

High Physical Properties of Biochar Issued from Cashew Nut Shell to Adsorb Mycotoxins (Aflatoxins and Ochratoxine A) and Its Effects on Toxicogenic Molds

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Abstract : Biochar is a microporous and adsorbent solid carbon product obtained from the pyrolysis of various organic materials (biomass, agricultural waste). Biochar is distinguished from vegetable charcoal by its manufacture methods. Biochar is used as the amendment in soils to give them favorable characteristics under certain conditions, i.e., absorption of water and its release at low speed. Cashew nuts shell from Mali is usually discarded on land by local processors or burnt as a mean for waste management. The burning of this biomass poses serious socio-environmental problems including greenhouse gas emission and accumulation of tars and soot on houses closed to factories, leading to neighbor complaints. Some mycotoxins as aflatoxins are carcinogenic compounds resulting from the secondary metabolism of molds that develop on plants in the field and during their conservation. They are found at high level on some seeds and nuts in Africa. Ochratoxin A, member of mycotoxins, is produced by various species of *Aspergillus* and *Penicillium*. Human exposure to Ochratoxin A can occur through consumption of contaminated food products, particularly contaminated grain, as well as coffee, wine grapes. We showed that cashew shell biochars produced at 400, 600 and 800°C adsorbed aflatoxins (B1, B2, G1, G2) at 100% by filtration (rapid contact) as well as by stirring (long contact). The average percentage of adsorption of Ochratoxin A was 35% by filtration and 80% by stirring. The duration of the biochar-mycotoxin contact was a significant parameter. The effect of biochar was also tested on two strains of toxigenic molds: *Aspergillus parasiticus* (producers of Aflatoxins) and *Aspergillus carbonarius* (producers of Ochratoxins). The growth of the strain *Aspergillus carbonarius* was inhibited at up to 60% by the biochar at 600°C. An opposite effect to the inhibition was observed on *Aspergillus parasiticus* using the same biochar. In conclusion, we observed that biochar adsorbs mycotoxins: Aflatoxins and Ochratoxin A to different degrees; 100% adsorption of aflatoxins under all conditions (filtration and stirring) and adsorption of Ochratoxin A varied depending on the type of biochar and the experiment conditions (35% by filtration and 85% by stirring). The effects of biochar at 600 °C on the toxigenic molds: *Aspergillus parasiticus* and *Aspergillus carbonarius*, varied according to the experimental conditions and the strains. We observed an opposite effect on the growth with an inhibition of *Aspergillus carbonarius* up to 60% and a stimulated growth of *Aspergillus parasiticus*.

Keywords : biochar, cashew nut shell, mycotoxins, toxicogenic molds

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