the vegetative growth and phenological development of plants (Tălmaciu et al., 2010; Trotuş et al., 2009).

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In this paper we present data on the inventory of rapeseed pests affecting rape crops, and ecological parameters values of these species.

MATERIAL AND METHOD

The research were conducted on rapeseed crops from A.R.D.S Secuieni, during 2010 – 2012 and consisted in observations and determinations on the collection and identification of harmful organisms.

The collection of harmful organisms was performed using yellow bowl trap type installed in rapeseed crops, in the period from the formation of leaves rossette and until plant maturity.

The results from the field were calculated and interpreted using different environmental parameters: abundance (A), dominance (D), constancy (C) and ecological significance index (W).

The abundance (A) represents all the individuals of a species from the capture in a certain place and at a certain time. On the basis of this indicator value are calculated the others indicators.

The dominance (D) shows the percentage of participation of each species in the catch. This indicator is calculated as follow:

$$D_A = \frac{N_A x\ 100}{N_1}$$

The dominance classes include species whose rate of spread fall within the following values:

D_1 – subrecedent species – spreading percentage P<1.1%;
D_2 – recedent species P=1.2 – 2.0%;
D_3 – subdominant species P=2.1 – 5.0%;
D_4 – dominant species P=5.1 – 10.0%;
D_5 – eudominant species P>10.1%.

The constancy (C) expresses the continuity of a species in the analyzed habitat. This feature is a structural indicator because presents the participation proportion of a species in the biocenosis structure realization.

The constancy is calculated by the mathematical formula:

$$C_A = \frac{n_p A}{N_P} X100$$

Depending on the value of this indicator, the species are distributed in the following classes:

C_1 – accidental species (1 – 25%)
C_2 – accessories species (25.1 – 50%)
C_3 – constant species (50.1 – 75%)
` C_4 – euconstant species (75.1 – 100%)

The ecological significance index (W) represents the relation between the structural indicator (C) and the production indicator (D). The ecological significance index is given by:

$$W_A = \frac{C_A X D_A X100}{10000}$$ where

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

W_1 – values below 0.1%
W_2 – with values between 0.1 – 1.0%

W_3 – with values ranging from 1.1 – 5.0%
W_4 – with values between 5.1 – 10.0%
W_5 – with values above 10.0%

W_1 class corresponds to the accidental species, W_2 and W_3 classes to the accessories species, and W_4 and W_5 classes corresponding to the characteristics species for the analyzed biocenosis.

The experience was made from two experimental variants:
V1 – untreated variant (control);
V2 – rapeseed in which were made chemical treatment of seed (Cruiser OSR = 15 l/t) and treatments during the growing season (T1 – Decis Mega = 0,15 l/ha; T2 – Biscaya 240 OD = 0,3 l/ha; T3 – Proteus OD 110 = 0,35 l/ha).

RESULTS AND DISCUSSIONS

The observations and measurements have shown that in the rapeseed crops were met 19 species of insect pests.

The collected material was subjected to a mathematical analysis resulting a series of ecological indicators which highlights the features of the analyzed biocenosis.

By using the yellow bowl type traps the collected entomofauna, at the untreated variant, totalized 19 species, whose abundance (A) ranged from 2114 specimens (*Meligethes aeneus* F.) and 1 specimen (*Oulema melanopa* L.) (tab. 1).

The dominance (D) according to the calculated percentage, the species are distributed in the following classes (tab. 1):

- 8 species in D1 class – subrecedent species, with values below 1.1% (*Ceuttorhynchus pleurostigma* Marsham*, Crepidodera feruginea* Scopoli*, Sitona lineatus* Germ.*, Chlorops pumiliones* Bjerkander*, Athalia rosae* L.*, Eurydema ornatum* L.*, Oulema melanopa* L.*, Tanymecus dilaticolis* Gyll.*);*

- 3 species in D2 class – recedent class, with values between 1.1 – 2% (*Phyllotreta nigripes* Fabr.*, Psylliodes chrysocephala* L.*, Oscinella frit* L.*);*

- 7 species in D3 class – subdominant species, with values between 2.1-5% (*Phyllotreta atra* Fabr.*, Phyllotreta nemorum* L.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda*, Baris chlorizans* Germ.*, Lygus pratensis* L.*);*

- 1 species in D5 class – eudominant species, with values above 10.1% (*Meligethes aeneus* F.*).*

The constancy (C) – depending on the value of this indicator, the species are distributed in the following classes (tab. 1):

- 7 species are accidental species with the indicator value between 1 – 25% (*Ceuttorhynchus pleurostigma* Marsham*, Crepidodera feruginea* Scopoli*, Sitona lineatus* Germ.*, Chlorops pumiliones* Bjerkander*, Eurydema ornatum* L.*, Oulema melanopa* L.*, Tanymecus dilaticolis* Gyll.*);*

- 6 species are accessories species with the indicator value between 25.1 – 50% (*Phyllotreta nigripes* Fabr.*, Psylliodes chrysocephala* L.*, Baris chlorizans* Germ.*, Lygus pratensis* L.*, Oscinella frit* L.*, Athalia rosae* L.*);*

- 5 species are constant species with the indicator value between 50,1 – 75% (*Phyllotreta atra* Fabr., *Phyllotreta nemorum* L., *Ceuttorhynchus napi* Gyll., *Ceuttorhynchus assimilis* Paykull, *Epicometis hirta* Poda);

- 1 species is an euconstant species with the indicator value between 75.1 – 100% (*Meligethes aeneus* F.).

The index of ecological significance (W) – depending of the calculated percentage value, the species are distributed into the following classes (tab. 1):

- 7 species are accidental species, with values below 0.1% (*Ceuttorhynchus pleurostigma* Marsham, *Crepidodera feruginea* Scopoli, *Sitona lineatus* Germ., *Chlorops pumiliones* Bjerkander, *Eurydema ornatum* L., *Oulema melanopa* L., *Tanymecus dilaticolis* Gyll.);

- 5 species are accessories species, with values between 0.1 – 1.0% (*Phyllotreta nigripes* Fabr., *Psylliodes chrysocephala* L., *Lygus pratensis* L., *Oscinella frit* L., *Athalia rosae* L.) şi 6 specii au valoarea indicatorului între 1,1 – 5,0% (*Phyllotreta atra* Fabr., *Phyllotreta nemorum* L., *Ceuttorhynchus napi* Gyll., *Ceuttorhynchus assimilis* Paykull, *Epicometis hirta* Poda, *Baris chlorizans* Germ.);

- 1 species is a characteristic species with the indicator value above 10.0% (*Meligethes aeneus* F.).

Table 1

The ecological parameters analysis of the species collected at the untreated variant

Species name	A	D		C		W	
		%	CI	%	CI	%	CI
Meligethes aeneus F.	2114	70,30	D_5	100,0	C_4	70,30	W_5
Phyllotreta atra Fabr.	124	4,12	D_3	74,07	C_3	3,05	W_3
Phyllotreta nemorum L.	110	3,66	D_3	55,56	C_3	2,03	W_3
Phyllotreta nigripes Fabr.	35	1,16	D_2	27,78	C_2	0,32	W_2
Psylliodes chrysocephala L.	53	1,76	D_2	46,30	C_2	0,82	W_2
Ceuttorhynchus napi Gyll.	81	2,69	D_3	66,67	C_3	1,80	W_3
Ceuttorhynchus assimilis Paykull	108	3,59	D_3	64,81	C_3	2,33	W_3
Ceuttorhynchus pleurostigma Marsham	6	0,20	D_1	9,26	C_1	0,02	W_1
Epicometis hirta Poda	112	3.72	D_3	57,41	C_3	2,14	W_3
Baris chlorizans Germ.	79	2,63	D_3	50,00	C_2	1,31	W_3
Crepidodera feruginea Scopoli	12	0,40	D_1	18,52	C_1	0,07	W_1
Lygus pratensis L.	64	2,13	D_3	40,74	C_2	0,87	W_2
Oscinella frit L.	62	2,06	D_2	29,63	C_2	0,61	W_2
Sitona lineatus Germ.	5	0,17	D_1	9,26	C_1	0,02	W_1
Chlorops pumiliones Bjerkander	2	0,07	D_1	3,70	C_1	0,00	W_1
Athalia rosae L.	31	1,03	D_1	27,78	C_2	0,29	W_2
Eurydema ornatum L.	4	0,13	D_1	5,56	C_1	0,01	W_1
Oulema melanopa L.	1	0,03	D_1	1,85	C_1	0,00	W_1
Tanymecus dilaticolis Gyll.	4	0,13	D_1	7,41	C_1	0,01	W_1

The entomofauna collected, from the second variant, with the help of yellow bowl type traps totalized 16 specii, whose abundance (A) ranged between 499 specimens (*Meligethes aeneus* F.) and 1 specimen (2 specii) (tab.2):

The dominance (D) according to the calculated percentage, the species are distributed in the following classes (tab.2):

- 4 species in D1 class – subrecedent species, with values below 1.1% (*Ceuttorhynchus pleurostigma* Marsham*, Lygus pratensis* L.*, Sitona lineatus* Germ.*, Athalia rosae* L.*);*

- 1 species in D2 class – recedent species, with values between 1.1 – 2% (*Phyllotreta nigripes* Fabr.*);*

- 6 species belong to D3 class – subdominat species, with values between 2.1 – 5% (*Phyllotreta nemorum* L.*, Psylliodes chrysocephala* L.*, Ceuttorhynchus napi* Gyll.*, Epicometis hirta* Poda*, Baris chlorizans* Germ.*, Oscinella frit* L.*);*

- 2 species in D4 class – dominant species, with values between 5.1 – 10% (*Phyllotreta atra* Fabr.*, Ceuttorhynchus assimilis* Paykull*);*

- 1 species in D5 class – eudominant species, with values above 10.1% (*Meligethes aeneus* F.).

The constancy (C) – depending on the value of this indicator, the species are distributed in the following classes (tab.2):

- 6 accidental species with values between 1 – 25% (*Phyllotreta nigripes* Fabr.*, Ceuttorhynchus pleurostigma* Marsham*, Lygus pratensis* L.*, Oscinella frit* L.*, Sitona lineatus* Germ.*, Athalia rosae* L.*);*

- 7 accessories species, with values ranging from 25.1 – 50% (*Phyllotreta atra* Fabr.*, Phyllotreta nemorum* L.*, Psylliodes chrysocephala* L.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda*, Baris chlorizans* Germ.*);*

- 1 euconstant species, with values between 75.1 – 100% (*Meligethes aeneus* F.*).*

The ecological significance index (W) – depending on the calculated percentage value, the species are distributed in the following classes (tab.2):

- 4 accidental species, with values below 0.1% (*Ceuttorhynchus pleurostigma* Marsham*, Lygus pratensis* L.*, Sitona lineatus* Germ.*, Athalia rosae* L.*);*

- accessories species, with values between 0,1 – 1% are 5 species (*Phyllotreta nemorum* L.*, Phyllotreta nigripes* Fabr.*, Psylliodes chrysocephala* L.*, Baris chlorizans* Germ.*, Oscinella frit* L.), and those with index values ranging from 1.1 – 5.0% are 4 species (*Phyllotreta atra* Fabr.*, Ceuttorhynchus napi* Gyll.*, Ceuttorhynchus assimilis* Paykull*, Epicometis hirta* Poda);

- 1 characteristic species, with values above 10.1% (*Meligethes aeneus* F.*).*

Table 2

The ecological parameters analysis of the species at the V2

Species name	A	D		C		W	
		%	Cl.	%	Cl.	%	Cl.
Meligethes aeneus F.	499	67,25	D_5	100,00	C_4	67,25	W_5
Phyllotreta atra Fabr.	43	5,80	D_4	37,04	C_2	2,15	W_3
Phyllotreta nemorum L.	22	2,96	D_3	25,93	C_2	0,77	W_2
Phyllotreta nigripes Fabr.	11	1,48	D_2	14,81	C_1	0,22	W_2
Psylliodes chrysocephala L.	19	2,56	D_3	27,78	C_2	0,71	W_2

Ceuttorhynchus napi Gyll.	30	4,04	D_3	37,04	C_2	1,50	W_3
Ceuttorhynchus assimilis Paykull	38	5,12	D_4	38,89	C_2	1,99	W_3
Ceuttorhynchus pleurostigma Marsham	1	0,13	D_1	1,85	C_1	0,00	W_1
Epicometis hirta Poda	27	3,64	D_3	35,19	C_2	1,28	W_3
Baris chlorizans Germ.	22	2,96	D_3	25,93	C_2	0,77	W_2
Lygus pratensis L.	5	0,67	D_1	7,41	C_1	0,05	W_1
Oscinella frit L.	19	2,56	D_3	11,11	C_1	0,28	W_2
Sitona lineatus Germ.	1	0,13	D_1	1,85	C_1	0,00	W_1
Athalia rosae L.	5	0,67	D_1	7,41	C_1	0,05	W_1

CONCLUSIONS

1. During 2010 – 2012, the rapeseed crops from Central Moldavian Plateau were attacked by 19 species of harmful insects.
2. The highest abundance, has shown in the untreated variant, at the *Meligethes aeneus* F. species of 2114 specimens.
3. The highest dominance of 70,30% has shown in the untreated variant, at the *Meligethes aeneus* F. species. The insect species collected from the winter rapeseed crops were classified into the 5 classes of dominance: D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5- eudominant species.
4. The highest constancy of 100% was evidenced in the both variants at *Meligethes aeneus* F. species.
5. The highest ecological significance index (W) of 70,30% highlighted in the untreated variant at the *Meligethes aeneus* F. species.

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