ABSTRACT

Key words: traps, effectiveness, entomofauna, shaking method, ecological parameters, production, winter rape.

Currently, the rape is perhaps one of the most important crops in the world, as a source of vegetable oils used in food and industry. At first, too high in erucic acid content decreased food value of rapeseed oil, because it had a high potential risk to human health. Therefore, the main objective in rapeseed breeding was not to increase the oil percentage, but to modify the content of oil in fatty acids and other substances, increasing the protein content and in particular reducing the content of erucic acid. The second component of rape seeds such as weight and as economic and biological value is the raw protein. The proteins, similar to those of soybean (95% from its value) have high biological value containing all the essential amino acids (**Bîlteanu, 1993**).

The rape agronomic importance is undeniable, being one of the most productive crops. The rape is considered one of the best preceding crop for the most demanding crops and a good field neighbor with the plants attacked by the same diseases as it has been shown that the risk of transmission from rape to the neighboring sola is minor, as these are different races of pathogen agents .

The knowledge of pests is of special practical interest, since the time of the attack is difficult to see due to its small size, sometimes milimeter, of the phytophagous species and their stages, and due to the specific parasite attack hidden within or between plant tissues, in soil and sometimes blurred by the vegetative growth and phenological development of plants.

Equally important is the knowledge of useful entomofauna from the winter rape crop, their role in maintaining the pest populations below the economic damage threshold, but also the effects of chemicals used in crop protection on them. Generally the entomophagous species are susceptible, vulnerable to pesticides. Mass destruction of the entomophagous species from the agroecosystems leads to the destruction of the existing balance between the different biosystems from agrobiocenosis, at the destruction of their stability. In an agrobiocenosis with few entomophagous

species, restoring its balance is achieved slowly, and only by the migration of useful organisms from outside of the chemical protection area, from the so – called entomophagous tanks.

The doctorate thesis **„Research on the useful entomofauna from rape seed crops, in S.C.D.A. Secuieni – Neamt conditions, depending on the chemical treatment applied for pest control”**, approaches the study of harmful and useful insect species found in winter rape crops from Neamt county.

The thesis contains 7 chapters, with 265 pages, 91 tables and 26 figures, and has two parts: the first part, which is a summary of the „National and international knowledge stage concerning the rape entomofauna” includes two chapters, with 31 pages, 7 tables, 6 figures, in which are exposed informations from the literature regarding the subject of the doctoral thesis and which were subsequently used for the comparison and interpretation of data obtained in the second part.

The second part, „Presentation and interpretation of experimental results. Conclusions and recommendations”, consists of 5 chapters, with 180 pages, 84 tables and 20 figures, which present the natural environment in which the research were conducted, the research material and method, the research results on the thesis subject.

The location of the experiences was at the Agricultural Research – Development Station Secuieni, during three agricultural years (2010 – 2011, 2011 – 2012, 2012 – 2013), different in terms of climate.

The 2010 – 2011 agricultural year was characterized as a normal year in terms of temperatures, the deviation from the annual average being 0.0^0C. The recorded rainfalls were more than 37.5 mm lower than the annual average, the agricultural year being considered normal.

Temperatures recorded in the agricultural year 2011 – 2012 exceeded the annual average by 0.3^0C, and the recorded rainfalls were lower than the annual average by 128.5 mm. Thus, the year was considered normal in terms of temperatures, but dry in terms of precipitations.

The 2012 – 2013 agricultural year was a difficult year for the rape crops, being characterized as a dry year in terms of temperatures, the deviation from the annual average was of 0.8^0C. In terms of rainfall this year has been characterized as a normal year, the amount of rainfall recorded a difference of -35.9 mm to the annual average.

The experiments were located on a typically cambic chernozem soil, with water pH 6.29, humus content of 2.3, nitrogen index of 2.1, P_2O_5 mobile of 39 ppm and K_2O mobile of 161 ppm.

Our researches have proposed to determine the harmful and useful entomofauna from the winter rape crops, collected with the help of yellow bowl type traps, Barber soil type traps and shaking method, the influence of some chemical treatments on the useful and harmful entomofauna and on the rape seed production.

To achieve the research objectives were studied 3 work versions from the same location, on the same type of soil and which have the same preceding plant the two – row barley.

- **V1** – the untreated variant;
- **V2** – the variant without seed treatment but with three vegetation treatments (T1 – deltamethrin 7.5g/ha; T2 – thiacloprid 72 g/ha; T3 – thiacloprid 35 g/ha + deltamethrin 3.5 g/ha);
- **V3** – the variant with seed treatment (thiamethoxam 4200 g/t + metalaxyl – M 484.5 g/t + fludioxonil 120 g/t) and with three vegetation treatments (T1 – deltamethrin 7.5g/ha; T2 – thiacloprid 72 g/ha; T3 – thiacloprid 35 g/ha + deltamethrin 3.5 g/ha).

During the growing season were conducted observations and measurements on rapeseed plants evolution an don the emergence, evolution and attack of harmful and useful entomofauna.

The collection of the entomological material was made using **the yellow bowl type traps, the Barber soil type traps and the shaking method.**

Based on the results obtained from the analysis of the biological material, the determination of the useful and harmful entomofauna species were calculated the ecological parameters (abudance A, dominance D, constancy C and the ecological significance index W), and the production data were statistically calculated using the analysis of variance, to establish the significance of the difference between the variants, calculating the limit for the transgression probability of 5%, 1% and 0.1%.

Chapter V - Obtained results regarding the harmful and useful entomofauna collected from the rape crops - presents data obtained in the own research on the structure, dynamics and abundance of harmful and useful insect species, analysis of the ecological parameters of harmful and useful entomofauna insect species collected from the area under study.

In 2010 – 2013 research period, the situation of the entomofauna collected by the collection method using **yellow bowl type traps**, is as follow:

- at the untreated variant was collected a total of 5220 specimens, of which 4751 specimens belong to harmful entomofauna and 469 specimens to useful entomofauna (8.98%).

- at variant 2 (without seed treatment but with three vegetation treatments) the total number of insects collected was of 2245 specimens, of which 1864 specimens belong to harmful entomofauna and 381 specimens to useful entomofauna (16.97%).
- at variant 3 (with seed treatment and three vegetation treatments) was collected a total of 1490 specimens, of which 1126 specimens belong to harmful entomofauna and 364 specimens to useful entomofauna (24.43%).

Through the **Barber soil type traps**, over the entire research period, the situation on the collected entomofauna is as follows:

- at the untreated variant was collected a total of 987 specimens, of which 180 specimens belong to harmful entomofauna and 807 specimens to useful entomofauna (81.76%).
- at variant 2 (without seed treatment but with three vegetation treatments) was collected a total of 763 specimens, of which 110 specimens belong to harmful entomofauna and 653 specimens to useful entomofauna (85.58%).
- at variant 3 (with seed treatment and three vegetation treatments) was collected a total of 271 specimens, of which 42 specimens belong to harmful entomofauna and 229 specimens to useful entomofauna (84.50%).

In 2010 – 2013 research period, the situation of the entomofauna collected through the **shaking method**, is as follows:

- at the untreated variant was collected a total of 4723 specimens, of which 4326 specimens belong to harmful entomofauna and 397 specimens to useful entomofauna (8.41%).
- at variant 2 (without seed treatment but with three vegetation treatments) was collected a total of 2166 specimens, of which 1912 specimens belong to harmful entomofauna and 254 specimens to useful entomofauna (11.73%).
- at variant 3 (with seed treatment and three vegetation treatments) was collected a total of 1283 specimens, of which 1151 specimens belong to harmful entomofauna and 132 specimens to useful entomofauna (10.29%).

For the pests spread in the influence area of S.C.D.A. Secuieni, ecological parameters were calculated, respectively, abundance(no. specimens), dominance (%), constancy (%) and ecological significance index (%).

In 2010 – 2013 research period, at the collection method using **the yellow bowl type traps**, it was found that:

- at the untreated variant were collected 19 species, their abundance ranged from 3135 specimens (*Meligethes aeneus* F.) to 4 specimens (*Oulema melanopa* L.). The dominance values classified the collected species into the 5 classes of dominance, *Meligethes aeneus* F. species being an eudominant species. The constancy ranged between 4.94% (*Oulema melanopa* L.) and 100.00% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 19 species in three categories: 7 accidental species, 5 accessories species and 2 characteristic species: *Epicometis hirta* Poda, *Meligethes aeneus* F..
- at variant 2 (without seed treatment but with three vegetation treatments) were collected 16 species, whose abundance ranged between 1152 specimens (*Meligethes aeneus* F.) to one specimen (*Crepidodera feruginea* Scopoli). The dominance values classified the collected species into the 5 classes of dominance, *Meligethes aeneus* F. species being an eudominant species. The constancy ranged between 2.47% (*Chlorops pumiliones* Bjerk., *Tanymecus dilaticolis* Gyll.) and 100.00% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 16 species in three categories: 4 accidental species, 11 accessories species and one characteristic species: *Meligethes aeneus* F..
- at variant 3 (with seed treatment and three vegetation treatments) were collected 14 species, their abundance ranging from 760 specimens (*Meligethes aeneus* F.) to one specimen (*Sitona lineatus* L.). The dominance values classified the collected species into the 5 classes of dominance, *Meligethes aeneus* F. species being an eudominant species. The constancy ranged between 1.23% (*Sitona lineatus* L.) and 100.00% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 14 species in three categories: 4 accidental species, 9 accessories species and one characteristic species: *Meligethes aeneus* F..

At the method of collecting with the help of **Barber soil type traps**, during 2010 – 2013 research period, it was noted that:

- at the untreated variant were collected 8 species, whose abundance ranged between 56 specimens (*Meligethes aeneus* F.) to 5 specimens *Phyllotreta nemorum* L., *Chlorops pumiliones* Bjerk.). The dominance values classified the collected species into 3 classes of dominance (D3 – 3 subdominant species, D4 – 1 dominant species, D5 – 4 eudominant species). The constancy ranged between 9.26% (*Phyllotreta nemorum* L.) and 57.41% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 8 species in two categories: 4 accessories species and 4 characteristic species.

- at variant 2 (without seed treatment but with three vegetation treatments) were collected 6 species, their abundance having values between 19 specimens (*Phyllotreta atra* L.) to one specimen (*Lygus pratensis* L.). The dominance values classified the collected species into 3 classes of dominance (D2 – 1 recedent species, D4 – 1 dominant species, D5 – 4 eudominant species). The constancy ranged between 1.85% (*Lygus pratensis* L.) and 27.78% (*Phyllotreta atra* L.). By the calculation of the ecological significance index we classified the 6 species in three categories: one accidental species, 3 accessories species and 2 characteristic species: *Meligethes aeneus* F. and *Phyllotreta atra* L..
- at variant 3 (with seed treatment and three vegetation treatments) were collected 6 species, their abundance ranging from 13 specimens (*Meligethes aeneus* F.) to 2 specimens (*Lygus pratensis* L.). The dominance values classified the collected species into 3 classes of dominance (D3 – 1 subdominant species, D4 – 2 dominant species, D5 – 3 eudominant species). The constancy ranged between 3.70% (*Lygus pratensis* L.) and 22.22% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 6 species in two categories: 4 accessories species and 2 characteristic species: *Meligethes aeneus* F. and *Phyllotreta atra* L..

In the three years of observations (2010 – 2013), using the **shaking method**, it was found that:

- at the untreated variant were collected 9 species, whose abundance ranged between 3548 specimens (*Meligethes aeneus* F.) to 30 specimens (*Psylliodes chrysocephala* L.). The dominance values classified the collected species into 4 classes of dominance (D1 – 1 subrecedent species, D2 – 4 recedent species, D3 – 3 subdominant species and D5 – 1 eudominant species), *Meligethes aeneus* F. species being an eudominant species. The constancy ranged between 42.22% (*Psylliodes chrysocephala* L.) and 100.00% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 9 species in two categories: 8 accessories species and one characteristic species: *Meligethes aeneus* F..
- at variant 2 (without seed treatment but with three vegetation treatments) were collected 9 species, their abundance having values between 1429 specimens (*Meligethes aeneus* F.) to 17 specimens (*Epicometis hirta* Poda). The dominance values classified the collected species into the 5 classes of dominance, *Meligethes aeneus* F. species being an eudominant species. The constancy ranged between 31.11% (*Epicometis hirta* Poda) and 100.00% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 9 species

in two categories: 7 accessories species and 2 characteristic species: *Meligethes aeneus* F. and *Phyllotreta atra* L..

- at variant 3 (with seed treatment and three vegetation treatments) were collected 9 species, their abundance ranged from 866 specimens (*Meligethes aeneus* F.) to 9 specimens (*Psylliodes chrysocephala* L., *Chlorops pumiliones* Bjerk.). The dominance values classified the collected species into the 5 classes of dominance, *Meligethes aeneus* F. species being an eudominant species. The constancy ranged between 31.11% (*Baris chlorizans* Germ. and *Chlorops pumiliones* Bjerk.) and 100.00% (*Meligethes aeneus* F.). By the calculation of the ecological significance index we classified the 9 species in two categories: 8 accessories species and one characteristic species: *Meligethes aeneus* F..

For the useful entomofauna spread in the influence area of S.C.D.A. Secuieni, ecological parameters were calculated, respectively, abundance(no. specimens), dominance (%), constancy (%) and ecological significance index (%).

In 2010 – 2013 research period, at the collection method using **the yellow bowl type traps**, it was found that:

- at the untreated variant were collected 17 species, whose abundance ranged between 150 specimens (*Pteromalus puparum* L.) to 4 specimens (*Dioctria lateralis* Meig., *Aneuclis melanarius* Holmgr.). The dominance values classified the collected species into the 5 classes of dominance, such: D1 – 3 subrecedent species, D2 – 4 recedent species, D3 – 4 subdominant species, D4 – 3 dominant species and D5 – 3 eudominant species. The constancy ranged between 4.94% (3 species) and 85.19% (*Pteromalus puparum* L.). By the calculation of the ecological significance index we classified the 17 species in three categories: 3 accidental species, 12 accessories species and 2 characteristic species: *Harpalus aeneus* F., *Pteromalus puparum* L..
- at variant 2 (without seed treatment but with three vegetation treatments) were collected 15 species, their abundance having values between 118 specimens (*Pteromalus puparum* L.) to one specimen (*Pachycrepoideus vindemiae* Rond.). The dominance values classified the collected species into the 5 classes of dominance, such: D1 – 2 subrecedent species, D2 – 2 recedent species, D3 – 5 subdominant species, D4 – 4 dominant species and D5 – 2 eudominant species. The constancy ranged between 1.23% (*Pachycrepoideus vindemiae* Rond.) and 71.60% (*Pteromalus puparum* L.). By the calculation of the ecological

significance index we classified the 15 species in three categories: 2 accidental species, 11 accessories species and 2 characteristic species: *Harpalus aeneus* F. and *Pteromalus puparum* L..

- at variant 3 (with seed treatment and three vegetation treatments) were collected 16 species, their abundance ranging from 130 specimens (*Pteromalus puparum* L.) to 2 specimens (*Eutanyacra picta* Schrank.). The dominance values classified the collected species into the 5 classes of dominance, such: D1 – 1 subrecedent species, D2 – 2 recedent species, D3 – 7 subdominant species, D4 – 4 dominant species and D5 – 2 eudominant species. The constancy ranged between 2.47% (*Eutanyacra picta* Schrank.) and 75.31% (*Pteromalus puparum* L.). By the calculation of the ecological significance index we classified the 16 species in three categories: 2 accidental species, 13 accessories species and one characteristic species: *Pteromalus puparum* L..

At the method of collecting with the help of **Barber soil type traps**, during 2010 – 2013 research period, it was noted that:

- at the untreated variant were collected 21 species, whose abundance ranged between 291 specimens (*Harpalus aeneus* F.) to one specimen (*Pterostichus nigrita* F.). The dominance values classified the collected species into the 5 classes of dominance(D1 – 8 subrecedent species, D2 – 5 recedent species, D3 – 4 subdominant species, D4 – 1 dominant species and D5 – 3 eudominant species). The constancy ranged between 1.85% (*Pterostichus nigrita* F.) and 100.00% (*Harpalus aeneus* F.). By the calculation of the ecological significance index we classified the 21 species in three categories: 8 accidental species, 9 accessories species and 4 characteristic species.
- at variant 2 (without seed treatment but with three vegetation treatments) were collected 21 species, their abundance having values between 157 specimens (*Harpalus aeneus* F.) to 3 specimens (2 species). The dominance values classified the collected species into the 5 classes of dominance(D1 – 7 subrecedent species, D2 – 5 recedent species, D3 – 5 subdominant species, D4 – 1 dominant species and D5 – 3 eudominant species). The constancy ranged between 5.56% (2 species) and 77.78% (*Harpalus aeneus* F.). By the calculation of the ecological significance index we classified the 21 species in three categories: 6 accidental species, 12 accessories species and 3 characteristic species: *Harpalus aeneus* F., *Brachynus crepitans* L., *Pterostichus cupreus* L..

- at variant 3 (with seed treatment and three vegetation treatments) were collected 16 species, their abundance ranged from 78 specimens (*Harpalus aeneus* F.) to one specimen (*Staphylinus* spp., *Harpalus calceatus Duft.*). The dominance values classified the collected species into the 5 classes of dominance(D1 – 2 subrecedent species, D2 – 3 recedent species, D3 – 5 subdominant species, D4 – 4 dominant species and D5 – 2 eudominant species). The constancy ranged between 1.85% (2 species) and 62.96% (*Harpalus aeneus* F.). By the calculation of the ecological significance index we classified the 16 species in three categories: 2 accidental species, 12 accessories species and 2 characteristic species: *Brachynus crepitans* L. and *Harpalus aeneus* F..

In 2010 – 2013 research period, using the **shaking method**, it was found that:

- at the untreated variant were collected 19 species, whose abundance ranged between 67 specimens (*Pteromalus puparum* L.) to 3 specimens (5 species). The dominance values classified the collected species into the 5 classes of dominance (D1 – 5 subrecedent species, D2 – 3 recedent species, D3 – 5 subdominant species, D4 – 2 dominant species and D5 – 4 eudominant species). The constancy ranged between 4.44% (2 species) and 68.89% (*Coccinella* spp.). By the calculation of the ecological significance index we classified the 19 species in three categories: 5 accidental species, 10 accessories species and 4 characteristic species.
- at variant 2 (without seed treatment but with three vegetation treatments) were collected 19 species, their abundance having values between 42 specimens (*Pteromalus puparum* L.) to one specimen (*Apinae* sp.). The dominance values classified the collected species into the 5 classes of dominance (D1 – 2 subrecedent species, D2 – 5 recedent species, D3 – 6 subdominant species, D4 – 2 dominant species and D5 – 4 eudominant species). The constancy ranged between 2.22% (*Apinae* sp.) and 53.33% (*Coccinella* spp. and *Pteromalus puparum* L.). By the calculation of the ecological significance index we classified the 19 species in three categories: 6 accidental species, 9 accessories species and 4 characteristic species.
- at variant 3 (with seed treatment and three vegetation treatments) were collected 17 species, their abundance ranged from 49 specimens (*Pteromalus puparum* L.) to one specimen (3 species). The dominance values classified the collected species into the 5 classes of dominance (D1 – 3 subrecedent species, D2 – 1 recedent species, D3 – 7 subdominant

species, D4 – 4 dominant species and D5 – 2 eudominant species). The constancy ranged between 2.22% (4 species) and 66.67% (*Pteromalus puparum* L.). By the calculation of the ecological significance index we classified the 17 species in three categories: 4 accidental species, 12 accessories species and one characteristic species: *Pteromalus puparum* L..

Chapter VI – presents studies on the effectiveness of insecticides tested in pest control of canola fields and their influence on the yields obtained.

In 2010 – 2011 agricultural year, the highest efficiency was recorded in combating the *Meligethes aeneus* F. species, in V3 (with seed treatment and three vegetation treatments) and have a value of 90.00%. The lowest efficacy was recorded at *Baris chlorizans* Germ. species, in V2 (without seed treatment but with three vegetation treatments), with the value of 57.20%.

The highest efficiency, in 2011 – 2012 agricultural year, was recorded in V3 (with seed treatment and three vegetation treatments) in combating the *Meligethes aeneus* F. species, and have a value of 93.19%. The lowest efficacy was recorded at *Baris chlorizans* Germ. species, in V2 (without seed treatment but with three vegetation treatments), with the value of 58.50%.

In 2012 – 2013 agricultural year, the highest efficiency was recorded in V3 (with seed treatment and three vegetation treatments) and have a value of 94.95%, in combating the *Meligethes aeneus* F. species. The lowest efficacy was recorded in V2 (without seed treatment but with three vegetation treatments), with the value of 59.82%, in combating *Baris chlorizans* Germ. species,.

Analyzing the influence of the chemical treatment applied for pest control on the production of oilseed rape during the experimental years**,** it was found that:

- the yield obtained, in 2010 – 2011 agricultural year, at the variant with seed treatment and three vegetation treatments (3381 kg/ha) was about 1.8 higher than the yield obtained at the untreated variant (1866 kg/ha).
- in 2011 – 2012 agricultural year, the yield obtained at the variant with seed treatment and three vegetation treatments (2638 kg/ha) was about 1.8 higher than the yield obtained at the untreated variant (1407 kg/ha).
- the yield obtained, in 2012 – 2013 agricultural year, at the variant with seed treatment and three vegetation treatments (3622 kg/ha) was about 2.0 higher than the yield obtained at the untreated variant (1768 kg/ha).

It has been found that in the research variants with chemical treatments, the production was higher than in the untreated variant, which indicates the importance of chemical treatments against the pests of rape crops.