

## SUMMARY

Maize (*Zea mays* L.) is a Central American cereal cultivated today in many regions of the world as a food, industrial and fodder plant and represents 80% of cereal production along with wheat.

Corn grains are used in the industry starch, alcohol, glucose and dextrin industry. Germs are used to extract oil used in dietetic nutrition. According to the National Association of Corn Producers, the yields are as follows: 100 kg of grain yields 77 kg of grain or 63 kg of starch or 71 kg of glucose or 44 liters of alcohol or 44 kg of plastic or 5.8 liters of ethanol fuel.

Corn is used in animal feed as concentrated fodder (grain), green corn (silage), strains (cocci) mixed with urea and molasses, silage (juicy fodder).

Corn, grain and potatoes are the main cultures used to feed people in Moldova.

Entomofauna in agricultural crops is determined by an assemblage of abiotic and biotic factors in interaction with the crop plant (wheat, corn, potatoes, lucerne, etc.)

In order to maintain as much as possible biodiversity in intensively farmed arable land, it is important to monitor bioindicator species as they can indicate the quality of anthropically influenced agricultural land. Detailed knowledge of the species community in a specific agricultural land can provide us with a forecast of agroecosystem stability.

Therefore, the purpose of the researches that were carried out was to determine the composition of entomofauna, its abundance, its dominance and diversity, as well as the zoogeographical and distribution groups in intensively farmed arable land, with specific agroecological factors and applied agro-technical measures.

Teza de doctorat “**Studies of entomofauna in maize crops according to applied technologies**”, addresses the study of entomofauna in maize crops according to applied crop technology; dynamics of harmful and antagonistic species; comparative study of entomofauna from corn crops, depending on the pre-plant.

The paper covers 177 pages and, according to the norms currently in force, it is made up of two main parts, namely the first part entitled "**The Current Stage of Knowledge**" of the national and international issues covered with 45 pages and the part the second one entitled "**Own Research**", extended on 132 pages, 102 tables and 9 figures.

The "current state of knowledge" consists of two chapters summarizing information from the literature with reference to the subject of the PhD thesis and subsequently used for the interpretation and comparison of the data obtained in the "Own Research" part and description of the natural environment of the Botosani County, in this chapter are presented information on geographic location, pedoclimatic conditions and meteorological and agrometeorological conditions from the research period in the stationaries studied.

**Part II, "Own Research"**, consists of 2 chapters:

**Chapter III** presents the purpose and objectives of the research, the materials and research methods used. The proposed objectives were:

1. Knowledge of the current state of the researches regarding the useful and harmful fauna of the corn crops in the NE of Moldova.
2. Monitoring the evolution of entomofauna biodiversity for each experimental variant.
3. Comparative study of entomofauna in maize crops, depending on the applied technology, especially the pre-plant.
4. The statistical calculation for each variant of ecological parameters such as abundance (A), constancy (C), dominance (D) and ecological significance index (W)

To achieve the objectives, several activities were carried out, namely:

- the bibliographic study of literature in the field, both in the world and in our country;
- installing different types of traps for biodiversity monitoring in the experimental field;
- observations made directly on the plants in the field;
- collecting the biological material through different methods: using Barber soil traps, entomological mesh, frappe etc;
- Sampling and performing specific analyzes to quantify some indicators.
- preparation of the material in order to identify the harmful and useful insects collected;
- analysis of collected biological material, determination of species and calculation of some ecological indices of pest populations and useful fauna.
- Calculation of the main environmental indicators: abundance (A), dominance (D), constancy (C), ecological significance index (W), etc.
- monitoring the evolution of entomofauna biodiversity for each experimental variant.

**Chapter IV Results and Discussions** presents studies on the structure, dynamics and some ecological parameters of the entomofauna collected in the stationary studios. To conduct research on entomophage collected from corn crops, Barber soil traps were used from May to August.

Four experimental variants were used to achieve the research objectives:

- variant 1, corn by grain;
- variant 2, corn after sunflower;
- variant 3, corn after soya;
- variant 4, corn by corn.

**The structure, dynamics and abundance of entomofauna collected from corn crops in V1 variant, corn by grain** was done periodically, with the help of Barber soil traps placed 6 traps and the material from 20 traps was harvested (Rec I - 6 traps, Recording II - 5 traps, Recording III - 3 traps, Rec. IV - 6 traps)

➤ in the corn crops a number of 4 harvests of the entomological material were made at the following dates: 25.05; 20.06; 15.07; 10.08. Were collected 2040 samples of insects belonging to 58 species/taxon. The collected species belong to 8 orders. The orders with the highest number of samples collected were *Coleoptera* (1891 samples), *Orthoptera* (38 samples), *Hymenoptera* (30 samples), *Arachnida* (26 samples), *Homoptera* (20 samples), *Diptera* (15 samples), *Heteroptera* samples) and *Isopoda* (8 samples).

➤ The highest percentage of samples of the species compared to the total number of samples had its species: *Epicometis hirta* Poda (66,17%), *Heteroptera* (7,06%), *Dermestes laniarius* L. (4,9 %), *Pterostichus cupreus* L (2,84%), *Harpalus distinguendus* Duft (2,79%), etc. The other species had a percentage between 0,049 % and 1,18 %

➤ In terms of the share of the species collected from the 2040 specimens, the *Coleoptera* are the most numerous, representing 92.7% of the total, followed by orthoptera by 1.86% of the total; the lowest weights, less than 1% had homopters (0.98%), dipters (0.73%), heteroptera (0.59%) and isopods (0.4%).

➤ Referring to the number of traps in which each species was collected, the variant V 1 shows that the most frequently collected species were *Dermestes laniarius* L, *Dorcadion pedestre* Poda, *Epicometis hirta* Poda, *Pterostichus cupreus* L and *Silpha obscura*, in 6 traps, followed by 7 species collected in 5 traps, then 10 species recorded in 4 traps, *Anisodactylus signatus* and *Armadilidium vulgare* in 3 traps. The other species were collected in one or two traps;

**In these species were calculated abundance (A), Constance (C), dominance (D) and environmental significance index (W).**

➤ the largest **abundance** had 21 species, of which: *Epicometis hirta* Poda (1350 samples), *Dermestes laniarius* L (71 samples), *Pterostichus cupreus* L (58 samples), *Harpalus distinguendus* Duft (57 samples). The other species had between 1 and 10 samples;

➤ species collected **constancy** of values between 5 and 30. The species with the highest values of the constant were *Silpha obscure* *Epicometis hirta* Poda, *Dorcadionpedestre* Poda, *Dermestes laniarius* L (30), *Arachnida*,

*Formicomus pedestris* Rossi, *Harpalus distinguendus* Duft, *Longitarsus anchusae*, *Phyllotreta vittula* and *Pseudophonus rufipes* (25), etc. The lowest values of constancy (5) had a number of 24 species.

➤ **Dominance** had the highest values for 18 species: *Epicometis hirta* Poda (66,18), *Dermestes lanarius* L (3,48), *Pterostichus cupreus* L (2,85), *Harpalus distinguendus* Duft (2,8), etc. The other species were between 0.5 and 0.05;

➤ **ecological significance index** has high values of 1.00 to 2 species *Epicometis hirta* Poda (19.854) and *Dermestes lanarius* L (10.44).

**The structure, dynamics and abundance of entomofauna collected from corn crops in V2 variant, corn after sunflower** was determined by harvesting the material from 24 traps (6 traps in 4 harvests), 55 species / taxons being collected, with a total of 2484 samples.

➤ The most frequently collected species were *Arachnida*, *Dermestes lanarius* L, *Dorcadion pedestre* Poda, *Epicometis hirta* Poda, *Gryllus campestris*, *Harpalus distinguendus* Duft, *Heteroptera* (*Pyrrhocoris*) and *Pterostichus cupreus* L, in 6 traps

➤ The highest percentage of samples of the species compared to the total number of samples was: *Epicometis hirta* Poda (55,66%), *Pterostichus cupreus* L (18,01%), *Heteroptera* (*Pyrrhocoris*) (4,54%), *Harpalus distinguendus* Duft (2,57%), *Dermestes lanarius* L. (1,28%), *Anthicus antherimus* and *Gryllus campestris* L (1,81%), *Arachnida* and *Phyllotreta vittula* (1,12 %) and *Opatrum sabulosum* L. (1 %). The other species had a percentage of between 0.049% and 0.78%,

➤ In terms of the share of the species collected from 2484 samples, the largest number of *Coleoptera* is represented by 90.03% of the total, followed by heteroptera by 4.71% of the total, by 1.52% by the species of the hymenoptera and the orthoptera and arachnids are recorded 1.25% and 1.12% respectively; the lowest weights, less than 1% had diptera (0.57%), isopods (0.45%) and homoptera (0.08%).

**s regards the values of the ecological indices**, it follows that:

➤ had the highest **abundance** of a species: *Epicometis hirta* Poda (1384 samples), and *Cassida nobilis* L and *Trox sabulosus* (10 samples). The other species had between 1 and 9 specimens;

➤ **the constancy** of the collected species ranged between 5.27 and 31.58. The species with the highest values of constancy was: *Agriotes lineatus*, *Armadilidium vulgare*, *Dermestes lanarius* L, *Epicometis hirta* Poda, *Formicomus pedestris*, *Gryllus campestris*, *Harpalus distinguendus* Duft, *Opatrum sabulosum* L., etc. The lowest value was recorded by a total of 29 species.

➤ **Dominance** had the highest values for species: *Epicometis hirta* Poda (49,96), *Formicomus pedestris* (13,42), *Pterostichus cupreus* L (6,33), *Agriotes lineatus* (4,81), *Opatrum sabulosum* L. (3,91), *Dermestes lanarius* L (3,33),

*Gryllus campestris* L(1,62), *Pseudophonus rufipes* (1,57), *Hymenoptera* (furnici) (1,53), *Harpalus distinguendus* Duft (1,24), *Orchestes quercus* (1,05), *Armadilidium vulgare* and *Pseudocleonus cinereus* (1,00). The other species had domination values of less than 1.00;

➤ **the ecological significance index** had values higher than 1.00 for a number of 6 species. This is it: *Epicometis hirta* Poda (15,77), *Formicomus pedestris* (4,23), *Pterostichus cupreus* L (1,99), *Agriotes lineatus* (1,52), *Opatrum sabulosum* L. (1,234) and *Dermestes lanarius* L (1,051).

**The structure, dynamics and abundance of entomofauna collected from corn crops in V3 variant, soybean corn** was determined by harvesting the material from 23 traps, with 46 species / taxon collected, with a total of 1592 samples.

➤ the highest percentage of samples of the species compared to the total number of samples had its species: *Epicometis hirta* Poda (52,32%), *Opatrum sabulosum* L.(9,04 %), *Pterostichus cupreus* L (8,85%), *Harpalus distinguendus* Duft (4,96%), *Pseudophonus rufipes* (3,14 %), *Gryllus campestris* L(2,51%), *Dermestes lanarius* L. (2,32%), *Armadilidium vulgare* (1,5%) and *Agriotes lineatus* (1,31%). The other species had a percentage of between 0.06% and 0.8%

➤ Referring to the number of traps in which each species was collected, the most frequently collected species were: *Armadilidium vulgare*, *Epicometis hirta* Poda, *Harpalus distinguendus* Duft and *Pterostichus cupreus* L, in 6 traps, followed by *Anisodactylus binotatus*, *Coccinella 7 punctata*, *Gryllus campestris* Land *Pseudophonus rufipes*, collected by 5 traps, and *Agriotes lineatus*, *Hymrachnida*, *Cetonia aurata*, *Dolichus halensis* and *Homoptera*(cycadas) in 3 traps. The other species were collected in one or two traps;

➤ With regard to the share of the species collected from the 1592 samples, the *Coleoptera* represent 90.77% of the total followed by *Orthoptera* with 2.83%, *Hymenoptera* (2.32%), *Isopoda* (1.5%) and *Homoptera* (1, 32%). The lower weights below 1% have been *Arahnida* (0.82%), *Diptera* (0.38%) and *Heteroptera* (0.06%).

**Regarding the values of the ecological indices**, it follows that:

➤ the greatest **abundance** was the species: *Epicometis hirta* Poda (833 samples), *Opatrum sabulosum* L. (144 samples), *Pterostichus cupreus* L (141 samples), *Harpalus distinguendus* Duft Duft (79 samples), *Pseudophonus rufipes* (50 samples), *Gryllus campestris* L(40 samples), *Dermestes lanarius* L (37 samples), *Armadilidium vulgare* (24 samples), *Agriotes lineatus* i *Coccinella septempunctata* (21 samples), *Arahnida*, *Dolichus halensis* and *Hymenoptera* (*Apis*) (13 samples), *Homoptera* (aphids), *Hymenoptera* and *Hymenoptera* (wasps) (12 samples), *Anisodactylus binotatus* (11 samples). The other species had between 1 and 9 samples;

➤ **the constancy** of the species collected had values between 4.35 and 26.09. The species with the highest values of constancy was: *Armadilidium vulgare*, *Epicometis hirta* Poda, *Harpalus distinguendus* Duft, *Pterostichus cupreus* L (26,09), *Anysodactylus binotatus*, *Coccinella 7 punctata*, *Dermestes laniarius* L, *Gryllus campestris* Land *Pseudophonus rufipes* (21,75), *Agriotes lineatus*, *Hymenoptera (Apis)*, *Hymenoptera* and *Opatrum sabulosum* L. (17,4), *Arahnida*, *Dolichus halensis* and *Homoptera (cicadas)* (13,05) *Amara aenea*, *Blytrophaga undata*, *Cantharis fusca*, *Cassida nobilis* L, *Corymbites latus*, *Hymenoptera (wasps)*, *Orthoptera*, *Pseudocleanus cinereus*, *Pseudophonus caesus*, *Pterostichus niger*, *Tanymecus dilaticollis* Gyll, *Trox sabulosus* and *Zabrus blapoides* cu 8,7. The smallest values of constancy (4.35) had a number of 17 species.

➤ **Dominance** had the highest values for species: *Epicometis hirta* Poda (52,33), *Opatrum sabulosum* L. (9,05), *Pterostichus cupreus* L (8,86), *Harpalus distinguendus* Duft (4,97), *Pseudophonus rufipes* (3,14), *Gryllus campestris* L (2,52), *Dermestes laniarius* L (2,33), *Armadilidium vulgare* (1,51), and species *Agriotes lineatus* and *Coccinella 7 punctata* (1,32). The other species had lower domination values 1,00;

➤ **the ecological significance index** had values higher than 1.00 for a number of 4 species. This is it: *Epicometis hirta* Poda (12,08), *Pterostichus cupreus* L (2,31), *Opatrum sabulosum* L. (1,57) and *Harpalus distinguendus* Duft (1,29).

**Structure, dynamics and abundance of entomofauna collected from maize crops at variant 4, corn by corn.** In variant V4, corn after corn was harvested the material from 19 traps, in total, 2098 samples belonging to a number of 55 species were collected.

➤ the highest percentage of samples of the species compared to the total number of samples had its species: *Epicometis hirta* Poda (49,95%), *Formicomus pedestris* (13,41%), *Pterostichus cupreus* L (6,35%), *Agriotes lineatus* (4,8%), *Dermestes laniarius* L. (3,33%). The other species had a percentage of 0.19% to 1.61%

➤ Referring to the number of traps in which each species was collected, the most frequently collected species were: *Agriotes lineatus*, *Armadilidium vulgare*, *Dermestes laniarius* L, *Epicometis hirta* Poda, *Formicomus pedestris*, *Gryllus campestris*, *Harpalus distinguendus* Duft, *Opatrum sabulosum*, *Pseudocleanus cinereus*, *Pterostichus cupreus* L, in 6 traps, followed by *Anisodactylus binotatus*, *Orchestes quercus*, collected by 5 traps, and *Cassida nobilis*, *Corymbites latus*, *Hymenoptera (ants)*, *Pleurophorus caesus*, in 4 traps, *Anthicus humilis*, *Arahnide*, *Phyllotreta nemorum*, were captured in 3 traps. The other species were collected in one or two traps;

**With regard to the ecological index values** V4 variant of the farm is as follows:

- **Abundance** had values ranging from 1050 samples to *Epicometis hirta* Poda and one samples (14 species);
- **constancy** of the collected species ranged between 5.27 and 31.58. Depending on the value of this indicator, the species is distributed in the following classes: 43 species it is accidental and 12 species it is accessories.
- **dominance** according to the calculated percentage value, the species are distributed in the following classes: 43 species are subrecedent, 7 species are recedente, 3 species are subdominant, one species is dominant, one species is eudominant(*Epicometis hirta* Poda)
- **the ecological significance index had values** higher than 1.00 for a number of 6 species. This is it:*Epicometis hirta* Poda (15,77), *Formicomus pedestris* (4,23), *Pterostichus cupreus* L (1,99), *Agrioteslineatus* (1,52), *Opatrum sabulosum* L. (1,234) and *Dermestes lanarius* L (1,051).

**Observations regarding the structure, dynamics and abundance of entomofauna collected in the four experimental variants** highlight the following aspects:

- were collected 103 species with a total of 8214 samples of which: 2040 samples at V1, 2484 samples at V2, 1592 samples at V3 and 2098 samples at V4
- Species with the highest number of samples were: *Epicometis hirta* Poda with 4617 samples, followed by the species *Pterostichus cupreus* L with 799 samples, *Formicomus pedestris* Rossi with 321 samples, *Opatrum sabulosum* L. with 267 samples, *Harpalus distinguendus* Duft with 226 samples, *Dermestes lanarius* L with 210 samples, *Gryllus campestris* with 141 samples, *Agriotes lineatus* with 137 samples, *Pseudophonus rufipes* with 130 samples, *Heteroptera (Pyrrhocoris apterus)* with 115 samples, etc. A total of 18 species had one sample collected.
- Looking at the four variants of pre-emergent plants as a whole, we can see that the number of samples collected in variant V2 represents 30% of all species, 25% for variants V1 and V4 and the remaining 20% is V3.
- If we refer to the species that were collected in only one variant, of the 103 species, we can say that 16 species were collected only in V1, 10 species in V2, 4 species in V3 and 14 species only in V4, a total of 44 species
- 17 species are found in three variants with a total of 739 samples representing 9% of the species collected.
- Most of the collected samples belong to 17 species with a total of 6917 samples representing 84.2% of the total, collected from all four variants. In V1 variant corn after grain, out of a total of 17 species, 2 species are dominant: *Epicometis hirta* Poda and *Dermestes lanarius* L., in variant V2 corn after sunflower, 4 species are dominant: *Epicometis hirta* Poda, *Pterostichus cupreus* L., *Arahnida* and *Hymenoptera*., in variant V3 corn after soybean, 8 species are dominant: *Opatrum sabulosum* L., *Gryllus campestris*, *Pseudophonus rufipes*,

*Armadillidium vulgare*, *Harpalus distinguendus* Duft, *Coccinella 7 punctata*, *Homoptera* (cycadas) and *Hymenoptera* (*Apis*), and in V4 variant corn after corn, 4 species are dominant: *Agriotes lineatus*, *Pseudocleonus cinereus*, *Anisodactylus binotatus* and *Cassida nobilis* L.

**Results on coccineline entomofauna (*Coleoptera* - *Coccinellidae*) collected from corn crops in society**

➤ During the research they were collected several species such coccineline: *Coccinella septempunctata* (280 samples), *Adalia bipunctata* (230 samples), *Thea vigintiduopunctata* (120 samples), *Propylea quatordecimpunctata* (100 samples), *Tythaspis sedecimpunctata* (80 samples), *Adonia variegata* (63 samples), *Adalia decempunctata* (38 samples), *Hippodamia tredecimpunctata* (21 samples), and species *Coccinella undecimpunctata* and *Anatis ocellata* (7 samples).