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Development and characterization of antibacterial, antifungal and mycotoxin adsorbent composite

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Brazil is one of the largest animal feed producers in the world and, increasingly, has been modernizing in order to adapt to the new requirements and market needs. There is a problem about contamination still in the field of grains used as raw material to obtain rations, which is contamination by mycotoxin-producing fungi, Aflatoxin B1 being one of the most incident and potentially toxic, whose tolerance standard in food for animal consumption is 50 ?g?kg-1. The development of methodologies that aim to mitigate the negative effects of these metabolites produced by fungi under adverse conditions is a challenge. Among the adsorbent materials, bentonite is one of the most used in the segment, due to its particular structural characteristics, as well as rheological properties, chemical composition and cation exchange capacity, and it also allows activation and insertion of compounds capable of adding other functionalities, such as antimicrobial activity. Geranyl acetate is an ester derived from geraniol, which has excellent antimicrobial properties, thermal stability and non-toxicity, which makes it interesting for insertion into bentonite. In this context, the objective of this work was to obtain an antibacterial, antifungal and adsorbent composite of Aflatoxin B1, through the organophilization of bentonite with octadecylammonium and subsequent activation with geranyl acetate (0.4 w/w). The antimicrobial activity was tested against Staphylococcus aureus, Escherichia coli and Salmonella typhimurium at a concentration of 104 UFC?mL-1, as well as against the fungi producing Aflatoxin B1, Aspergillus niger and Aspergillus flavus at a concentration of 105 spores?mL-1, through the technique of diffusion in solid medium and determination of the resistance of materials to fungi. The adsorbent capacity was studied through adsorption kinetics at times of 0, 15, 45, 100, 120 and 150 min and Aflatoxin B1 concentration of 1 mg?L-1, at pH of 3.5 (equivalent to the condition of stomach) and pH of 6.5 (equivalent to the condition of the intestine) at a temperature of approximately 41±1 ºC. The results showed that the composite developed has excellent antimicrobial activity, especially in relation to Aflatoxin B1-producing fungi, and also acts as an effective adsorbent of this mycotoxin.