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Suppressive composts from organic wastes as agents of biological control of fusariosis in Tatartan Republic (Russia)

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Plant diseases are one of the seriously limiting factors of agriculture efficiency around the world. Diseases caused by fungi are the major threat to plants. Crop protection in modern agriculture heavily depends on chemical fungicides. Disadvantages of chemical pesticides soon became apparent as damage to the environment and a hazard to human health. In this regard use of biopesticides becomes an attractive alternative method of plant protection.
For biological control of fungal plant diseases, separate bacterial or fungal strains as well as their communities can be used. Biopreparations must consist of microbes that are typical for local climate and soil conditions and therefore are able to survive in environments for a long time. Another option of plant pests' biological control is implementation of suppressive composts made of agricultural or other organic wastes. These composts can not only prevent the development of plant diseases, but also improve the soil fertility.
The objective of this work was estimation of potential of composts and strains isolated from these composts as means for biological control of fusariosis that is one of the most widespread plant soil born disease. The composts were made up of the commonly produced agricultural wastes produced in Tatarstan Republic (Russia). Fusarium oxysporum f. sp. radicis-lycopersici was used as a model phytopathogen.
Ten types of organic waste (Goat manure (GM), Chicken dung (CD), Chicken dung with straw addition (CS), Rabbit dung (RD), Cow manure (CM), Rerotting pork manure (RPM), Fresh pork manure (FPM), Pork manure with sawdust and straw (PMS), the remains of plants and leaves (PL), the vegetable waste (VW) were sampled in the big farms situated in Tatarstan Republic which is one of the main agricultural regions of Russia. The initial wastes were composted for 150 days. Further, the following characteristics of the composts were assessed: pH, electro conductivity, TOC, DOC, Ntot.
On petri dishes with meat pepton agar, the composts and their water extracts were checked towards their ability to inhibit growth of F. oxysporum. It was shown that three composts – CD, FPM and RD – possessed suppressiveness towards the model phytopathogen. From these three wastes, 28 bacterial and fungal strains were isolated and, in their turn, checked towards their ability to inhibit F. oxysporum. It was demonstrated that five of the isolated strains are highly suppressive to model test-object (the growth area of F. oxysporum did not exceed 30%), six of the stains were moderate suppressive (the growth area of F. oxysporum ranged from 35% to 60%), and other strains did not cause negative effects for the model phytopathogen.
Further, we will check the composts and the isolated strains using the model system "soil - tomato plant - phytopathogen". As a result, effective composts and strains will be recommended as agents for biological control of fungal diseases in the region. Besides, the structure of bacterial and fungal community of the composts with suppressive properties will be assessed using 454-pyrosequencing.