Hindawi
International Journal of Analytical Chemistry
Volume 2018, Article ID 4650764, 8 pages
https://doi.org/10.1155/2018/4650764

Research Article

Determination of Aflatoxin B_1 in Feedstuffs without Clean-Up Step by High-Performance Liquid Chromatography

Sasiprapa Choochuay,[1,2] Jutamas Phakam,[1,2] Prakorn Jala,[3] Thanapoom Maneeboon,[4] and Natthasit Tansakul[1,2]

[1] *Department of Veterinary Pharmacology and Toxicology, Faculty of Veterinary Medicine, Kasetsart University, 10900, Bangkok, Thailand*
[2] *Center for Advanced Studies for Agriculture and Food, KU Institute for Advanced Studies, Kasetsart University (CASAF, NRU-KU), 10900, Bangkok, Thailand*
[3] *Faculty of Veterinary Medicine, Kamphaengsaen Campus, 73140, Nakhon Pathom, Thailand*
[4] *Kasetsart University Research and Development Institute, 10900, Bangkok, Thailand*

Correspondence should be addressed to Natthasit Tansakul; natthasitt@yahoo.com

Received 16 March 2018; Accepted 10 May 2018; Published 24 June 2018

Academic Editor: Mohamed Abdel-Rehim

Copyright © 2018 Sasiprapa Choochuay et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

A reliable and rapid method has been developed for the determination of aflatoxin B_1 (AFB_1) in four kinds of feedstuffs comprising broken rice, peanuts, corn, and fishmeal. A sample preparation was carried out based on the QuEChERS method with the exclusion of the clean-up step. In this study, AFB_1 was extracted using acetonitrile/methanol (40/60 v/v), followed by partitioning with sodium chloride and magnesium sulfate. High-performance liquid chromatography with precolumn derivatization and fluorescence detection was performed. The coefficients of determination were greater than 0.9800. Throughout the developed method, the recovery of all feedstuffs achieved a range of 82.50-109.85% with relative standard deviation lower than 11% for all analytes at a concentration of 20-100 ng/g. The limit of detection (LOD) ranged from 0.2 to 1.2 ng/g and limit of quantitation (LOQ) ranged from 0.3 to 1.5 ng/g. The validated method was successfully applied to a total of 120 samples. The occurrence of AFB_1 contamination was found at the following concentrations: in broken rice (0.44-2.33ng/g), peanut (3.97-106.26ng/g), corn (0.88-50.29 ng/g), and fishmeal (1.06-10.35 ng/g). These results indicate that the proposed method may be useful for regularly monitoring AFB_1 contamination in feedstuffs.

1. Introduction

Aflatoxins (AFs) are secondary metabolites of fungi (e.g., *Aspergillus flavus* and *A. parasiticus*). AFs occur naturally and can be found in common food and feedstuffs such as rice, peanuts, corn, fishmeal, and soybean meal [1–3]. The four major analogues—aflatoxins B_1 (AFB_1), B_2 (AFB_2), G_1 (AFG_1), and G_2 (AFG_2)—are the most important members because they all pose a potential risk to human and animal health if food and feedstuffs have been contaminated. In particular, the toxicity of AFB_1 can range from levels that may cause immune system suppression to the induction of teratogenic, mutagenic, and carcinogenic activities [4, 5], which is collectively classified as a carcinogen (Group I) by the International Agency for Research on Cancer (IARC) [6]. In addition, feedstuffs comprise the first link of the food chain; therefore, there is a risk of AFB_1 carryover from feedstuffs into animal tissues and/or biological fluids such as meat, milk, and eggs, which may eventually be hazardous for human consumption [7–9]. As a result of such adverse health effects of the toxin, it is necessary to have a sensitive, reliable, and accurate method for monitoring AFB_1 level in feedstuffs.

High-performance liquid chromatography with fluorescence detection (HPLC-FLD) is considered as the most reliable instrument for the quantification of AFs due to its accuracy and high sensitivity. However, it requires clean-up steps involving immune affinity columns (IAC) to remove interferences and preconcentration of AFB_1. IAC is also