

Aflatoxin Contamination, Related Health Issues and Home Remedies in Peanut

Ramandeep Singh* and Rubina Gill**

^{1 & 2}Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Jalandhar, Punjab, India, 144411.

ARTICLE ID: 047

Introduction:

Aflatoxins are the toxic substances produced in various agricultural crops and storage food by *Aspergillus spp.* The aflatoxin B and G type are found to be riskier for both human and animals whereas M type is not the much serious. It is more common in the regions having high humidity along with warm climate. Permissible limit of aflatoxin in India is 0.5ppb and 30ppb in mild and crop, respectively. In India, first time the effect was report in Gujarat where 106 people died due to the hepatitis which occurred due to aflatoxin. In 1975, humans and dogs in the north India were affected by aflatoxins. In Punjab, 1.4 thousand hectares area was under groundnut with 2.8 thousand tonnes of production during 2019-2020. It is mostly grown in Hoshiarpur district having average yield of 1975 kg/ha.

Occurrence:

Common aflatoxin producing fungi are *A. flavus* and *A. parasiticus*. Temperature ranging between 25⁰ to 32⁰ C and humidity from 16 to 85 % are favourable for growth of the fungus. Various genes and enzymes are involved in production of aflatoxins such as sterigmatocystin, dihydrosterigmatocystin, etc. Greater amount of aflatoxin in groundnut is also noticed due mismanagement in the production of crop. Environmental factors during maturity



and harvesting leads to increase in the aflatoxin content in the produce. High humidity and warm temperature in storage condition also favours the fungus growth. Evidence of presence

of aflatoxin in milk were also reported and the content of aflatoxin was higher in milk of animal who were fed the contaminated forage. Insect infestation is another cause of aflatoxin contamination. The soil containing high amount of residues and moisture content leads to growth of aflatoxin producing fungus. Under drought conditions, plants release moisture which invites the fungus growth.

Presence in crops and food:

Aflatoxins are present in large number of crops like *Arachis hypogea*, *Zea mays*, *Glycine max*, *Triticum aestivum*, *Oryza sativa*, *Gossypium spp.*, etc. but contamination is high in case of groundnut, maize, and cotton. The food grains which are kept for storage in improper conditions are also found to be contaminated with aflatoxins. Recent studies also reported that aflatoxins are present in milk as well, generally when animals are fed with high aflatoxin contaminated feed. The animals raised for egg and meat production, if fed with aflatoxin containing feed, it contaminates the produce as well. In India, it was found that 21 % of groundnut has high amount of aflatoxin which is not safe for human consumption. ICRISAT in a report unveils that Indian groundnut contains many times high aflatoxin than the prescribed limits because of storing in high temperature and humid conditions and during cultivation under drought stress.

Healthy kernels



Aflatoxin infected Kernels



Effects on humans and animals:

Both humans and animals can tolerate certain amount of aflatoxin intake, but larger consumption leads to various health hazards and which can be life threatening in severe cases. In humans, consumption of high aflatoxin contaminated food products can lead to liver infection and cancer. Weakening of immune system is another impact. In children, weak immune system makes them susceptible to high infections. Carcinogenic effects in kidney can also be caused by aflatoxins. Reduction in growth of cattle due to anaemia that is caused by aflatoxins. Detrimental effect on heart is also reported in humans by consumption of aflatoxins. Brain cells do not function properly due to aflatoxins. The impact of aflatoxin depends on age, sex and nutrition of both humans and animals. Reduced milk and egg production are also noticed. High consumption of aflatoxins by human causes digestion problems and can lead to death also. Mutagenic effects leading to alteration in DNA and loss/gain of chromosome is also a serious problem.

Management methods:

As high amount of aflatoxin is not safe for humans and animals, so various methods are used to reduce the aflatoxin content in various crops and other food products as well. Use of bacteria like *Bacillus*, *Pseudomonas* etc. have been found impactful in reducing contamination of aflatoxins. In physical methods, 40-80% reduction in aflatoxin by just the removal of damaged or diseased kernels. By using *Trichoderma spp.*, contamination can be reduced by 20-90 percent in groundnut. Processing of the food including cooking, drying and pasteurization are also followed in India and other parts of the world. It is simple method which can be followed by individuals in their house before the consumption of aflatoxin contaminated food. Higher temperature of 237⁰ to 306⁰ C decomposes the aflatoxin and it can be followed at industrial level during the production of various products and packaging of kernels. Maintaining the proper conditions in the food storage structures also reduce the contamination of food with aflatoxin. During production, harvesting and transportation, careful working and avoiding any damage to the produce also controls the contamination. Crop rotation with a non-host crop of fungus breaks its life cycle which is also very useful and cheap as well and can be followed easily on large scale. Growth of aflatoxin producing fungus can be inhibited with use of neem extract.

Home remedies to overcome aflatoxin:

- Storing the kernels at low temperature which reduces the chances of fungus growth.
- Removal of unhealthy or partially cracked or destroyed kernels which might favour the growth fungus.
- Roasting of kernels in oil is also helpful in reduction of 50% of B₁ type aflatoxin.
- Heating at 100⁰ C also reduces aflatoxin contamination.



Groundnut Field

Conclusion:

Aflatoxin contamination in groundnut is very serious issue as it threatens the human and animal life by causing various diseases. Occurrence of various diseases and death around the world has been reported due to aflatoxin consumption. Large number of crops and food stuff has been contaminated which can cause casualties. But methods to control aflatoxin production like physical and cultural are easy to follow and can reduce contamination up to 60 % and biocontrol is more effective as it can reduce contamination up to 90 %. So, if all the methods followed properly great number of health issues in humans and animals can be reduced.

References:

- Anjaiah, V., Thakur, R. P., Koedam, N. (2006). Evaluation of bacteria and *Trichoderma* for biocontrol of preharvest seed infection by *Aspergillus flavus* in groundnut. *Biocontrol Science Technology*, **16**, 431-436.
- Cole, R. J., Cox, E. H. (1987). Handbook of toxic fungal metabolites.
- Feuell, A. J. (1966). Aflatoxin in groundnuts IX, Problems of detoxification. *Tropical Science*, **8**, 61.
- Galvano, F., Galofaro, V., Galvano, G. (1996). Occurrence and stability of aflatoxin M1 in milk and milk products. *Journal of Food Protection*, **59**, 1079-1090.
- Iqbal, S. Z., Mustafa, H. G., Asi, M. R., Jinap, S. (2014). Variations in vitamin E level and aflatoxins contamination in different rice varieties. *Journal of Cereal Science*, **60**, 352-355.
- Kamle, G. N., Ozbey, F., Kabak, B. (2015). Co-occurrence of aflatoxins and ochratoxin A in cereal flours commercialised in Turkey. *Toxins*, **11**, 328.
- Murshed, S. A. A., Bacha, N., Talal, T. (2019). Detection of total aflatoxins in groundnut and soybean samples in Yemen using Enzyme-Linked Immunosorbent Assay. *Journal of Food Quality*, **7** 61-72.
- Rustom, I. Y. S. (1997). Aflatoxin in food and feed: occurrence, legislation, and inactivation by physical methods. *Food Chemistry*, **59**, 57-67.
- Tian, F., Chun, H. S. (2017). Natural products for preventing and controlling aflatoxin contamination of food, *IntechOpen*, **8**, 89-94
- Williams, C. D., Jaeschke, H. (2011). Liver Toxicology. *Encyclopedia of Environmental Health*. **55**, 1127-1133
- Williams, J. H., Phillips, T. D., Jolly, P. E., Stiles, J. K., Jolly, C. M., Aggarwal, D. (2004). Human aflatoxicosis in developing countries: A review of toxicology, exposure, potential health consequences and interventions. *Journal of Clinical Nutrition*, **80**, 1106-1122.