

## Antifungal Efficacy of Biogenic Waste Derived Colloidal/Nanobiochar against *Colletotrichum gloeosporioides* Species Complex

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### Abstract

Anthrax disease, caused by *Colletotrichum* spp., is the primary cause of postharvest losses in *Musa* spp. While various physical, chemical and biological methods have been developed to control this disease, their implementation in crop protection systems faces significant challenges. Nanotechnology holds great promise for improving the longevity and effectiveness of agricultural products, thereby ensuring economic and environmental sustainability. This study was aimed to investigate the inhibitory effect of colloidal biochar (CBC)/nanobiochar (NBC) derived from corn cob (CC) and *Gliricidia sepium* wood (GW) against *Colletotrichum gloeosporioides* species complex. CC and GW - CBC/NBC properties were thoroughly characterized using UV-Vis, Fluorescence, FTIR Spectroscopy and SEM analyses. Concentrations of CC and GW - CBC/NBC ranging from 0.4 to 20 g/L were tested in the study. Among the tested concentrations, CC - CBC/NBC at 1, 1.2, 1.6, 2, 4 and 8 g/L, as well as GW CBC/NBC at 0.4, 0.6, 0.8, 1, 1.2, 1.6, 2, 4, 8, 12 and 20 g/L, exhibited substantial reductions in mycelial densities. A notable reduction in the fungal growth rate was observed when using Zeolite, CBC/NBC at various weight percentages (10 to 50 wt/wt%). This suggested that the incorporation of CBC/NBC into the zeolite matrix contributed to the antifungal activity. However, high concentrations of CC - CBC/NBC (12 and 20 g/L) revealed higher mycelial densities, indicating a potential loss of effectiveness or even promotion of fungal growth. This study provides valuable insights into the potential antifungal activity of CC and GW - CBC/NBC against the *Colletotrichum gloeosporioides* species complex.

**Keywords:** *Anthrax, Colletotrichum gloeosporioides, Biochar, Nanobiochar, Antifungal activity*