AgroScience Today

Popular Article

e-ISSN: 2583-0147

Volume 5 Issue 9
Page: 0958 – 0960

Aflatoxin contamination in agricultural products and their decontamination strategies

Ramalakshmi .A[1]* and Balakrishnan .M[2]

[1]Associate Professor (Agrl. Microbiology), Department of Agrl. Microbiology, TNAU, Coimbatore, Tamil Nadu, India.

[2]Professor and Head, Department of Food Process Engineering, TNAU, Coimbatore, Tamil Nadu, India.

Corresponding author's e-mail: *ramalakshmi.a@tnau.ac.in*

Published on: September 30, 2024

ABSTRACT

Mycotoxins, also known as aflatoxins, are low molecular weight secondary metabolites that are mostly produced by *Aspergillus* species fungi, including *A. flavus*, *A. parasiticus*, and a few others, including *A. pseudotamarii*, *A. bombycis*, *A. nomius*, and *A. ochraceoroseus*. Numerous crops like groundnuts, cereals, fruits and vegetable and other processed products are prone to aflatoxin contamination, produced by fungi belonging to the *Aspergillus* section *Flavi fungi*. The presence of aflatoxins in crops leads to both health and economic challenges in numerous areas. Many countries have established specific thresholds (ranging from 2 to 20 ppb) for permitted levels of aflatoxin contamination in their food and agricultural products intended for human or animal consumption. A number of techniques have been used to get rid of aflatoxins from contaminated food and feed.

INTRODUCTION

Aflatoxins are produced by various fungal genera *Aspergillus flavus*, *Aspergillus parasiticus*, and *Aspergillus nomius* and are known to affect crops like groundnut, corn, sorghum, rice, cotton, chilli pepper, nutmeg. These are small molecules having furanocoumarin and lactone ring structure and are produced as secondary products. Animal and human health may be negatively

impacted by direct or indirect aflatoxin exposure in immunotoxic, mutagenic, oestrogenic, hepatotoxic, hemorrhagic, carcinogenic, teratogenic, neurotoxic, nephrotoxic and immunosuppressive ways. More than 18 distinct aflatoxin variants have been identified so far, with aflatoxins B1(the most carcinogenic), B2, G1, and G2 being the most widespread and lethal. A recent investigation revealed that between 60-80% of crops around the world are affected by mycotoxin contamination. Many countries have established specific thresholds (ranging from 2 to 20 ppb) for permitted levels of aflatoxin contamination in their food and agricultural products intended for human or animal consumption.

The most prevalent and very dangerous mycotoxins found in food include aflatoxins (AFs), trichothecenes, ochratoxins, fumonisins, zearalenone (ZEA), and patulin. While Aspergillus parasiticus creates both the B and G groups of aflatoxins through a number of metabolic pathways, Aspergillus flavus typically only produces the B group. AFM1 and M2 are metabolic derivatives of AFB1 and AFB2, respectively. The IARC (International Agency for Research on Cancer) categorized AFB1 as Group1 which leads to human cancer. Nevertheless, compared to AFB1, AFM1 is around ten times less mutagenic, genotoxic, and toxic; its carcinogenic effects have been shown in a number of species. In addition to being cytotoxic, AFM1 can damage DNA, mutate genes, result in chromosomal abnormalities, and alter cells in mammals. The Food and Drug Administration (2017) recommended that maximum permissible level of total aflatoxin was 20 ppb for all foods.

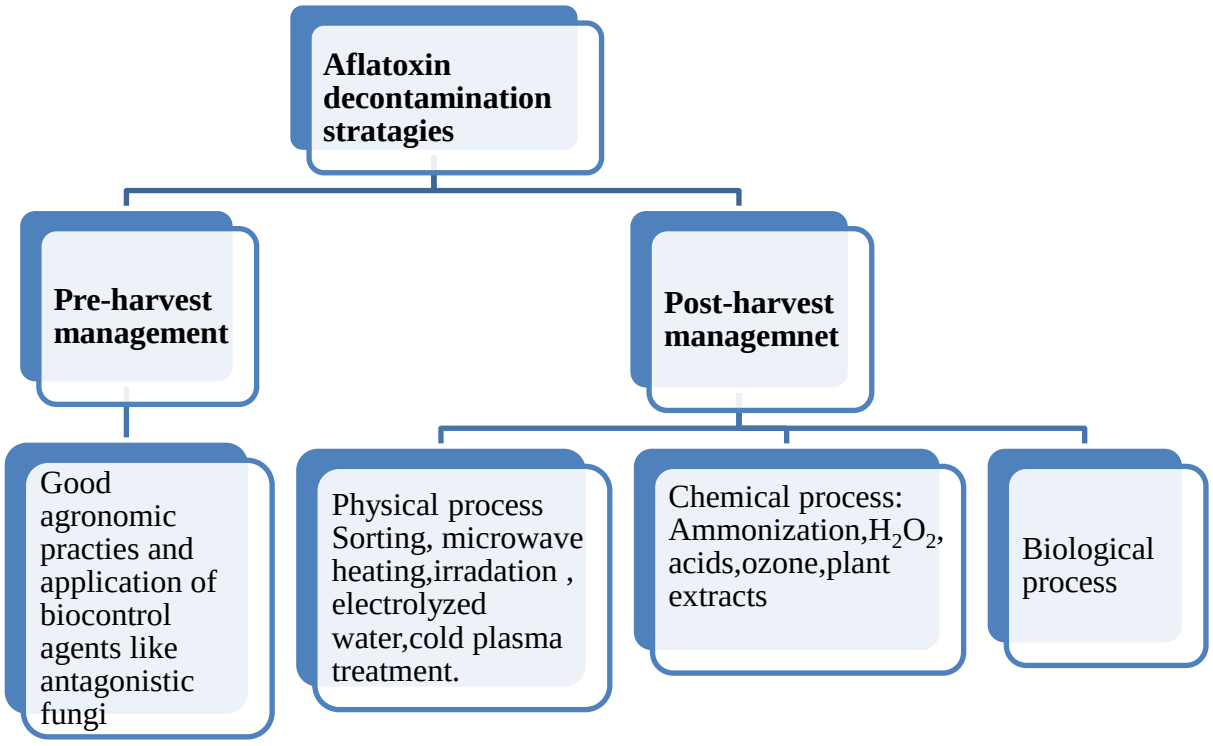

Figure 1. Decontamination strategies of Aflatoxin

A number of techniques have been used to get removal of aflatoxins from contaminated food and feed. A few drawbacks of eliminating aflatoxins using physico-chemical methods include potential losses in the nutritional content of the commodities treated and inadequate toxin elimination, hence the biological methods have proven to be an effective means of aflatoxin decontamination without loss of nutritional quality of the products.

Scientific investigations have focused on mitigating aflatoxin contamination approach, categorized into i). Pre-harvest management ii).post-harvest management strategies. The pre-harvest management by biocontrol agents and the implementation of good agricultural practices. ii). Post-harvest management encompasses a range of techniques, including physico-chemical interventions, natural phytochemical processes, and biological approaches. These measures are designed to target and eliminate aflatoxins present in feeds, food items, and various agricultural products, ensuring the safety and integrity of the food supply chain **(**Fig 1).

CONCLUSION

In today's context, global food security is challenged by the widespread of aflatoxin contamination in food crops. Various physical and chemical techniques have been used to address this problem, but each has a unique set of disadvantages. These include the need for costly equipment, potential loss of nutritional value through methods like radiation, and the risk of chemical residues remaining on treated food products. The biological methods have proven to be an effective means of aflatoxin decontamination without loss of nutritional quality of the products.