

SUMMARY

of the PhD thesis entitled:

RESEARCH ON *LUMBRICIDAE* POPULATIONS UNDER DIFFERENT PEDOCLIMATIC CONDITIONS IN MAIZE CROP

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Keywords: earthworms, *Lumbricidae*, soil biodiversity, vermicompost, ecosystem

The aim of the research is to analyze the influence of vermicompost and vermicompost extract on maize cultivation, as well as to investigate *Lumbricidae* populations under different pedoclimatic conditions in Romania. The research focused on evaluating the effects of vermicompost application on plant growth and soil health, as well as investigating the impact of environmental factors on earthworm populations in both natural and controlled conditions.

Structure of the PhD thesis

The PhD thesis "**Research on *Lumbricidae* Populations Under Different Pedoclimatic Conditions in Maize Crop**" consists of two parts, in accordance with current regulations: the bibliographic study, which includes 158 references, and the personal research. **Part I: Bibliographic Study** contains one chapter, totaling 25 pages, representing approximately one third of the thesis and forming the basis for its development.

CHAPTER I. The current state of knowledge regarding *Lumbricidae* populations in agricultural crops aims to refresh knowledge about the impact and benefits of earthworms on soil structure. *Lumbricidae* populations represent an essential component of agricultural ecosystems due to their vital role in maintaining soil structure and fertility. Earthworms are considered bioindicators of soil health, being key organisms in the nutrient cycle. Depending on the species and environmental conditions, they can influence mineralization processes, organic matter decomposition, and soil aggregate formation. The diversity and abundance of earthworm populations are influenced by climatic factors, soil type, and agricultural practices, including pesticide and fertilizer use. Earthworms play a crucial role in the nutrient cycle by decomposing organic matter and accelerating the humification process. Through their feeding and soil mixing activity, earthworms contribute to the mineralization of nitrogen and phosphorus, two essential elements for plant growth. The channels created by earthworms increase water infiltration and improve soil aeration, thus facilitating plant access to nutrients. Additionally, their activity stimulates microbiological activity, which has a positive impact on nutrient availability in the soil.

Part II of the thesis is dedicated to personal research conducted in the study area from 2020 to 2022, focusing on the impact of vermicompost and vermicompost extract application in maize cultivation, as well as determining *Lumbricidae* populations in maize-cultivated agricultural lands in three different regions of Romania.

Chapter II, Materials and Methods, describes the institutional framework and the material base used for this research. The studies were conducted from March 2020 to September 2022 and involved the collection of *Lumbricidae* from the three research locations: Secuieni - Neamț County, Beidaud - Tulcea County, and Borcea - Călărași County, as well as agricultural works performed. The second part of the research consists of studies carried out in the laboratory of the Plant Protection Research and Development Institute in Bucharest,

where maize samples were analyzed, along with the effects of vermicompost and vermicompost extract application on them. The research aimed to determine the efficiency of these products in the growth and development of maize plants. Various methods of vermicompost application were used on different experimental plots, and the plant responses to these treatments were monitored. *Lumbricidae* populations were studied in different locations across Romania to understand the variability in abundance and species diversity based on local soil and climatic conditions. The collection methods included the use of soil traps and manual digging to obtain soil samples. The earthworm populations were then analyzed to determine their abundance, diversity, and structure.

Chapter III. Results and Discussions presents the conclusions of the research on vermicompost and vermicompost extract application in maize cultivation, as well as studies on *Lumbricidae* populations in different locations. **Results from the application of vermicompost and vermicompost extract:** This section analyzes the effects of vermicompost and vermicompost extract treatments on maize seed germination and plant development. **Effects of vermicompost extract on maize root germination and development:** The results show the positive impact of vermicompost extract on the germination process and root growth. **Effects of vermicompost on maize root and foliar development:** This subsection describes the impact of vermicompost application on both root and foliar development in maize, highlighting improvements observed at both levels. **Results obtained in Secuieni - Neamț County, Beidaud - Tulcea County, and Borcea - Călărași County:** The results of the research on *Lumbricidae* populations in these locations are presented. The studies evaluated the abundance and diversity of earthworm species, analyzing the influence of local soil and climatic conditions on these populations.

Chapter VI – General Conclusions and Recommendations: This final chapter is dedicated to the conclusions and especially to recommendations regarding agricultural practices. In all three locations – **Secuieni, Beidaud, and Borcea** – there is a direct relationship between climatic conditions (especially temperature and precipitation) and earthworm population activity. The populations were most active in years with adequate rainfall and moderate temperatures, such as in 2020, while biological activity decreased significantly in 2021 and 2022 due to rising temperatures and periods of drought. However, the precipitation in some summer months of 2022 favored a slight recovery of biological activity in **Beidaud and Borcea**.