ABSTRACT

Keywords:

No-tillage, conventional tillage, *Triticum aestivum* L., amount of soil microorganism, physical properties, crop yield.

The main challenge today is to produce enough food and fiber for the world's population, which is expected to grow to about 9-11 billion people to year 2050. In addition to ensuring food security, the quality and functionality of the soil are major concerns.

Over the years, the need to produce as much as possible has led to an intensification of agriculture, which has led to increased food production and improved economic profitability on the one hand, but also accelerated soil quality degradation on the other.

From a historical point of view, soil tillage has been necessary for seedbed and weed control, although it has also resulted in soil degradation and loss of organic matter.

Thus, with the advent of conservation agriculture in the 1990s, especially the use of no-tillage systems, it has been proved that maintaining crop productivity, soil fertility, and environmental sustainability could provide potential advantages over conventional systems.

The development of sustainable tillage systems, which can assure constant crop productivity while reducing soil degradation, involves substantial knowledge about the effects of agricultural practices.

If the multitude of research studies after the NT concept's emergence showed its efficiency in connection to soil quality, it was deemed suitable to conduct research on the PhD thesis entitled „***The influence of tillage system applied to the crops of autumn wheat on some components of the soil population***". The experiments are aimed at measuring the effects of tillage (both conventional and no-tillage) on microbiological activity, physical and hydrophysical indices, as well as productivity

parameters in winter wheat. Researching the implementation and development of agricultural technologies that have the potential to enhance soil quality and increase winter wheat crop productivity, wheat is an important cereal crop that ranks third in global production after corn and rice, covering 22 % of the world's total cultivated land (18 million km^2).

Considering the importance of microorganisms in the cycling of nutrients, and in particularly the fact that microbial communities are subject to significant, radical, and dynamic change as a result of applied tillage methods, I believe it is essential to understand how soil microbial communities respond to tillage activities in my opinion, considering this research will help to promote soil applied technologies that enhance productivity as well as other soil properties.

Considering the information presented in this paper, the aim was to accomplish the project objectives related to the effects of tillage systems on soil characteristics as a factor of the climatic conditions in the study region.

The following activities were required to meet the objectives:

- Organizing the experience of soil preparation from an agrotechnical approach (in the case of the CV variant, execution of basic ploughing and seedbed preparation) and phytotechnics (following sowing and harvesting dates);
- Soil sampling to determine the soil's physical and hydrophysical properties, such as bulk density, water stability, and soil moisture. They were collected in three stages, diagonally, from each variant of tillage in order to highlight the differences between them as clearly as possible.
- Collecting samples for analysis relevant to soil microbiology determination. The total number of microorganisms, the proportion of fungus, the number of G^+ and G^- bacteria, free aerobic and anaerobic nitrogen fixers, *Azotobacter chroococcum*, and *Clostridium pasteurianum* all were determined during this activity.
- Harvesting experiences and analyzing the elements of productivity;
- Assessing production.

The experiment took place during three agricultural years, from 2016 to 2019, on a plot of land within the Ezăreni farm, which is part of the University of Life Sciences' "Ion Ionescu de la Brad" Teaching Station in Iasi.

The thesis contains 198 pages and is divided into two parts, comprising eight chapters, tables, and figures.

The first part, which is divided into two chapters, contains a synthesis of bibliographic data, while the second part, which is divided into six chapters, contains the study material and method, as well as the climatic conditions of the three years of experience and the outcomes.

Documentary studies were conducted for the first part of the thesis from various sources, including scientific articles, journals, books, doctoral theses, and specialized treatises, resulting in the first chapter of the thesis containing various information and visions that help understand the concept of tillage, as well as some important aspects of winter wheat cultivation.

The second chapter provides an overview of current studies on the impact of tillage systems on soil's physical, hydrologic, and microbiological qualities.

The goal and objectives of the research, as well as research materials and techniques, are presented in chapter three of the thesis.

Soil samples were taken in a natural setting from a depth of 0-40 cm, from every 10 cm layer, to measure the bulk density, using the ratio of the dry soil mass in the oven to the entire volume of the sample.

The samples modified settlement were also collected down to a depth of 40 cm and examined in terms of structural element size by sifting on a sieve with different mesh sizes and water stability by sieving in distilled water.

Samples were collected and evaluated in all three agricultural years, at sowing, during vegetation, and at harvesting of winter wheat, in order to make these determinations.

The gravimetric method was used to determine soil moisture at depths of 0-90 cm, every 10 cm down to 30 cm, and every 20 cm down to 90 cm. The sampling period was identical to earlier determinations, with the caveat that during the vegetation period and until crop harvest, the goal was to collect samples every decade, or every 10 days, depending on climatic conditions.

During four stages of vegetation, tillering, stem elongation, flowering and harvesting, samples were taken from 7 cm around the roots to emphasize biological activity.

The fourth chapter summarizes the climatic data collected over the three years of research and includes a description of the natural environment on the Ezăreni farm.

In terms of rainfall, the first year of experience, 2016-2017, was the wettest, with an annual amount of 871.1 mm, while in terms of average annual temperature, the second agricultural year had an variation of 1.61 ^{O}C compared to the multiannual average.

The fifth chapter presents and evaluates personal data regarding the impact of the two tillage systems on some soil physical and hydro-physical parameters.

The no-tillage system had lower bulk density values due to the fact that all soil work is done in a single pass with the help of a complex equipment that handles loosening, processing, fertilizing, and planting in a single passing. As a result, the soil was less compacted than in the conventional version.

The results showed that under the no-tillage system, water stability and soil moisture were positively influenced, both at sowing and during the vegetation period.

The results of chapter six on the influence of conventional tillage and no-tillage systems on soil biological activity had several main objectives, including:

- determining the amount of microorganisms in soil;
- determining the number of genera of micromycetes from the studied variants;
- determining the number of Gram-positive and Gram-negative bacteria from the analysed soil samples.

The achievement of these goals required the collection of soil samples and dilutions in order to develop Petri dish culture methods, the identification of specific cultural characteristics in microorganisms using solid media, the preparation of lactophenol preparations, and the use of optical microscopy techniques to examine fungi.

The results of the analyses revealed that the percentage distribution of the major micromycetes genera was directly influenced by the applied tillage systems on the one hand, and the growth stage of the fall wheat crop on the other.

The average of the three years of research revealed that in the case of both variants of production, the most common were species belonging to the *Penicillium* genus, which had the highest proportions throughout the study (67,2 % percent to 73,1 % percent in no-tillage and 54,0 % percent to 69,8 % percent in conventional).

The results of the influence of the two tillage variants on some morpho-physiological properties, productivity elements, and production at winter wheat crop are presented and interpreted in the seventh chapter, which appears that the no-tillage variant has influenced positively both biometric parameters and productivity elements, as well as production.

The second year of experience yielded the best results in terms of productivity, with both forms of ploughing achieving higher yields both the previous year and the last agricultural year evaluated.

The main conclusions of the thesis, which show that the specified objectives were realized, are offered at the end of the doctoral thesis, specifically chapter eight, followed by the bibliographic references, which were studied for the construction of this paper.