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Biochar as a potential carrier for agricultural beneficial microbes

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Abstract

© SGEM2018. In the recent years, growing interest to biochar as a means of improving soil quality is observed. Biochar is a product of pyrolysis of biomass such as plant residues or organic wastes. Biochars made of manures are special because they can solve two environmental problems simultaneously – waste reduction and soil fertilization, but they are less studied. In our research, we suggest to improve the properties of biochars derived from manures by means of immobilizing beneficial microbes on them. In this study, the choice of the method of such immobilization was made. Biochar from chicken manure produced at 500°C peak temperature for 3 h was used as a model biochar, and *Pseudomonas putida* able to suppress soil borne phytopathogens was used as a model microbe. Two types of immobilization in laboratory conditions were used. The first one included spreading of night culture concentrated ~3 fold (final cells amount – about 10⁷ gene copies ml⁻¹) on the surface of biochar in a ratio of 1:1, then drying in sterile conditions for 24 h and packing. The second one included wetting biochar in the culture medium with ~1.5 fold concentrated night culture, shaking for 1 h, then drying in sterile conditions for 24 h and packing. To track the survival rate of immobilized bacteria, scanning electron microscopy as well as quantitative PCR were used. It was shown that bacteria survived similarly after both types of immobilization during the first 10 days, however, later wet immobilization seemed to be more effective, which was proved by higher bacterial gene numbers on that biochar as compared with the dry treated one. We suggest that this is due to deeper penetration of microbes into the pores of biochars while using the wet method.

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Keywords

Beneficial microbes, Biochar, Chicken manure, Method of immobilization

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