Comparisons of different methods for detection of aflatoxin in grain and grain products

H. Mohamadi, H. Abbaspour, M. Hassanshahian

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Abstract

Aflatoxins are secondary metabolites of, primarily, the fungi *Aspergillus flavus* and *A. parasiticus*. There are four principle types of aflatoxin: B_1, B_2, G_1 and G_2, which are named for their respective innate fluorescent properties and mobility in chromatograms. Aflatoxins can cause liver disease in animals and may cause other diseases involving other organ systems. Aflatoxins can be found mainly in cereals, corn, peanuts, cottonseed and nuts. Commonly used analytical methods for the determination of aflatoxins include thin-layer chromatography (TLC), high-performance liquid chromatography (HPLC), gas chromatography (GC) and immunochemical methods such as enzyme linked immunosorbent assay (ELISA). ELISA methods are based on the ability of antibody to distinguish the three-dimensional structure of mycotoxins. ELISA test kits are well favored as high through-put assays with low sample volume requirements and often less sample clean-up procedures compared to conventional methods such as TLC and HPLC. They are rapid, simple, specific, sensitive and portable for use in the field and have become the most common quick methods for the detection of mycotoxins in foods and feeds. However, although the antibodies have the advantage of high specificity and sensitivity, because the target compounds are mycotoxins but not the antigens, compounds with similar chemical groups would also interact with the antibodies. This so-called matrix effect or matrix interference commonly occurs in ELISA methods, which can give rise to underestimates or overestimates in mycotoxin concentrations in commodity samples. Additionally, insufficient validation in ELISA methods causes the methods to be limited in the range of matrices examined. Therefore, an extensive study on the accuracy and precision of the ELISA method over a wide range of commodities is needed and a full validation for an ELISA method is essential and critical.