

ABSTRACT

Minimization of Ochratoxin A in Cocoa and Cocoa Products
Using a Food Safety Approach

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Development of a validated, quality controlled and reliable method for the determination of Ochratoxin A (OTA) in cocoa beans of high fat contents is described. This method was applied to cocoa beans sampled at different stages of cocoa processing over a four-year period. The results were used to assess the prevalence of OTA by year and a higher incidence of OTA contamination was observed in 2007, as compared with those in 2006, 2009 and 2010. The results were also used to identify the stages of cocoa processing that were susceptible to OTA contamination and it was observed that stored beans as well as unfermented beans had levels of OTA in excess of the Maximum Permissible Level of 2ng/g.

In addition to chemical analyses, mycological evaluation of cocoa beans sampled at different stages of processing and storage as well as swab samples of various processing facilities was undertaken. The three *Aspergillus* spp isolated were *A. tamarii*, *A. fumigatus* and *A. niger*.

The effect of modified atmospheres on fungal growth and OTA production was also investigated as a recommendation of measure for control during storage of beans for extended periods of time. The modified atmosphere was created from respiration of the cocoa beans in sealed chambers and alternatively by the addition of dry ice pellets. The advantage of using carbon dioxide is that it improves and maintains cocoa flavour and subsequently extends the shelf-life of beans. It also serves as a healthier and safer alternative fumigant than phosphine.

Eventually, identification of the Critical Control Points for OTA contamination along the processing chain, including harvesting, processing and storage was used to develop a HACCP-based system for local cocoa production. This evidence-based approach can subsequently be used to develop a full HACCP system for the cocoa industry.

Keywords: Ochratoxin A, *Aspergillus*, Cocoa, HACCP