

Simultaneous determination of aflatoxins and ochratoxin A in single and mixed spices

ABSTRACT

Methods for the extraction and high performance liquid chromatography (HPLC) quantification of aflatoxins (AFs) and ochratoxin A (OTA), in a single procedure, from selected individual spices, i.e., coriander, chili, cumin, fennel and turmeric, were developed. The optimized method was then applied to spice mixtures, i.e., curry, kurma and soup powders. The aflatoxins B₁, B₂, G₁ and G₂ (AFB₁, AFB₂, AFG₂ and AFG₂) and ochratoxin A were extracted using a multi-mycotoxin immunoaffinity column, and the determination was conducted using reverse-phase HPLC and fluorescence detector (FLD) with a photochemical derivatisation system. The samples, for recovery study, were spiked with 3 different concentrations of AFB₁ and AFG₁ (0.4, 4.0 and 40 µg/kg), AFB₂ and AFG₂ (0.2, 2.0 and 20 µg/kg), and OTA (0.5, 5.0 and 50 µg/kg). Validation was conducted to confirm that the method was suitable for multi-toxin and multi-matrix analysis. The recoveries of AFB₁, AFB₂, AFG₁ and AFG₂ ranged from 72% to 100% for coriander, chili, cumin and all of the spice mixtures, and lower recoveries, ranging from 61% to 80%, were attained for fennel and turmeric. The recovery of OTA ranged from 96% to 113% for coriander and from 73% to 100% for chili, cumin, fennel, turmeric and all of the spice mixtures. The repeatability (RSD_r) of the determination of AFB₁, AFB₂, AFG₁, AFG₂ and OTA contained in all of the spices ranged from 2% to 19%, whereas the LOD was 0.1 µg/kg for AFB₁/AFG₁, 0.05 µg/kg for AFB₂/AFG₂ and 0.1 µg/kg for OTA, and the LOQ was 0.4 µg/kg for AFB₁/AFG₁, 0.2 µg/kg for AFB₂/AFG₂ and 0.5 µg/kg for OTA. The results indicated that the method for the simultaneous determination of AFs and OTA can be applied to both single and mixed spices and is suitable for routine laboratory analysis.

Keyword: Simultaneous determination; Aflatoxins; Ochratoxin A; Spices