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Biochar as a Priming Agent

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Abstract

Biochar is a product of carbonization, obtained through the pyrolysis of organic wastes. Biochar has received increasing attention because of its distinctive properties. Biochar can be used in various applications particularly for carbon sequestration, as a soil amendment and for bioremediation (Seyedsadr et al., 2022; Mukherje et al., 2022). Among these applications, biochar has a great potential to use for agricultural purpose. Biochar addition into soil improves soil texture and increases soil fertility by increasing the pH and cation exchange capacity and promoting aggregation of the moisture and nutrient retention ability (Kumar et al., 2022). Moreover, the porous surface of biochar which serves as a refuge for microbes from predation, enhances microbial activity and functions. Seed priming is a pre-sowing strategy for influencing seedling development by modulating pre-germination metabolic activity prior to emergence of the radicle and generally enhances germination rate and plant performance (Golezani et al., 2008). Common priming techniques include osmopriming (soaking seeds in osmotic solutions such as polyethylene glycol), halopriming (soaking seeds in salt solutions) and hydropriming (soaking seeds in water). The elimination of the use of chemicals in pre-germination applications and the use of environmentally friendly biochar instead of them is very important for sustainable agriculture. The mineral fraction of biochar comprises macro- and micro-elements which may act as a source of minerals for seeds (Saletnik et al., 2019). There is only one study in the literature on the use of biochar in priming. Saletnik et al. (2019) used the biochar in priming and reported that adding biochar to water to be used in hydroconditioning process improved the germination capacity of seeds Virginia mallow by 20%. However, the effect of biochar on germination was not investigated extensively in their study. The objective of this study is to investigate the usability of biochar in the priming to improve seedling performance of seeds. For this purpose, the biochars, which were obtained from different biomasses, were tested in priming of pepper seed. To understand the effect of biochar types and dosing on priming, the biochars obtained from six different biomasses (animal waste, lignocellulosic wastes and carbohydrate-rich wastes) at different temperatures (300, 400, and 500 °C) were used at different ratios (2.5%, 5% and 7.5%) in priming tests. Priming performance of biochars were controlled by germination and seedling emergence tests. The chemical and

agronomic charecteristics, such as WHC, CEC, and water exctractable nutrients, were determined using standart analysis methods. Chemical composition of aquation phase after priming was also analyzed. It was observed that the priming using biochar increased germination capacity of seeds. But, the extent of increase varied depending on biochar type and dose. It was found that both soluble nutrients and some organics having plant growing hormons in biochar showed effect an increase in germination performance of pepper seed.

Keywords: Biochar; Priming; Seed

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