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Sorption of Sulfathizole on Soil treated with Giant *Miscanthus*-derived Biochar

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Two types of biochars produced from Giant-*Miscanthus* at different pyrolysis temperatures (400^{o}C and 700^{o}C, referred as GMC-400 and GMC-700, respectively) were treated to soil and sorption of sulfathiazole (STZ) to them was evaluated as a function of pH (2, 5 and 7) and aging period (0, 3, and 6 month).

Sorption of STZ was nonlinear with N value less than 1 (0.51$<$ N $<$0.75), thus the linearized sorption coefficient (K_d^*) was determined for comparison across samples. The magnitude of K_d^* of GMC-700 treatments (1.27-3.38 L kg^{-1}) was less than GMC-400 treatments (3.96-9.96 L kg^{-1}). The sorption to GMC-400 treated soils increased up to 3.3 fold of untreated soil in laps of aging period over 6 months, whereas no statistical difference was observed for GMC-700 treatment. Results of FTIR and SEM analyses revealed that and the micropore of GMC-700 was deformed and the O-containing functional groups of the GMC-400 treatment increased with aging. The sorption of STZ was pH-dependent in the order of pH 2 $>$ pH 5 $>$ pH 7. The sorption hysteresis (H) index for GMC-400 treatment was less at pH 5 (2.53) than at pH 7 (3.99) probably due to increased ionic solute fraction at pH 7. Both values increased after 6 months aging (4.18 and 3.17, respectively), which is due to increased functional group in sorption domain with aging.

The results of this study demonstrate that enhanced sorption of STZ on GMC treated soils is mainly contributed by greater micropore surfaces at low pyrolysis temperature, abundance of hydrophilic functional groups with aging period, and $\pi^+ - \pi$ electron donor-acceptor interaction at low pH.