

AMENDED SOIL WITH DIFFERENT APPLICATION RATES OF SUGARCANE STRAW BIOCHAR INTERFERE SORPTION AND DESORPTION OF METRIBUZIN

Kamila Cabral Mielke¹; Maura Gabriela da Silva Brochado¹; Bruna Aparecida de Paula Medeiros¹; Maria Eduarda Rodrigues Rezende¹; Lucas da Rocha Bastos¹; Alessandro da Costa Lima¹; Kassio Ferreira Mendes¹

¹Av. P.H. Rolfs Edifício Arthur Bernardes, Campus Universitário, Viçosa, MG, Brazil.
kamila.mielke@ufv.br

Destaque: Application of sugarcane straw biochar at rates above 1.5% increases sorption and decreases desorption of metribuzin in soil

Resumo: Biochar is a carbon-rich material that comes from the partial carbonization of different feedstock under controlled conditions. The application of this material to the soil has shown to directly influence the sorption-desorption of pre-emergence herbicides. The effects of biochar on herbicide behavior in the soil depend, among other factors, on the rate of application in the field. The objective of the study was to investigate the sorption and desorption of metribuzin in an amended soil with different application rates of sugarcane straw biochar. The experimental design was entirely randomized with seven application rates of biochar (0; 0.1; 0.5; 1; 1.5; 5 and 10% w w⁻¹) produced in a pyrolysis temperature of 750°C. The sorption and desorption study were carried out in an equilibrium batch method with five concentrations of metribuzin (0.5; 1; 2; 4 and 8 mg L⁻¹) where the average concentration corresponds to the highest recommended dose of the herbicide (1920 g a.i. ha⁻¹) for sugar cane cultivation. The analysis of the herbicide was performed in High Performance Liquid Chromatography (HPLC). The sorption and desorption coefficient data were fitted to the Freundlich isotherm model (K_f). The K_f values of sorption (1.42 mg^(1-1/n) L^{1/n} Kg⁻¹) and desorption (0.78 mg^(1-1/n) L^{1/n} Kg⁻¹) were low for the unamended soil. Application rates of 5 and 10% of biochar increased 6- and 10-fold the K_f of sorption and decreased the desorption between 15- and 45-fold relative to the unamended soil. Application rates <1.5% had no impact on sorption ($K_f = 1.84$ mg^(1-1/n) L^{1/n} Kg⁻¹) and little interference with desorption (2.84 mg^(1-1/n) L^{1/n} Kg⁻¹) of metribuzin. The biochar applied at 5 and 10% sorbed 77.8 and 89.4% and desorbed 14.2 and 3.7% respectively, relative to the total applied herbicide. The application of rates > 5% of sugarcane straw biochar strongly increased sorption and reduced the desorption of metribuzin in the soil and can influence the residual effect and weed control.

Palavras-chave: Carbonaceous material; herbicide behavior; residual; environment

Agradecimentos: The authors thanks Federal University of Viçosa, Coordination for the Improvement of Higher Education Personnel (CAPES) and Foundation for Research Support of the State of Minas Gerais (FAPEMIG)

Instituição financiadora: CAPES - 88887.479265/2020-00 and FAPEMIG - 2070.01.0004768/2021-84)