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ORIGINAL ARTICLE

In vitro studies on gastrointestinal monogastric and avian models to evaluate the binding efficacy of mycotoxin adsorbents by liquid chromatography-tandem mass spectrometry

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ABSTRACT

Objective: The objective of this study is evaluating the efficacies of 11 mycotoxin adsorbent products, marketed in South East Asia. Three prominently occurring mycotoxins; aflatoxin B1 (AFB1), deoxynivalenol (DON), and zearalenone (ZEN) were simultaneously spiked into the samples.
Materials and Methods: Samples were simultaneously tested in vitro in phosphate buffer and simulated at different pH conditions in the gastrointestinal tracts of the porcine and avian model, analyzed by liquid chromatography-tandem mass spectrometry (LC-MS/MS).
Results: All mycotoxin adsorbent products had high efficacy at over 90% for AFB1 adsorption in both GI porcine and avian models. AFB1 could be adsorbed more in acidic condition than the basic condition. ZEN adsorption was determined to be more stable at pH 3 than pH 6.5 or 8.4, in which pH condition might influence on ZEN desorption rate. DON was poorly adsorbed by all tested agents.
Conclusions: The finding showed that the adsorption rate varied depending on the type of adsorbent. Our results might provide useful information regarding the efficacy of mycotoxin adsorbents commercially marketed in the region.

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Aflatoxin B1; deoxynivalenol; LC-MS/MS; mycotoxin adsorbent; mycotoxin binder; zearalenone

Introduction

Contamination of food and feedstuffs with mycotoxins as harmful secondary metabolites produced by certain filamentous fungi is a global concerning issue with one-quarter of the estimated agricultural commodities [1]. The negative effects of mycotoxins on animals depend on species, age, dose, duration, and the nutritional and health status in which they are consumed. Contaminated feed can also affect the health functions and promote illness in animals that cause an economic loss. Therefore, a various physical, chemical, and biological methods to offset the adverse effects of mycotoxins have been implemented [2–5].

Using anti-mycotoxin feed additives is an alternative and attractive way of reducing the risk of mycotoxicosis and diminishing the transfer of mycotoxins from feed into animal products [6]. Generally, anti-mycotoxin feed additives are used to decrease mycotoxin absorption and to promote the excretion. The anti-mycotoxin or mycotoxin detoxifying agents can be categorized into two major groups as bio-transforming and adsorbing agents. First, bio-transforming or mycotoxin modifier agents, e.g., bacteria, fungi, yeast, and enzymes act to degrade mycotoxins into non- or less-toxic metabolites. Second, adsorbing agents as mycotoxin binders or adsorbents cause to decrease the absorption of mycotoxins from the gastrointestinal tract into the blood circulation and target organs by adsorbing on their surface. The use of adsorbing agents as technological feed additives has recently been officially

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