Geophysical Research Abstracts
Vol. 21, EGU2019-15899, 2019
EGU General Assembly 2019

New types of soil amendments increase numbers of soil microbiota in arable soil

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Abundance of soil microorganisms is determines its health and quality. Excessive use of chemical fertilizers in agriculture in the last years caused imbalance in the supply of soil nutrients resulting in soil degradation, changes and decrease in communities of soil microbiota, and further environmental problems. Revived usage of organic fertilizers could restore biological activity and microbial abundance in arable soils. Combination of organic fertilizers and new types of soil amendments has a potential to enhance benefit of organic matter in soil and through increased biomass of soil microbiota further improve utilization of nutrients.

Therefore, we carried out a three-year experiment of application of organic matter and soil amendments into the soil, and compared the state and abundance of soil microorganisms in treated soils. The experiment was carried out in 2014 - 2018 in the Czech Republic on soil type cambisols (Postoupky locality) on arable land. The experimental area is located at an altitude of about 220 m a. s. l. The individual variants were as follows: 1) Control – only NPK, 2) Manure + Z‘fix + NPK, 3) Manure + PRP Sol + Z‘fix + NPK, 4) Manure + NPK, 5) Manure + PRP Sol + NPK, 6) PRP Sol + NPK, 7) Manure + Biochar + NPK, 8) biochar + NPK, 9) Manure + bentonite + NPK, 10) Bentonite + NPK, 11) Sugar production sludge + NPK. Z‘fix is industrially produced amendment – activator of biological transformation of organic matter in manure - and PRP Sol is industrially produced soil amendment.

The aim was to find changes in abundance of bacteria, fungi, and ammonia oxidizing bacteria in the soil microbial community (AOB) in various combinations of applied organic matter and soil amendments. We confirmed that the combination of manure and three of four tested soil amendments (Z‘fix, PRP Sol, and biochar) increased biomass of all three monitored groups of microorganisms, enumerated as copies of 16S rDNA (bacteria), 18S rDNA (fungi), and AOB-specific 16S rDNA per gram of dry soil. The best option for the improvement of soil microbial abundance was the variant Manure + Z’fix + NPK.

The work was supported by the project of Technology Agency of the Czech Republic TH02030169.