The role of biochar pyrolysis temperature on hexazinone sorption-desorption in soil using the batch-equilibrium method

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Summary Pyrolysis of organic waste involves the thermal transformation of biomass under partial or no oxygen supply to solid (biochar), liquid (bio-oil) and gas phases. Pyrolysis temperature controls the physico-chemical properties (e.g. composition, particle and pore size distribution) of the biochar, which in turn influence herbicide retention in the soil, mainly herbicides applied in pre-emergence, as hexazinone. The aim of this research was to assess the role of biochar pyrolysis temperature on hexazinone sorption-desorption in a Brazilian soil. Triazine-6-^{14}C-hexazinone (radiochemical purity 99.7%, specific activity 3.14 MBq mg^{-1}) sorption-desorption was evaluated using the batch-equilibrium method from Freundlich model and five solutions (0.63, 1.25, 1.88, 2.50, and 3.13 mg L^{-1}) were used. Biochar was prepared from eucalyptus (*Eucalyptus grandis*) at 450, 550, 650, 750, 850 and 950°C. The biochar was added to soil at 1% (w w^{-1}) ratio. The K_f values calculated for the hexazinone sorption on the unamended and all biochar-amended soils was 0.18 (50.49%) and ranged from 0.12 to 0.24 $\mu mol^{(1-1/n)} L^{1/n} kg^{-1}$ (57.57–70.33%), respectively. Desorption on the unamended and all biochar-amended soil was 26.17% and ranged from 27.23 to 19.80%, respectively. The $1/n_{(desorption)}$ are greater than $1/n_{(sorption)}$, suggesting that the hexazinone sorption by all treatments was reversible. H values ranged from 1.25 to 1.95 on all treatments. As biochar pyrolysis temperature increased, hexazinone sorption also increased and desorption increased. The results showed that biochar pyrolysis temperature can influence on hexazinone sorption-desorption in the soil, which this material reduces the availability of herbicide in the soil solution for weed control.

Keywords Residual herbicide, retention process, soil amendments.