

### **Supplementary Text S1. Fourier Transform Infrared Spectroscopy (FTIR)**

The XRD results showed calcite as a dominant mineral in unfortified biochar at lower pyrolysis temperatures (BC500) and minor phases of  $\text{Ca(OH)}_2$ ,  $\text{K}_2\text{CO}_3$ , whereas with an increase in temperature (BC700 and BC800), there was a reduction in calcite minerals and the presence of new phases such as anhydrite ( $\text{CaSO}_4$ ) and magnetite, which suggests mineral transformation at the higher temperature (**Supplementary Fig. S2**). BC500 with Fe fortification resulted in high intensity signal for the presence of anhydrite and magnetite, which demonstrates Fe incorporation and mineral transformation, whereas FBC700 and FBC800 showed the presence of oldhamite (Ca, Fe, S), and Fe (0), suggesting Fe reduction and incorporation.