Stress regulation of ochratoxin A biosynthesis

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Ochratoxin A is an important mycotoxin produced by several *Aspergillus* and *Penicillium* species. Among the aspergilli, *A. carbonarius*, which is an important contaminant of grapes, coffee and cocoa, is a strong ochratoxin A producing species. On the other hand, *Penicillium nordicum* and *P. verrucosum* are the two *Penicillium* species able to produce ochratoxin A. The latter is also able to produce citrinin. *P. nordicum* occurs in NaCl-rich foods, whereas *P. verrucosum* mainly can be found on cereals, but occasionally also on NaCl-rich food commodities. *P. nordicum* is very well adapted to NaCl-rich environments. In fact, the growth rate is nearly unaffected within a certain NaCl concentration range. Moreover also the production of ochratoxin A is very high over a wide concentration range. This is not the case for *P. verrucosum*. This species changes its metabolite profile according the environmental conditions. It produces citrinin under certain growth conditions but this production is shifted towards ochratoxin A under high NaCl concentrations. This is interesting because citrinin has a polyketide structure very similar to ochratoxin A, except that it does not contain chlorine. It has been suggested that the production of ochratoxin A is an adaptive feature in high NaCl environments. Unexpectedly for this reason, *A. carbonarius*, which also produce ochratoxin A, is not adapted to NaCl-rich environments. In fact, very moderate concentrations of NaCl can have a profound negative influence on growth rate and thereby of course on ochratoxin biosynthesis.

External signals like variations in osmotic conditions by changes in the NaCl concentrations of the substrate are mediated via signal transduction pathways from the environment to the transcriptional level, e. g. the ochratoxin A biosynthesis genes. The most important signal transduction pathway involved in osmoregulation is the conserved HOG signal pathway. For *P. nordicum*, it could be demonstrated that the phosphorylation of HOG, which is the last MAP kinase of the pathway, is correlated with the biosynthesis of ochratoxin A. In *P. nordicum*, a consistent phosphorylation could be observed over the whole NaCl concentration range (0-100 g/l). In *P. verrucosum*, a high phosphorylation is merely found at higher concentrations of NaCl which is in agreement with ochratoxin A production. In contrast to the conditions in *Penicillium* which suggests a regulation of the ochratoxin A biosynthesis by HOG in response to NaCl, the HOG protein is phosphorylated at high NaCl conditions in *A. carbonarius* too, but these conditions obviously do not support ochratoxin A biosynthesis in this species. This suggests a different adaptive role of ochratoxin A biosynthesis between the two genera.

Fate of aflatoxins during the processing of pistachio and apricot kernel

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Aflatoxin contamination of nuts is a serious problem for many producing countries. Throughout the nut production chain, processing is a key factor for prevention of mould growth and aflatoxin contamination Application of good agricultural practices in orchards to reduce mould infection during growing and the hazard analysis critical control point approach to prevent contamination during harvest and post-harvest stages result in minimization of aflatoxin contamination.

This study aimed to determine the effect of further processing (dehulling, drying, blanching and sorting) on reduction of aflatoxin contamination in pistachio and apricot kernel. Aflatoxin contaminated pistachio and apricot kernel lots were processed using industrial processing facilities that are generally applied prior to marketing to evaluate aflatoxin reduction. Samples were taken and analyzed by HPLC with fluorescence detection before and after each processing stage to demonstrate the effect of each process on aflatoxin contamination. Further processing such as sorting and blanching consistently reduced aflatoxin contamination in pistachio and apricot kernel; after each step aflatoxins were concentrated in the rejected kernels (pick-outs/damaged kernels).

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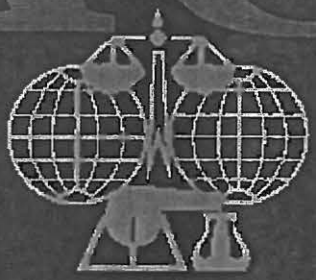

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