

Effect of Different Types of Soil Amendments on the Soil Aggregate Stability in *Eleusine coracana*-Grown Soil

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Stability of aggregates plays a crucial role in determining the physical health of soils. Soil amendments applied in agriculture may induce various properties, such as soil water repellency (SWR), which can influence the stability of aggregates. This study examined the effects of different soil amendments and their SWR on aggregate stability in *Eleusine coracana* (finger millet) grown soil. Cattle manure (CM), water-repellent leaf litter (*Casuarina equisetifolia*, CE), CE-derived biochar (BCCE), and quick lime (CaO) were mixed with sieved surface soil (3% CM, 3% CE, 3% BCCE, 1% CaO). Only soil was used as the control. The experiment followed completely randomized design with treatments in triplicate. Soil mixtures were filled into polybags (3750 g per bag) while maintaining the homogeneity of the bulk density for treatments. The moisture content was initially maintained at 80% of the field capacity of soil (450 cm³ per polybag) to ensure initial homogeneity. Germinated *E. coracana* seeds were transplanted and kept in a protected house. Initially, the SWR of mixtures was determined using the water drop penetration time (WDPT) test. At the 10th week, all aggregates were separated into two-equal (7 cm) layers (TL: top layer and BL: bottom layer) of each polybag and the percentage of water-stable aggregates (% WSA) was determined using wet sieving apparatus. The 3% CE-amended sample showed slight SWR, while others were non-repellent. The 3% CE-amended sample showed the highest % WSA (TL: 99.21% and BL: 99.23%, $p < 0.05$) due to the high initial hydrophobicity of CE. The control showed the lowest % WSA (TL: 76.17% and BL: 75.52%, $p < 0.05$). Results showed that the slightly repellent 3% CE significantly enhanced the % WSA. SWR reduces the water entry into the aggregates and lowers pressure buildup, enhancing their resistance to disruption. Results validation under field conditions is required to ensure field applicability.

Keywords: Soil amendments, Stability of aggregates, Water repellency