Scientific Papers. Series A. Agronomy, Vol. LV-2012
ISSN Online 2285-5793; ISSN-L 2285-5785

INFLUENCE OF DIFFERENT AMENDMENTS ON THE DYNAMICS OF MOLDS IN CHERNOZEM SOIL OF DOBROGEA

Tatiana PASCU[1], Elena DELCĂ[2]

[1]National Research-Development Institute for Soil Science, Agrochemistry and Environmental Protection – ICPA Bucharest; 61 Mărăşti Blvd., 71331, Bucharest, Romania
[2]Payment and Intervention Agency for Agriculture Constanta; 51 Tomis Avenue, 900725, Constanta, Romania

Corresponding author e-mail: tpascu@yahoo.com

Abstract

The aim of the current paper was to observe the effect of the application of organic and inorganic amendments on the dynamics the molds abundance. Research showed that the average total number of culturable molds ranged between 4.44-13.24x10^{3}CFU/g dry soil (Valu lui Traian). Molds density also increased significantly following the administration of specific biofertilizers (Biovin, BactoFil Professional, Mycos Green). Inorganic fertilizers have not a positive effect on microbial density values, which were more or less similar to those reported for the control.

Key words: *biofertilizers, humus, molds, soil fertility.*

INTRODUCTION

The researches conducted in the Turn of the Dobrogea (Valu lui Traian) aim to establish a pattern of chernozem soil biological reconstruction by applying various amendments aimed at stimulating molds abundance, with the targets:

- degradation and decomposition of organic matter;
- restoration of soil structure;
- recovery of the stock of humus.

MATERIAL AND METHOD

Experimental plot: 7 hectares of arable land outside the village Valu lui Traian, Constanta;
Culture: wheat, Josef variety.
Time of experimentation: the agricultural year 2010-2011 both in different phases of the wheat growing season and after harvest.
Experimental versions: 7 variants.
Biovin fertilizers were administered for the first time in Dobrogea.
Biovin is produced through a technological process from grape kernels. 12 years of research proved the following: it aerates the soil, improves it (it contains up to 70% humus makers - 8x10^{7}CFU/g), it enriches the soil with microorganisms that create humus (8x10^9 aerobic microorganisms per gram) [1].

Table 1. Fertilizers administered

Experimental plots	Fertilizers administered
V1	100 kg/ha $N_{15}P_{25}K_{15}$ in autumn; 150 kg/ha NH_4NO_3 in early spring.
V2	Biovin 400 kg/ha; Biovin 30 de l/ha -½ at herbicide stage; -½ at flour stage.
V3	Manure - 15t/ha in autumn.
V4	Biovin 30 de l/ha -½ at herbicide stage; -½ at flour stage.
V5	Biovin 150 kg/ha - administered during sowing; NH_4NO_3 – 150 kg/ha: - 40 kg/ha in early spring; - 50 kg/ha at herbicide stage; - 60 kg/ha at flour stage.
V6	Biovin 375kg/ha; Biovin 30 l/ha - ½ at herbicide stage; - ½ at flour stage; 1mc Green Mycos; 1l Bactofil Professional.
V7	March – were not applied amendments.

Bactofil Professional is a product for improving the soil biological quality and contains nitrogen fixing bacteria $5.2x10^9$CFU/ml, phosphate-solubilization bacteria, and heterotrophic bacteria that stimulates the decomposition of organic matter [5].

Green Mycos is a product containing arbuscular mycorrhizal fungi and a number of factors that stimulate the establishment of symbiosis, improving the soil quality up to 20 years [1].

Description of working methods:

The experiments have taken place on a 7ha, which was divided in 7 variants, each variant being administered a different type of fertilizer in different quantities and periods.

Quantitative determination of microbial abundance was done by decimal dilutions of soil followed by inoculation of known quantities on solid nutrient media Bergey's [2], Papacostea, P. [4]. For this purpose, after weighing the samples were inoculated on culture medium with a specific composition. Thus, to determine the number of total culturable molds it has been used nutrient:

- Czapek-Dox medium from Merck ($NaNO_3$ 3g; K_2HPO_4 1g; $MgSO_4$ 0.5g; KCl 0.5g; $FeSO_4$ samples; Saccharine 30g; Agar 17-20g; pH 5.5; it was sterilized for 30 min at 115°C);
- Sabouraud medium from Merck ($CaCl_2$ 0.5g; 0.1g K_2HPO_4; KH_2PO_4 0.1g; 10% MoO_3 0.1ml; 0.05ml $FeCl_3$ 10%; it was sterilized for 30 min at 115°C);
- Rose Bengal (glucose 20g; Agar 18g; Rose Bengal 33mg; potatoes extract 500ml; pH 6; it was sterilized for 30 min at 115°C), (prepared in laboratory);
- PDA (Potato Dextrose Agar) - Glucoză 20g; Agar 18g; potatoes extract 500ml; pH 5.5; it was sterilized for 30 min at 115°C; (prepared in laboratory) [3]. Three were inoculated Petri plates on each variant.

Soil samples were collected from about 15 cm depth in order to perform quantitative analysis of molds throughout the agricultural year 2010-2011, both in different phases of the wheat growing season and after watching his collection for development of microbial growth, depending on the variant.

The total number of molds per gram of soil was calculated by using the formula: no. molds = X colonies x dilution x 10 x 100/100-U, where X = average of colonies grown on culture medium, 10 = balancing coefficient of 0.1 ml of inoculum in the reporting of dilution soil U% = soil moisture [6].

RESULTS AND DISCUSSION

Microbial abundance was maximal in V_3 (manure), the only variant which showed an increase from $10.56x10^5$CFU/g dry soil, in October to $14.43x10^5$CFU/g dry soil, in August (Fig. 1).

V_6 (mycorrhiza, Bactofil Professional) shows the smallest decrease in abundance microbial from october 2010, $12.42 x10^5$CFU/g dry soil, until august 2011, $6.58x10^5$CFU/g dry soil, compared with other variants (Fig. 1).

V_1 (chemical) has not a positive effect on microbial abundance because it was observed a significant decrease from $23.02x10^5$CFU/g dry soil in October, to $5.07x10^5$CFU/g dry soil in August (Fig. 1).

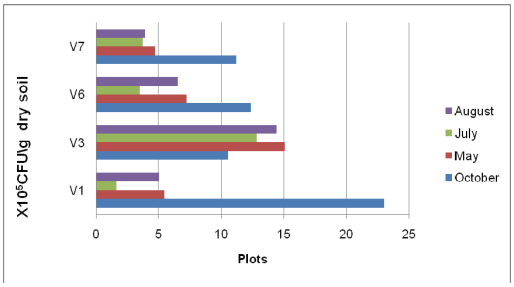

Fig. 1. Dynamic variation of monthly molds in the crop year 2010-2011

Microbial abundance was found:

- highest in October, V_4 (Biovin liquid) $14.89x10^5$CFU/g dry soil, V_5 (Biovin, ammonium nitrate) $14.09x10^5$CFU/g dry soil, decreasing in august V_4 (Biovin liquid) $1.46x10^5$CFU/g dry soil V_5 (Biovin, ammonium nitrate) $2.8x10^5$CFU/g dry soil; have similar values, superior version control V_7 $3.96x10^5$CFU/g dry soil, but insignificant in the dynamic abundance moulds (Fig.2);
- the lowest value was determined in october on the V_2, $9.99x10^5$CFU/g dry soil after applying biofertilizers decreasing to $1.82x10^5$CFU/g dry soil in August (Fig.2).

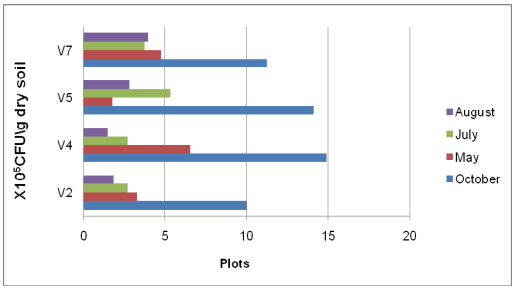

Fig. 2. Dynamic variation of monthly moulds in the crop year 2010-2011

Most microbial dynamics has occurred V_3 (manure), $13.24x10^5$CFU/g dry soil and V_6 (mycorrhiza, Bactofil Professional), $7.45x10^5$CFU/g dry soil (Fig.3).

Other experimental variants:

- V_5 (Biovin, ammonium nitrate) $6.74x10^5$CFU/g dry soil, V_4 (Biovin liquid) $6.4x10^5$CFU/g dry soil, showed the lowest abundance of molds, but with values superior version control (V_7) $5.93x10^5$CFU/g dry soil.
- V_2 (Biovin solid, liquid) $4.44x10^5$CFU/g dry soil, showed the lower values (Fig. 3).

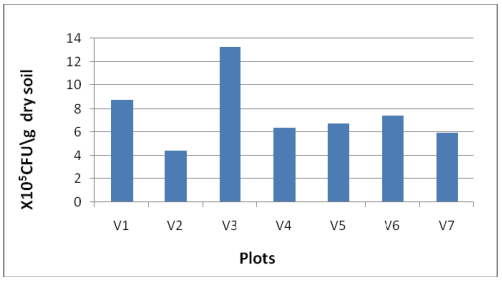

Fig. 3. Annual average change in the dynamics of molds whichever

CONCLUSIONS

We recommend as models for reconstruction of the soil:

- V_3 (manure) - the highest abundance of molds cultivation $13.24x10^5$CFU/g dry soil (Fig.3); show an increase of 223% compared to the control variant $5.93x10^5$CFU/g dry soil (Fig.3);
- V_6 (Biovin, Bactofil Professional; Green Mycos) – $7.45x10^5$CFU/g dry soil (Fig.3), show an increase of 126% compared to the control variant $5.93x10^5$CFU/g dry soil (Fig. 3).

Our preliminary data show that organic amendments with complex composition have a direct effect on the abundance and diversity of soil and influence indirectly the microbial metabolism and nutrient cycling rate.

Rather poor development of molds in Valu lui Traian, is due partly weather conditions, excessive drought.

REFERENCES

[1] Berca, M., 2008. Probleme de ecologia solului. Editura Ceres, Bucureşti, p.43-63.

[2] Bergey's, 1986. Manual of Sistematic Bacteriology. vol. 2, Williams and Wilkins, Baltimore, USA, p.1075-1079.

[3] Lazăr, V., Herelea, V., Cernat, R., Balotescu, M.C., Bulai, D., Moraru, A., 2004. Microbiologie generală, manual de lucrări practice. Ed. Universităţii din Bucureşti, p. 280-315.

[4] Papacostea, P., 1976. Biologia solului. Ed. Ştiinţifică şi Enciclopedica, Bucureşti, p.81-259.

[5] Robescu, V.O., 2009. Modele privind managementul reconstrucţiei de mediu în bazinul superior al râului Dâmboviţa. Ed. Ceres, Bucureşti, p.189-196.

[6] Voiculescu, A.R., Toti, M., Dumitru, M., 2006. Decontaminarea solurilor poluate cu compuşi organici. ISBN 973-657-939-5.