



Tackling the Menace of Mycotoxin in Nutmeg

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Spices are considered an inevitable component for human nutrition. It has been used for flavouring, imparting colour, aroma and preservation of food. Majority of spices that are traditionally traded globally are products of tropical environment characterized with wide ranges of temperature, humidity and rainfall. Hence, spices that are cultivated mainly in tropics and subtropics are invariably exposed to contamination with mycotoxins produced by a myriad of toxigenic fungi and nutmeg is not an exception to this malady.

Nutmeg is the dried seed of *Myristica fragrans* which yields two spices viz., nut and mace. Inadequate drying and insect infestation make the nut as well as mace vulnerable to fungal attack (Fig.1),

subsequently leading to mycotoxin contamination. Agricultural products can be contaminated with mycotoxins if processing of commodities is delayed or the moisture content in the produce exceeds critical values invariably favouring mold growth under storage. The naturally occurring toxin, aflatoxin in nutmeg and mace has become a major concern especially in the European markets where several alerts have been issued on the quality aspects.

Occurrence of Mycotoxins in Nutmeg

Aspergillus flavus is the most predominant toxigenic fungal contaminant in nutmeg followed by *Rhizopus stolonifer*. In recent years, rapid alerts on Aflatoxin (AF) in nutmeg have been issued by the European

Commission. Between 2002 and 2011, the Rapid Alert System for Food and Feed (RASFF) received 61 notifications on mycotoxins in nutmeg, of which 60 notifications concerned AF particularly originating from Indonesia and India. Contrastingly, there have been only two notifications of Ochratoxin (OTA) (in one notification, OTA was simultaneously found with AFs) in nutmeg originating from India. The maximum ceiling limit of aflatoxin level for export from India to various countries is 5-30µg/kg.



Health Hazards of Mycotoxins

Owing to the procedures adopted while processing and the environmental conditions prevailing during processing, spices may heavily be contaminated with toxigenic fungi and mycotoxins. In spices, there are two groups of mycotoxins of concern: aflatoxins (AFs) and ochratoxin A (OTA). AFs are considered as the most toxic group of mycotoxins produced by certain *Aspergillus* species (*A. flavus*, *A. parasiticus*, and rarely *A. nomius*). While several types of AFs are produced in nature belonging to a group called difuranocoumarins, only

four viz., aflatoxin B1 (AFB1), aflatoxin B2 (AFB2), aflatoxin G1 (AFG1) and aflatoxin G2 (AFG2), are naturally found in foodstuffs. *A. parasiticus* produces both B and G aflatoxins and is well adapted to soil environment, while *A. flavus* is more adapted to the aerial parts of plants and produces only B aflatoxins. Aflatoxins have several toxic effects on animals and humans, including carcinogenic, mutagenic, teratogenic, and immunosuppressive activity. AFB1 is the most potent genotoxic and carcinogenic AF and among the most commonly found AFs in agricultural products. AFB1 and naturally occurring mixtures of AFs have been classified by the International Agency for Research on Cancer (IARC) as group I carcinogens, with a role in the etiology of liver cancer, notably among subjects who are carriers of hepatitis B virus surface antigens.

Prevention of Mycotoxin Contamination

- Adopt pre-harvest control measures like good cultural practices such as insect control, irrigation during drought conditions, appropriate time of harvesting, cropping patterns etc.
- Take up post harvest precautions like proper post-harvest drying (cost effective), storage, shelling, de-hulling, sorting, early harvest, regionally adjusted planting dates.

While most of the processed dried foods are considered comparatively low-risk products from a microbiological standpoint, herbs and particularly spices, are exceptions and commonly contain high levels of fungi and other microorganisms that can potentially cause food poisoning. Good agricultural practices (GAP) coupled with good manufacturing practices (GMP), including removing injured and diseased produce, avoiding contact with soil during harvesting as well as drying, quickly reaching

“safe” moisture levels, improved drying methods, storage conditions, increased hygienic practices and safer packaging procedures have resulted in much lower levels of mycotoxin contamination in nutmeg. Furthermore, the use of ongoing training programmes to sensitize farmers,

manufacturers, and traders about GAP and GMP by food safety authorities in various countries, should be continued and further encouraged as this has a beneficial effect in lowering the mycotoxin levels in these commodities.



Ginger Rhizome Maggot: Fact and Fallacy

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Maggot feeding on decaying rhizome

Ginger is a part and parcel of Indian cuisine and various Ayurvedic preparations since time immemorial. India ranks first in terms of area of cultivation and second in production of ginger in the world. With the development of many high yielding varieties, the crop has become an assured source of income to many farmers in different states of the country. However,

the crop is susceptible to various pests and diseases, sometimes leading to complete failure of the crop. Hence, farmers resort to application of several rounds of pesticides leading to accumulation of residues in the final produce.

Timely diagnosis and proper knowledge of pests and diseases can reduce the