TOXICITY SCREENING OF DIFFERENT MODIFIED BIOCHARS ON THE GERMINATION AND EARLY SEEDLING GROWTH

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Key Words: Toxicity Screening, Modified biochar, germination, seedling growth, seed size

Applying biochar as soil amendment improves soil physicochemical properties, carbon sequestration and plant growth. However, prior to use as amendment, BC must be investigated for both its potential positive and negative effects on soil and plants. Seed germination and early seedling growth are considered to be very sensitive to various external factors and are therefore frequently used for initial screening of different soil amendments. In this study we assessed the impact of different biochar modifications on seed germination, i.e., (germination rate and seedling growth). Ten different types of biochar representing different biochar modifications, such as physical and chemical activation, mineral (ash) enhanced biochar (Buss et.al.,2019) phosphorus-loaded biochar, and potassium-loaded biochar (Mašek et.al., 2019) were screened for their toxicity using sand with a uniform biochar application rate of 0.5% in petri dishes. The room temperature was (CRD maintained approx. 25 ˚C during the whole experiment period. The experiment was conducted under Complete Randomized Design). It is known that the size of a seed affects the fitness of the plant growing from it; larger seeds often have higher fitness (Kering and Zhang 2015; Giles 1990) and are therefore initially less affected by external conditions. Most past studies involving study of phytotoxic effects of biochar on seed germination have focused on a single crop and did not account for the effect of the seed size. Based on a relevant literature review and preliminary experiments, we selected seeds of different plants based on their size, such as, spring barley, white clover and cress seed. The result obtained to date show that biochar none of the biochar exhibited any significant detrimental effects on the germination of the barley seeds, however there are differences observed, depending on the type of biochar modification used and also the size of seeds selected for the tests figure 1.

Figure 1 Effects of biochar on early seedling growth of spring barley

In this presentation we will present results of a large number of experiments, focussed on assessment of impacts of biochar modifications aimed at production of engineered biochar on resulting biochars' phytotoxicity assessed based on an array of parameters, including germination time, germination percent, early seedling growth, seed vigour and chlorophyll content. These results will be the first in investigating the nature and role of seed size in assessing biochar phytotoxicity and the role played by biochar modifications aimed at designing engineered biochar. This work will provide an important new framework for designing guidelines for future studies related to safe application of biochar and engineered biochar development.

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