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Utilization of treated spent coffee grounds and wheat bran as biofertilizer

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Abstract

Global food waste production exceeds 1,300 million tons. Approximately 40% of this amount is accounted for waste produced by the food processing industry. This group of food waste includes, but is not limited to, wheat bran and spent coffee grounds. World production of wheat bran reaches 100 million tons per year and spent coffee grounds about 6 million tons per year. This material often remains unused and is landfilled even though the Waste Framework Directive lays down basic waste management principles and establishes the waste hierarchy where landfilling is the least favourable option of waste treatment and should be limited to the minimum necessary. Various strategies can be adopted to minimize landfilling of food waste generated from food processing. Nowadays, the greatest effort is devoted to food waste recovery for animal feeding, obtaining various chemicals, or for soil amendments. The long-term application of food waste organic fertilizer was shown to improve soil quality, stimulate crop yields, and even have a positive influence on the growth of soil bacteria. However, direct application of food waste to the soil is often not possible, therefore food waste is treated by composting or by other methods before application to the soil. In the case of spent coffee grounds, the biggest problem is the residual content of caffeine and phenolics. It was previously reported that the addition of 2.5% of spent coffee grounds to the soil has a significant negative effect on plants (Cruz et al., 2015; Ciesielczuk et al., 2018). Therefore, our study is focused on the detoxification of spent coffee grounds and its subsequent use as a fertilizer in combination with native wheat bran and thermally treated wheat bran. In the experiments, the content of phenolic substances and caffeine was reduced to a minimum amount by oxidation and extraction procedure. The prepared mixtures of biofertilizer and soil (modal brown) were used in a pot experiment where the effect of fertilizer addition to the soil on lettuce (*Lactuca sativa L.*) growth was monitored. Results obtained during the duration of the experiment have shown that despite the reduction of phenolic substances and caffeine in coffee spent grounds after detoxification procedure, the soil containing treated spent coffee grounds harmed plant growth even though the partial physicochemical parameters of the soil were improved by the addition of organic fertilizer.

Keywords: Coffee grounds, food waste, detoxification, growing media, biofertilizer

References

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