# THE INFLUENCE ON THE SOIL OF PHYSICAL ACTIVITY INDEX CELLULOLYTIC AUTUMN WHEAT UNDER AGROCOENOSES

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***Summary.*** *Microflora and microfauna in the soil is the most important living rhizosphere and consists of bacteria, cyanobacteria, fungi, algae and protozoa. Because of their mineralization of organic substances takes place and make the circuits of carbon, nitrogen, phosphorus or sulfur in nature. Scope this article consists in assessing the influence of soil physical indices on cellulolytic activity under agrocenoses autumn wheat. Research activities were conducted cellulolytic Didactic -experimental Chetrosu resort in Anenii Noi district on sandy loam carbonate chernozem in agrocenoses autumn wheat in rotation (after Bean) with different technologies of tillage - No-till plowing and (years 2016). Cellulolytic activity was determined by the Mişustin E., 1978 method, and evaluated according to Table 1 based on the principle of the method using the decomposition of cellulose under aerobic conditions blades in the 0-30 cm layer of soil. The research results cellulolytic activity in autumn wheat agrocenoses during earing depending on the technology applied to soil tillage is shown in Table 2 and 3 (G. Muller, 1968). According to research for the variant plowing cellulolytic activity varies between 48-56%, and the variant No-till varies between 27-33%.*

***Keywords***: cellulolytic activity, crop rotation, agrocenoses, autumn wheat, soil tillage

## INTRODUCTION

Soil is a natural formation, the most superficial layer of the land is linked to changes in the world rocks under the influence of living organisms and non-living, solar heat and precipitation. Soil is the first development environment and resource base of the plant for the life of animals and humans (Demeter T., 2009).

It can`t be considered ground than crust altered the earth's surface, imbued with life. Although ground hosts many bodies as typical soil organisms are considered but only those to whom he serves as continuously living environment. Some creatures are driven into the ground, but could not find suitable living conditions must perish, others live only temporarily in the ground during a certain phase of their development. Some feed on the ground; others spend a short time in the soil without taking food. All these beings are not regarded as belonging to soil organisms themselves, can still play a role in certain cases and to influence soil properties (G. Muller, 1968).

It is evident that soil is a favorable environment for various microorganisms that convert plant residues are involved in the formation of soil structure, humus formation and mineralization.

Franz H. (1949) notes that independent of specific environmental conditions (biotope), the representatives of soil flora and fauna arose several forms of adaptation which development takes place the same in the different groups bodies. Report to community life in the soil have been identified 4 groups of which group bodies sessile (edafon sessile) lies first expressed by bacteria and fungi that can populate as a film even in the smallest particles ground. A special role in the transformation of organic material they have microorganisms represented by bacteria, fungi, actinomycetes, etc.

Bacteria are the most common group of organisms ranging from several hundreds of thousands to billions each soil cm3 and is about 40% of the microorganisms in the soil. The area most populated by bacteria is found in the vicinity of the roots of the plants in the soil layer of 2-5 mm, also called rhizosphere. By way of nutrition heterotrophic bacteria and autotrophic classified, and after the use of oxygen in aerobic and anaerobic.

Fungi are heterotrophic microorganisms predominantly aerobic, who prefer an acidic environment, live with bacteria and have a great importance in the process of humification and ammonification.

Actinomycetes is form of transition from bacteria to fungus develops in reaction from acidic to alkaline conditions, have a high capacity for decomposition of organic matter.

Microorganisms in the soil are two categories of biochemical processes specific multilateral order physico-chemical, biological and agriculture consequences. First are degradation processes (fermentations, Ammonification, etc.) that is issued in organic matter and minerals available to plants secondly synthesis processes (molecular nitrogen fixation and humification), which creates a reserve of substances in soil nutritious

organic form, which significantly the physico-chemical and soil fertility influences (www.determinarea existing microorganisms in soil html).

## MATERIAL AND METHOD

Research cellulolytic activities were conducted Didactic-experimental Chetrosu resort in Anenii Noi district on sandy loam carbonate chernozem in agrocoenoses of autumn wheat in crop rotation (after Bean) with different technologies of tillage - No-till and plowing.

Autumn wheat, one of the most important grains occupying the largest areas on the globe, and the special importance of wheat is that its seeds can be stored for a long time. Products made from wheat is the basic food for a large proportion of the world population making up approx. 35-40% of research that has been chosen for this plant quite important. In the research they were placed bottles with cloth in soil at different depths in three repetitions, both rows and between rows of plants. Cellulolytic activity was evaluated depending on soil moisture, as determined by the drying of soil samples and conducted field penetration resistance with penetrometer.

The composition of the pulp falls more than 50% of organic carbon of the Biosphere. Cellulose is the most widespread polysaccharide from plant sources in nature. Higher plants contain cellulose in 40-70% of their body. In this connection, the microorganisms that break down cellulose play a very important role in the carbon cycle on Earth.

The diversity of soil microorganisms to break down cellulose allows different soil conditions, acid or alkaline pH, loose or compacted with different humidity and temperature. The microorganisms' breaks down the cellulose are specific: under aerobic decomposition running *actinomycetes* bacteria and fungi aerobic and anaerobic mesophilic bacteria and thermophilic. In good condition in terms of climatic conditions in the soil and creates aerobic cellulose decays slowly and is stopped completely if high temperatures and drought. The most common aerobic microorganisms that break down cellulose are of the genus *Cytophaga* and *Sparasytophaga*; of myxobacteria genres: *Mixococus, Sorangium* and *Polyangium*; fungi that break down cellulose are species of the class *Ascomycetes, Basidiomycetes*.

Fungi and bacteria found in the cellulolytic group of soil belong in mostly mesophilic, having an optimum temperature of 25-30°C activity. If water saturation exceeds 50% of the field capacity for water, the cellulose is carried out more and more bacteria, fungi while regressing activity (Gârla D., N. Cazmali, 2013).

Cellulolytic activity was determined by the Mişustin E., 1978 method and measured according to Table 1 based on the principle of the method using the decomposition of cellulose under aerobic conditions blades in the 0-30 cm layer of soil.

*Table 1. Class's values cellulolytic activity on chernozioms (Mişustin E. method)*

| Index level | Cellulolytic activity |
|---|---|
| Very small | < 36 |
| Small | 36 - 52 |
| Moderate | 52 – 68 |
| High | 68 - 84 |
| Very high | > 84 |

## RESULTS AND DISCUSSIONS

The works carried out on soil physical properties resulting in a change in some cases of soil creating favorable conditions for the activity of microorganisms. The research results cellulolytic activity in autumn

wheat agrocoenoses during earing depending on the technology applied to soil tillage is shown in Table 2 and 3.

According to research for the variant plowing cellulolytic activity varies between 48-56%, and the variant No-till varies between 27-33%. Observe well that cellulolytic activity is reduced of No-till variant of autumn wheat under agrocoenoses (forerunner beans) compared with cellulolytic activity, plowing variant (Fig. 1). By plowing plow essential increase aerobic microflora (fungi, bacteria, actinomycetes) that have a role in decomposition of organic cellulose (resistant), for fresh organic substances decompose very intense, their transformation coefficient is very low in humus. Transformation (mineralization) fast fresh organic waste material leads to lack of energy in soil and bacteria begin to decompose the humus (G. Muller, 1968).

*Table 2. Cellulolytic activity (%) in agrocenoses autumn wheat depending on soil tillage, May-June 2016, SDE Chetrosu*

| Depth, cm | Decomposition blade,% compared to the initial mass | Appreciation against the chernozioms cellulolytic activity (Mişustin E. method) |
|---|---|---|
| Variant, plowing | | |
| 0-10 | 55.67 | Moderate |
| 10-20 | 47.83 | Small |
| 20-30 | 50.26 | Small |
| The variant No-till | | |
| 0-10 | 30.14 | Very small |
| 10-20 | 26.86 | Very small |
| 20-30 | 33.08 | Very small |

*Table 3. Cellulolytic activity (%) in agrocenoses winter wheat depending on soil tillage, May-June 2016, SDE Chetrosu*

| Depth, cm | The location of blade | Decomposition blade,% compared to the initial mass | Findings on chernozioms cellulolytic activity (Mişustin E. method) | Mediate |
|---|---|---|---|---|
| **The plowing variant** | | | | |
| 0-10 | At a time | 59.85 | Moderate | 55.67 |
| | Between rows | 49.94 | Small | |
| | At a time | 57,23 | ?Medium | |
| 10-20 | At a time | 51,44 | Small | 47,83 |
| | Between rows | 42,87 | Small | |
| | At a time | 49,18 | Small | |
| 20-30 | At a time | 53,39 | Medium | 50,26 |
| | Between rows | 47,87 | Small | |
| | At a time | 49,53 | Small | |
| **The No-till variant** | | | | |
| 0-10 | At a time | 27,25 | Very small | 30,14 |
| | Between rows | 38,46 | Small | |
| | At a time | 24,72 | Very small | |
| 10-20 | At a time | 20,86 | Very small | 26,86 |
| | Between rows | 33,29 | Very small | |
| | At a time | 26,43 | Very small | |
| 20-30 | At a time | 33,59 | Small | 33,08 |
| | Between rows | 35,47 | Small | |
| | At a time | 30,18 | Small | |

The area most populated by microorganisms is in close proximity to the plant roots, it explains that the cellulolytic activity is higher compared to rows between rows cellulolytic activity and decomposition of the canvas to the original table is shown in Fig. 2. The analysis of data shows that the depth of sampling indicates the characteristic changes in the numerical distribution of microorganisms. Thus, most organisms have been identified in the surface layers of soil (0-10 cm depth harvest), which can be explained by the presence in the soil horizon of large quantities of organic substances as nutrients used by the microorganisms. The amount of microorganisms depends on soil moisture, weather conditions, soil tillage technology etc.

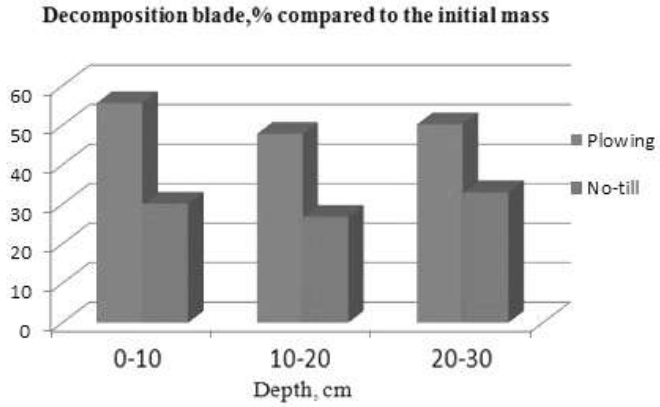


Fig. 1. Depending on the technology cellulolytic activity agrocenoses applied to soil tillage in autumn wheat, SDE Chetrosu, May 2016

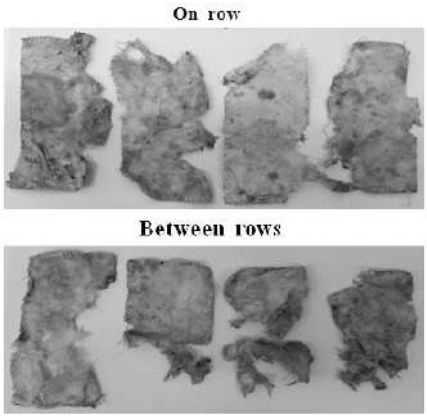


Fig. 2 - Decomposition blade, % compared to the initial mass of autumn wheat under agrocenoses

In agrocenoses autumn wheat (pre beans) on both variants No-till plowing and soil moisture was investigated in the 0-110 cm layer and soil penetration resistance are shown in Table 4.

*Table 4.*

*Soil moisture, resistance to penetration agrocenoses autumn wheat under different tillage systems, May 2016, SDE Chetrosu*

| Depth, cm | Moisture,% | | The soil resistance to the penetration, kgf/cm$^2$ | |
|---|---|---|---|---|
| | Plowing | No-till | Plowing | No-till |
| 0-10 | 10.11 | 11,27 | 8,6 | 19,5 |
| 10-20 | 11.97 | 11,88 | 11,8 | 21,6 |
| 20-30 | 12,54 | 13,02 | 15,9 | 20,5 |
| 30-40 | 13,22 | 14,38 | 19,2 | 22,1 |
| 40-50 | 13,99 | 15,18 | 19,6 | 22,7 |
| 50-60 | 14,22 | 14,81 | | |
| 60-70 | 13,62 | 14,22 | | |
| 70-80 | 12,7 | 13,97 | | |
| 80-90 | 12,96 | 13,78 | | |
| 90-100 | 14,14 | 14,69 | | |
| 100-110 | 13,24 | 14,32 | | |
| 110-120 | 13,58 | 13,01 | | |

Agrocenoses of soil moisture in autumn wheat on plowed version is smaller compared with the No-till variant because the plants are well developed and fully covered surface. From the data obtained on the soil moisture, soil moisture is observed that maintaining the depth of the No-till variant autumn wheat agrocenoses.

If we evaluate soil resistance to penetration of alternative research notes that soil penetration resistance research No-till variant autumn wheat under agrocenoses is higher and varies between 20 to 23 kgf/cm2, so soil this variant research is compacted and penetration resistance research on alternative agrocenoses plowing under autumn wheat ranges between 9-20 kg/cm2.

The soil resistance (http://www.madr.ro/images/agricultura/agricultura-romaniei-aprilie 2012.pdf) is a measure of the capacity of soil to resist deformation and refers to the amount of energy that is required to break aggregates or implants penetration into the soil. The soil penetration resistance depends on certain properties thereof, such as the composition of the grain size, degree of compaction and structure, the content of the humus.

The soil penetration resistance is related to, among other things, the moisture content of the soil (http://www.recolta.eu/arhiva/harta-diferitelor-tipuri-de-soluri-din-romania-9508.html, Schothorst C., 1968). The higher the moisture contents of the soil, the lower the penetration resistance and, therefore, the load carrying capacity.

## CONCLUSIONS

The obtained data from research on cellulolytic activity under agrocenoses autumn wheat with different tillage technologies, we can certainly mention that cellulolytic activity plant rows of wheat is higher by approx. 18-21% (decay blade to the initial mass) compared with cellulolytic activity between rows of plants. Both variants research cellulolytic activity under agrocenoses autumn wheat with different technologies tillage - No-till plowing and it is noted that cellulolytic activity is higher in the 0-10 cm layer, decomposition blade version research on plowing is 55.67% over the initial mass, and the No-till variant research decomposing blade to the 30.14% initial mass. Cellulolytic activity is directly influenced by soil moisture, soil tillage technology, weather conditions, resistance to penetration and other factors which act directly and indirectly, the activity of microorganisms in the soil. Soil moisture depends on the climate, nature and inclination of soil and vegetation. Along with temperature, soil moisture influences greatly the biological activity and the possibility of self-purification. Knowledge of soil moisture is important both in terms of agro-technical and ecological point of view.

## BIBLIOGRAPHY


1. Alcamo, I. E. *Microbes and society, an introduction to microbiology, Jones and Bartlett Publishers*. Boston, 2003. pp. 294-315.
2. Gîrla, D., Cazmalî, N. *Indicații metodice privind evaluarea stării solului din diferite agroecosisteme pe baza unor indici microbiologici*. Ed. UASM. Chișinău, 2013. pp. 11-13.
3. Demeter, T. *Pedologie generală*. Ed. CREDIS. București, 2009. pp. 6.
4. Franz, H. *Bodenleben und Bodenfruchtbarkeit. Wien,* 1949. 287 p.
5. Mihustin, E., Vasileva, O. *Warmeliebende Mikroorganismen des Bodens (russ).* Mikrobiologija 14, 1945.
6. Muller, G. *Biologia solului.* Ed. Agro Silvica. București, 1968. pp. 28-27.
7. Schothorst, C. J. - De relatieve dichtheid van humeuze gronden. De Ingenieur 80(2); Also: Verspr. Overdr. 53, Instituut voor Cultuurtechniek en Waterhuishouding, Wageningen. 1968. pp. B1-B8.
8. Мишустин, Е., Емцев, В. Микробиология. *Из.* Колос. Москва, 1978. 351 с.
9. ***http://www.madr.ro/images/agricultura/agricultura-romaniei-aprilie-2012.pdf;
10. ***http://www.recolta.eu/arhiva/harta-diferitelor-tipuri-de-soluri-din-romania-9508.html