ADSORPTION OF AFLATOXIN B1 ON THE LOCAL NATURAL ZEOLITE

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The human diet contains a wide variety of natural carcinogens. Aflatoxins, a group of potent mycotoxins with mutagenic,carcinogenic, teratogenic, hepatotoxic and immunosuppressive properties, are of particular importance because of their adverse effects on animal and human health. Aflatoxin B1 (afB1) is the most toxic and most prevalent compound. In the study , natural zeolite originated from Gördes region of the Turkey was investigated for its ability to adsorp afB1 in simulated human digestion solutions. It is aimed to determine the mechanism of the aflatoxin adsorption for biological applications. For this, the characterization of the adsorbent was performed and adsorption experiments were conducted. The theoretical cation exchange capacity was determined as 2.08 meq/g. The equilibrium time was determined as 120 min based on the experiments performed at a fixed afB1 concentration of 2 ppm, adsorbent dose/solution of 25 mg/10 mL, solution pH of 7.4, at 37 °C, and at an agitation speed of 130 rpm as a function of contact time. The experimental adsorption equilibrium data obtained for initial afB1 concentrations (in the range of 0 - 2 ppm) were fitted to the Langmuir, Freundlich , and Langmuir-Freundlich (Sips) adsorption equilibrium models. The experimental adsorption equilibrium data fitted better to Sips equation than to other equations, due to the fact that this model has three adjusting parameters as compared to the Langmuir and Freundlich models with two parameters. Effect of different parameters (temperature, solution pH, adsorbent/solution ratio, initial afB1 concentration, agitation speed, adsorbent particle size) on the amount of afB1 adsorbed at equilibrium was tested. The adsorption capacity did not significantly affected by the adsorption temperature. Slight increase in the equilibrium adsorption capacity of the zeolite for afB1 at the lower solution pH can be explained by the change of the zeolite surface with the pH. The amount of afB1 adsorbed at equilibrium decreased as the zeolite particle size increased. This confirmed that the adsorption occurs on the external surface of the zeolite particle as expected regarding the size of afB1 molecule which is larger than the pore size of the zeolite. afB1 adsorption rate was increased at equilibrium with the increase in agitation speed. As the zeolite dose increased, while volume of the adsorption solution was kept constant, the adsorption capacity of the zeolite decreased.

Keywords: aflatoxin, adsorption, natural zeolite