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The Most Important Methods for Reduction or Detoxification of Aflatoxins in Food and Feed Matrices

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Aflatoxins are the most important mycotoxins in many foods. About 20 different types of aflatoxins have been identified and the most important species include AFB_1, AFB_2, AFM_1, AFG_1, and AFG_2 [1]. Information achieved from the metabolic activity in human liver indicates that human beings have an average sensitivity to the acute toxicity of aflatoxin B_1. However, these data may demonstrate higher sensitivity to the chronic toxicity of this toxin, especially to its carcinogenicity. Numerous studies confirmed that children may be exposed to aflatoxins by consuming milk from mothers who received aflatoxin in their diets. The potential risk of aflatoxin in diets is obvious and thus extensive efforts are required to reduce or remove this food contamination [2, 3]. Preventive strategies with regard to production of aflatoxins are divided into two phases of pre- and post- harvest. In pre-harvest phase, the fungal contamination control on the farm is considered [4]. Weather conditions, such as the level of rain or temperature are some of the factors that affect production of aflatoxins. In addition, management systems such as appropriate plantation, favorable maintenance, prevention of stress, provision of appropriate nutrition, plant pest control, plant disease control, management of product remainder, and post-harvest measures play important roles in controlling aflatoxins [5].

Post-harvest phase is related to appropriate sorting and storage; therefore, physical, chemical, and biological methods can be used to reduce aflatoxins. Adsorption physical and thermal processes (extrusion, baking, frying, cooking, and roasting) among physical methods, ozonation and chemical agents among chemical methods, and microbial metabolization and enzymes among biological methods reduce aflatoxins. For example *Pantoea* is a genus of Gram-negative bacteria of the family Enterobacteriaceae recently separated from the genus enterobacter. This genus includes at least 20 species. *Pantoea* aflatoxin degradation enzyme (PADE), which is isolated

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from the supernatant of *Pantoea* sp.T6, is capable of destroying AFB_1 and can reduce aflatoxin B_1 in the food and feed industry [6]. Moreover, cell-free supernatant of *Bacillus velezensis* DY3108 has the ability to destroy AFB_1. In addition, *B.velezensis* DY3108 might be a possible candidate for detoxification of AFB_1 in food and feed matrices [7]. *Armillaria tabescens* is a fungus species in the Physalacriaceae family. Aflatoxin oxidase (AFO), an enzyme generated by *Armillariella tabescens* has the oxidative detoxification activity against aflatoxin B_1 and sterigmatocystin [8].

Geneally, microwave heating, electron beam and gamma irradiation, UV and pulsed light, electrolyzed water, and cold plasma are the newest methods of Aflatoxins reduction in food and feed matrices. Various studies show that using new technologies has important role in reducing aflatoxins in several foods [4]. In addition, the level of aflatoxin reduction in foods depends on several factors such as food ingredients, pH, and matrix [4]. Most techniques used to reduce aflatoxins in food do not cause complete degradation of aflatoxins. Moreover, loss of nutritional value and absence of other contaminants are among the other important issues. Therefore, preventive techniques, rather than degradation methods should be used to prevent the formation of aflatoxins.

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