THE MICROBIAL EVALUATION OF SOIL FROM IALOMIȚA COUNTY, ROMANIA

EVALUAREA MICROBIANĂ A SOLULUI DIN JUDEȚUL IALOMIȚA, ROMÂNIA

MIHAI Constanța[1], CONSTANTIN M.[1], PARASCHIV M. [2,3], CÎMPEANU C.[1], BĂDULESCU L. [1], CONSTANTIN C. [1,2*]

*Corresponding author e-mail: manolecarmen2000@gmail.com

Abstract. This paper presents the population of micro-organisms found in six soil samples from Balaciu, Ialomița county, Romania, with a certain electrical conductivity and pH.The soil samples were dried, ground, revitalized with peptone water, and then incubated at 31 °C. The culture media used were: nutrient agar: yeast extract, peptone, agar; YPG agar: yeast extract, peptone, glucose, agar supplemented with chloramphenicol. The soil samples were inoculated in Petri dishes and incubated for 7 days at 35 °C for bacteria and 28 ºC for fungi. After incubation, the number of microorganisms was calculated by the CFU determination technique (colony forming units). Also, the electrical conductivity with values less than 4 dS/m and the pH, whose values exceeded 8, were determined.

Key words: electrical conductivity, microbial population, pH

Rezumat. Această lucrare prezintă populația de microorganisme găsite în şase probe de sol din zona Balaciu, Ialomița, România, cu o anumită conductivitate electrică şi pH. Probele de sol au fost uscate, măcinate, revitalizate cu apă peptonată, apoi incubate la 31 °C. Mediile de cultură utilizate au fost: agar nutritiv: extract de drojdie, peptonă, agar; Agar YPG: extract de drojdie, peptonă, glucoză, agar suplimentat cu cloramfenicol. Probele de sol s-au inoculat în plăci Petri şi s-au incubat timp de 7 zile la 35 °C pentru bacterii şi la 28 °C pentru fungi. După incubare, numărul de microorganisme a fost calculat prin tehnica de determinare UFC (unități formatoare de colonii). De asemenea, au fost determinate conductivitatea electrica cu valori mai mici de 4 dS/m si pH-ul, ale cărui valori au depăşit 8.

Cuvinte cheie: conductivitate electrică, pH, populație microbiană

INTRODUCTION

Soil is a dynamic, living, natural system that is vital to the function of terrestrial ecosystems. Soil health is maintained by physical, chemical and biological factors (Micuti *et al.,* 2017). The soil as an ecosystem is one of the main

---

[1] University of Agronomic Sciences and Veterinary Medicine Bucharest, Romania

[2] National Institute of Research and Development for Biological Sciences Bucharest Romania

[3] Research Center for Advanced Materials, Products and Processes – University Politehnica of Bucharest Romania

factors in sustaining life, its composition being an indicator of environmental and food quality (Sharma *et al.*, 2010). According to Doran and Zeiss (2000), soil can be defined as "the capacity of a soil to function, within land use and ecosystem boundaries, to sustain biological productivity, maintain environmental health, and promote plant, animal, and human health". There is a strong relationship between soil quality and its biodiversity (Steven Cork *et. al,* 2012).

One of the soil components is represented by microorganisms, being responsible for the decomposition of organic matter into nutrients easily assimilable by plants. Extracellular enzymes, most of them produced by soil microorganisms, are closely related to ecological functions of soil such as biomass production, contaminated soil recovery, and ecosystem conservation (Micuti *et al.*, 2017).

Since the demand for agricultural products is expected to increase by at least 70%, the exploitation of soil microbial communities for preserving the biosphere must be done (Barea, 2015).

Thus, the aim of this study was to evaluate the microbial population of soils from Balaciu, Ialomiţa county in order to know its status and to see if it is suitable for plant halophytes cultivation.

MATERIAL AND METHOD

The soil samples that were the basis of the experiments were collected from 6 sampling points at a depth of 0-30 cm. from which the average soil samples resulted.

After incubation, the samples of the soil were inoculated on culture media (nutrient agar - NA and YPG agar). Sowed Petri dishes were incubated for 7 days at 35 °C for bacteria and 28 °C for fungi.

After incubation, the number of bacteria and fungi in each soil sample was calculated by the CFU determination technique (colony forming units).

CFU = N x c x 10, where,

CFU = number of viable cells/1ml sample

N = average of the colonies counted from the same dilution

c = dilution reverse

10 = coefficient reference to 1ml.

The microscopic examination consisted in making smears using the Gram staining technique.

Using an adapted method (Rayment and Higginson, 1992) the EC was realized.

Samples soil pH was demined using an adapted method (Kalra, 1995).

RESULTS AND DISCUSSIONS

The EC values of soil samples were similar, the differences being insignificant (tab. 1). According to FAO, the EC values are in the range 0-2 dS/m, being non-saline.

At this stage, the following genres have been identified: Ascomycetes, Deuteromycetes (*Candida mycoderma* spp.), and the following pathogens: *Botryotinia fuckeliana ((Botrytis cinerea* Pers.*)* which produces extracellurar

polysaccharides (Fanizza *et al.*, 1995), *Penicillium* spp., *Rhizopus* spp., *Aspergillus* spp., *Mucor* spp., species of the genus *Agrobacterium*, *Bacillus*, *Clostridium*, *Pseudomonas*, *Sarcina*, *Staphylococcus*.

According to Garbeva *et al.*, 2004, using traditional cultivation technique, the main organisms found in soil are gram positive bacteria (*Clostridium* spp.*, Bacillus* spp.*, Arthrobacter* spp.*, Brevibacterium* spp.*, Corynebacterium spp.)* or subgroups of the Proteobacteria like *Pseudomonas, Serratia, Enterobacter, Rhizobium*, etc.

The identified colony forming units are shown in table 1.

Table 1

Soil samples characterization

Sample	CFU/10g soil	pH	EC dS/m
P$_1$	287	8.54	0.3
P$_2$	269	8.55	0.2
P$_3$	253	8.33	0.2
P$_4$	274	8.18	0.2
P$_5$	284	8.69	0.3
P$_6$	267	8.48	0.2

There were no quantitative variations of the soil microbiota analyzed at the depth from which the samples were collected (30 cm).

Regarding the pH value, all samples recorded values above 8 indicating the presence of significant amounts of sodium exchangeable as a result of the presence of Na_2CO_3. This is corroborated with low EC values (Batjes, 1995).

CONCLUSIONS

1. With regard to microbiological soil evaluation the main classes of microorganisms were: actinomycetes, bacteria, and molds.
2. The assessment of soil microbiology highlighted: *Bacillus* sp., *Rhizopus* sp., *Aspergillus* sp., *Penicillium* sp.
3. Nonsporogenic bacteria are represented by a series of gram-negative species, mainly belonging to the genus *Pseudomonas*.
4. The soils analyzed are not saline.
5. According to pH values, soils have high sodium carbonate content.

REFERENCES

1. **Barea J. M., 2015** - *Future challenges and perspectives for applying microbial biotechnology in sustainable agriculture based on a better understanding of plant-microbiome interactions,* Journal of Soil Science and Plant Nutrition, 15, p. 261-282.
2. **Batjes, N. H., 1995** – *A global data set of soil pH properties,* Technical paper 27, International and information Centre (ISRIC), Wageningen, p. 1-33.
3. **Cork S., Eadie L., Mele P., Price R., Yule D., 2012** - *The relationships between land management practices and soil condition and the quality of ecosystem services delivered from agricultural land in Australia, Scientific report of project funded by the Australian Government, p. 1-127.*
4. **Doran J. W., Zeiss M. R., 2000** - *Soil health and sustainability: managing the biotic component of soil quality.* Applied Soil Ecology 15, p. 3-11.
5. **Fanizza G**., **Bisignano V., Pollastro S., Miazzi M., Faretra F., 1995 –** *Effects of polysaccharides from Botryotinia fuckeliana (Botritis cinereal) on in vitro culture of table and wine grapes (Vitis vinifera),* Vitis, 34, p. 41-44.
6. **Garbeva P., Van Veen J.A., Van Elsas J.D., 2004** – *Microbial diversity in soil: selection of microbial populations by plant and soil type and implications for disease suppressiveness,* Annual Review of Phytopathology, 42, p. 243-270.
7. **Kalra Y. P., 1995** – *Determination of pH of soils by different methods: collaborative study, Journal of AOAC International, 78, 310-324.*
8. **Liu H., Mirzaee H., Rincon-Florez V., et al., 2017** - *Emerging Culture-Independent Tools to Enhance Our Understanding of Soil Microbial Ecology: A Paradigm Shift in Terrestrial Biogeochemistry,* Microbial Biomass, Western Sydney University Library.
9. **Micuti M.M., Bădulescu L., Israel-Roming F. 2017** - *A Review On The Enzymatic Indicators For Monitoring Soil Quality. Scientific Bulletin.* Series F. Biotechnologies, Vol. XXI, ISSN 2285-1364, 223-228.
10. **Sharma S. K., Ramesh A., Sharma M., et al., 2010** - *Microbial soil community structure and diversity as indicators for evaluating soil quality,* E. Lichtfouse (ed.), Biodiversity, Biofuels, Agroforestry and Conservation Agriculture, Sustainable Agriculture Reviews 5.