AFLATOXINS DETOXIFICATION BY GAMMA IRRADIATION

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Mycotoxins are secondary toxic metabolites of filamentous fungi. Aflatoxins (AFs) are produced to *Aspergillus* species such as *A. flavus* and *A. parasiticus*. These fungi are ubiquitous in nature and usually found on agricultural commodities. Therefore, AFs are encountered in many important foodstuff, including wheat, rice, maize, peanuts, sorghum, pearl millet, spices, oilseeds, tree nuts and milk. Due to the high toxicity of AFs, many methods have been studied to reduce or eliminate these mycotoxins from food and feed. Gamma irradiation is one technology that has been investigated with promising results.

The aims of this study were (I) to study the effect of gamma radiation on aflatoxin B1, aflatoxin B2, aflatoxin G1 and aflatoxin G2 (II) to evaluate the effect of the presence of water on AFs degradation during the irradiation process; and (IV) to evaluate the cytotoxicity of radiolytic products formed.

Dried samples with 1 µg of mycotoxin and solutions in water or in methanol:water with 1 µg/mL were submitted to gamma radiation doses ranging from 1 to 10.0 kGy. After irradiation, AFs levels were determined by HPLC with fluorescence detection and photochemical post-column derivatization. Cytotoxicity was assessed in HepG2 cells using assays to evaluate alterations of metabolic activity, plasma membrane integrity and lysosomal function.

A degradation of AFs around 90% was observed at radiation doses above 1.7 kGy, but only when irradiated in an aqueous environment. In the dehydrated form, no significant reduction of AFs concentration and toxicity was observed comparing with controls. The radiolysis of water plays an important role in this destruction and explains the differences found. This phenomenon produces highly reactive free radicals which can degrade AFs or interact with them, producing molecules with lower biological activity. For the aqueous samples, cytotoxicity assays showed a significant reduction of toxicity with increasing radiation doses. A 2 kGy dose was sufficient to eliminate almost all toxicity. No increase of cytotoxicity was observed in any of the experiments after irradiation. These results point out that irradiation may contribute for the detoxification of aflatoxins on food commodities if water is available.

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