



## Evaluation of carbon dynamics of calcareous soils amended with biochar under the application of low-voltage electrical charge

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### Abstract

Among the important health parameters in soil, soil organic carbon (SOC), microbial biomass carbon (MBC), microbial respiration ( $\text{CO}_2$ ), water-soluble carbon (WSC) are the most affected parameters by environmental conditions. In this study, we investigated the effect of low-voltage electrical charged soil (VEC:  $0_{\text{mV}}$  -  $3.5_{\text{mV}}$  -  $7.5_{\text{mV}}$ ) with biochar (BC) application on calcic Vertisol soil in terms of soil health parameters under laboratory conditions. At the end, 37-week measurement, the highest amount of soil  $\text{CO}_2$ -C emission was seen with a low-voltage electrical charged application of BC+ $7.5_{\text{mV}}$  ( $12.89 \text{ mg CO}_2\text{-C kg}^{-1} \text{ soil week}^{-1}$ ), while the lowest amount was seen with the application of BC+ $0_{\text{mV}}$  ( $1.31 \text{ mg CO}_2\text{-C kg}^{-1} \text{ soil week}^{-1}$ ). The Fourier transform infrared (FTIR) spectrum that displayed different functional group activities with all the application and the highest increases were observed in the alkyne (C-Br) ( $547 \text{ cm}^{-1}$ ) and alkenes (=C-H) ( $964 \text{ cm}^{-1}$ ) groups with BC application, while the lowest increases were seen with BC+ $7.5_{\text{mV}}$  application. Examining the thermogravimetric (TGA) results, the smallest mass loss was observed with the BC+ $7.5_{\text{mV}}$  application (24.98%), while the highest was with BC+ $3.5_{\text{mV}}$  (21.41%). The highest breakdown in differential scanning calorimeter (DSC) was observed in BC-applied soil in the volatile C group [(EXO 1 (30- 200 °C)]. Especially in EXO 3 (385-475 °C), a high level of breakdown occurred, which was an indication of recalcitrant carbon groups. This study indicated that low-voltage electrical pulse was inappropriate for evaluation of soil C dynamics including SOC, WSC, MBC, and basal soil respiration.

**Keywords:** Biochar, Calcic vertisol, Electrical charged soil, FTIR, TGA-DSC