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# CHARACTERIZATION OF USEFUL AND HARMFUL INSECTS BIODIVERSITY IN VALEA CALUGAREASCA VITICULTURAL ECOSYSTEM

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***Abstract***
*The mail goal of this paper was to analyse the environmental impact of agricultural practices in Valea Calugareasca viticultural ecosystem. Diversity characterizes the healthy state of ecosistems. The quantification of biodiversity was achieved in order to understand and compare the ecosystem community structure, based on the following indicators: Simpson biodiversity index, Shannon biodiversity index, equitability. They were applied five different variants of vines culture technology: (1) natural permanent grassing soil; (2) temporary natural grassing; (3) artificial grassing or sown; (4) cultivation of the strips between the rows with plants bees; (5) black furrow by plowing. The biodiversity at the level of useful and harmful insect species was influenced by the applied culture technology, this process been highlighted by the values of diversity indices. The two indices of diversity, Shannon and Simpson recorded the highest values in case of technological variants based on maintenance of soil by permanent natural grassing and artificial or sown grassing.*

*Keywords: biodiversity, ecosystem, useful and harmful fauna, vine.*

## 1. INTRODUCTION

Survival of the human species is ensured and limited by natural services and resources. One of the services is to maintain biodiversity. Its decline is a major concern of specialists in the field. The importance of biodiversity stems from its role in maintaining ecological processes that ensure soil formation, the conversion of inorganic matter into the presence of solar light in organic matter, the absorption of pollutants, the regulation of substance circuits in nature such as water, carbon, nitrogen, climate regulation and resource supply natural**.**

Species diversity is an indicator of the stability of the ecological system. It is a source of food, raw material and health for people as a "natural pharmacy". It is important in scientific research to protect and preserve it.

Biodiversity characterizes the health status of ecosystems (Begon et al., 1996; Holloway and Stork, 1991; Popov, 1979a, 1984b; Popov et al., 2007). Insects play a vital role in the functioning of an ecosystem (Popov et al., 2005a, 2006b). Species are the ecosystem recycling compartment providing the material circuit and energy flow.


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## 2. MATERIALS AND METHODS

The researches were carried out between 2015-2016, at the Research and Development Institute for Viticulture and Enology Valea Calugareasca.

In a vineyard ecosystem, they were applied five different variants of vines culture technology:

V1: natural permanent grassing soil by leaving the strip between rows of herbs (sprouts) growing spontaneously;

V2: temporary natural grassing by leaving the ground for a few years, after which it appears. Leave the band between rows of herbs (weeds) growing spontaneously;

V3: artificial grassing or sown by grinding soil in strips (the area between rows) and sowing the land with green fertilizers: wild peas (*Pisum elatius)*, white clover *(Trifolium repens)*;

V4: cultivation of the strips between the rows with plants bees (*Salvia officinale*);

V5: black furrow by plowing.

In order to collect the biological material representing the useful and harmful entomofauna reserve from the vineyards, several methods have been used.

**The Barber traps**, which are the classic method for collecting ground-moving arthropods (epigee), in the case of nocturnal or diurnal grasshoppers, but also other invertebrates with high activity on the soil, such as aranas, miriapodes, etc. A trap is composed of a glass vessel (diameter 8 cm) and a capacity of 400-450 ml. The dishes are buried in the soil so that their upper part is at ground level. Inside the vessels are placed 125 ml of formalin or formaldehyde solution in the concentration of 3-4%, substances that preserve the collected material and do not influence in any way the capture (Figure 1). Six traps /variant were installed in each experimental plot.

**Leaf samples** were an efficient method of estimating populations at the leaf level. This method consists in taking 50 leaves / variant, collected randomly once a week (on the same day of the week) (Figure 2). They were put in bags with the batch and date labels, transported to the laboratory, and examined under a microscope.

**The fracture technique** was used to evaluate fauna (harmful and useful) in the experimental variants, completing the other techniques (visual control, buried traps or Barber). The basic principle of the method is to shake a number of vegetative organs above a conical or square device (an entomological net).

The identification of harmful and useful species was carried out in the laboratory using a specialized instrumentation: binocular magnifier, microscope and documentary material (manual, determined determinants, atlases).

For the quantification of biodiversity in a habitat, the following indices of biodiversity characterization were used: the Simpson biodiversity index, the Shanon biodiversity index and equivalence. Biodiversity indices are the mathematical measure of species diversity in a community. The ability to quantify diversity through indices is an important tool for biologists to understand and compare the structure of a community (Begon et al., 1996).

The Shannon diversity index is a common index used to characterize the diversity of species in a community and takes into account both abundance and fairness of species distribution. The Simpson biodiversity index is used to describe the abundance of each species. Equity is the measure of the relative abundance of different species. These indices were calculated from the field data, comparing the values obtained for the 5 variants of soil maintenance in the wine ecosystem.


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***Figure 1- Location of Barber traps***

***Figure 2- Harvesting leaf samples***

**3. RESULTS AND DISCUSSIONS**

58 species of harmful fauna and 183 species of useful fauna were found.

From the first category we highlight the following species: *Coccinella 7-punctata*, *Propylea 14-punctata* L., *Coccinula 14-punctata* L., *Thea 22-punctata* L, *Haplothrips intermedius* Bong, *Haplothrips reuteri* Karn, *Empoasca vitis, Cicadella viridis* L., *Hyalesthes obsoletus* Signoret., *Nabis sp., Scymnus sp., Peribatodes rhomboidaria, Calliptamus italicus L., Locusta migratoria* L.

From the category of useful species, we highlight *Forficula auricularia* L, *Blitophaga undata* Mull., *Calosoma auropunctata* L., *Harpalus pubescens* L., *Sciaridae*, *Chalcidoidea*, *Ichneumonoidea*, *Formicoidea*.

In the useful fauna, the percentages per species were as follows: Coleoptera-7.90%; Araneae-24.34%; Diptera-1.97%; Dermaptera-52.63%; Hymenoptera-13.16% (Figure 3).

The following percentages were found in the harmful fauna: Homoptera - 58.62%; Lepidoptera-1.72%; Orthoptera-39.66% (Figure 4).

As can be seen from the data below, the indices of diversity used reveal different values obtained in the five soil maintenance variants. In Figure 5, the Shannon diversity index best illustrates the difference between technologies in the Orthoptera and Homoptera orders. Insects in the Orthoptera order showed the lowest diversity index.

The relevant differences are found in the Lepidoptera order (Figure 6), where diversity was absent, with the value of 0.00, except for the V3 variant at which the Simpson diversity index had the value of 1.00. In the case of the Araneae order, Shannon and Simpson had the highest values for variants V1 and V2.

In Figure 5, in the case of the Dermaptera order, the Shannon diversity index had the highest value for V3 variant, and the Simpson diversity index in the same variation.

The lowest index values were recorded for V5. The order of Coleoptera presented the highest values of the indices in the soil maintenance variant by natural permanent grassing soil (V1).

At the Diptera order, for variants of soil maintenance V2 and V3, diversity did not exist, and for variants V1 and V4 had the same values (0.69 and 1.00 respectively).




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Insects of the Hymenoptera order presented the highest values of the Shannon diversity index for the black furrow by plowing (V5). The Simpson Diversity Index had the highest values for the V3 variant, by artificial grassing or sown (Figure 6).

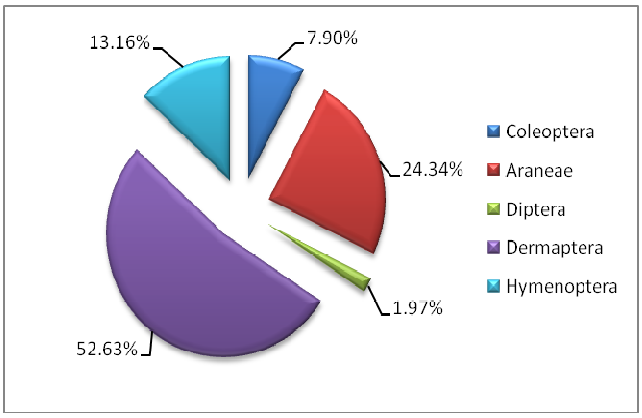


***Figure 3- Useful fauna***

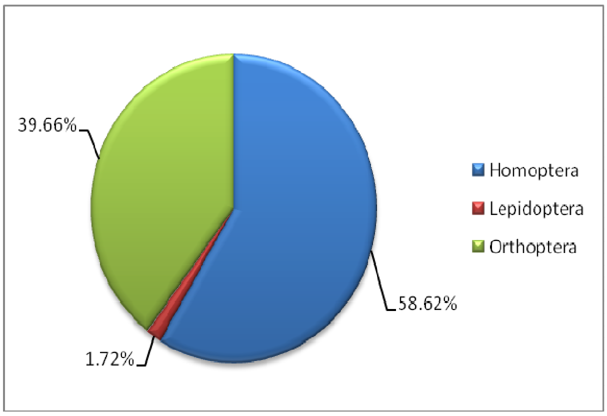


***Figure 4- Harmful fauna***

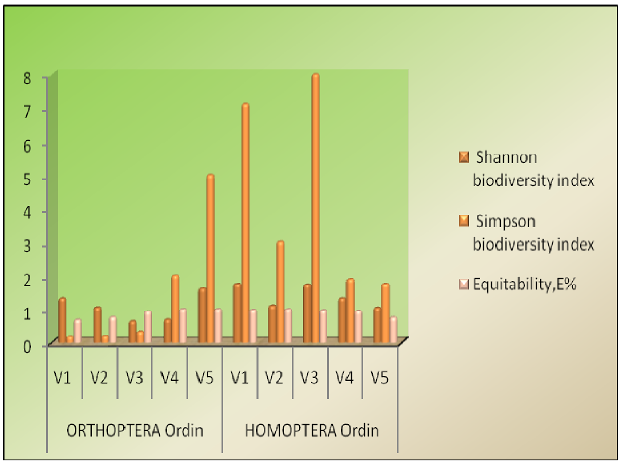


***Figure 5- Diversity indicators for Orthoptera and Homoptera species in five variants of vines culture technology***

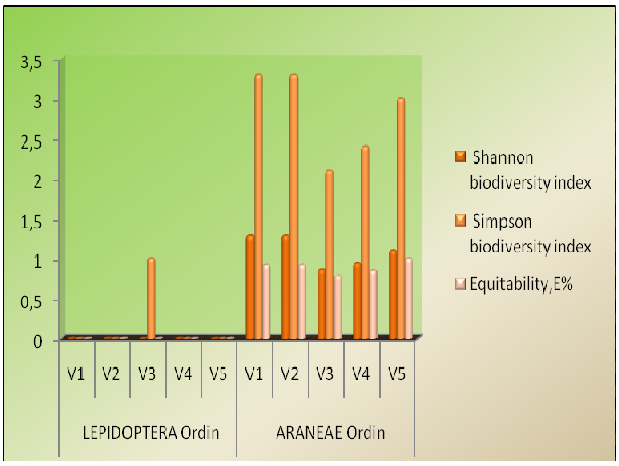


***Figure 6- Diversity indicators for Lepidoptera and Araneae species in five variants of vines culture technology***


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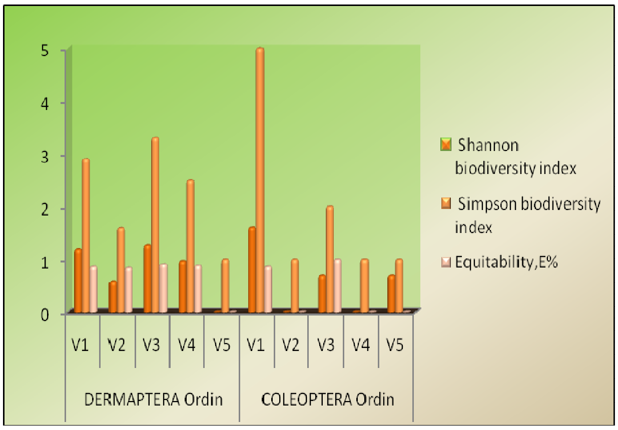


***Figure 7- Diversity indicators for Dermaptera and Coleoptera species in five variants of vines culture technology***

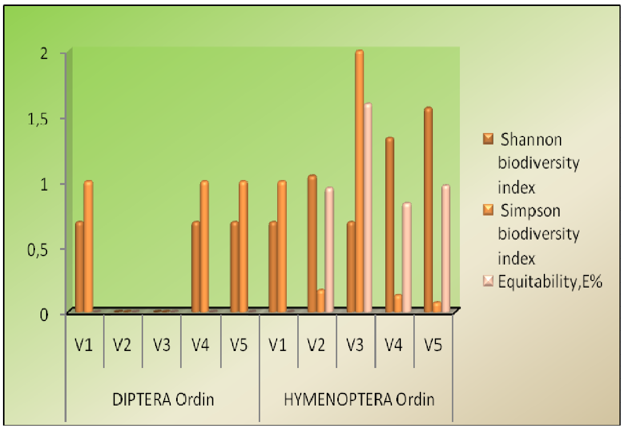


***Figure 8- Diversity indicators for Diptera and Hymenoptera species in five variants of culture technology***

## 4. CONCLUSIONS

1. The useful and damaging fauna of a vineyard ecosystem is very varied.
2. Vine culture technology strongly influences biodiversity at the level of useful and harmful arthropod species, being significantly illustrated by diversity indices.
3. The highest values for the harmful and useful insect pests of the Shannon and Simpson diversity indicators were technologically via the natural permanent grassing soil and by artificial grassing or sown.

## 5. ACKNOWLEDGEMENTS

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