

## Aflatoxin

Aflatoxins are potent toxic, carcinogenic, mutagenic, immunosuppressive agents, produced as secondary metabolites by group of *Aspergillus* sp. on variety of food products. *A. flavus* is the predominant species present in the Indian soils. Among 18 different types of aflatoxins identified, major members are aflatoxin B1, B2, G1 and G2. Due to deleterious effects on animal and human health, World Health Organization (WHO) and many importing countries imposed strict Sanitary and Phytosanitary (SPS) measures to prevent entry of aflatoxin contaminated foodstuffs and feeds to their countries.

Aflatoxin contamination in groundnut is contained at different stages. The following are the stages, where management strategies were adopted to contain the fungus and subsequently aflatoxin contamination in groundnut.

- a. Pre-harvest management
- b. Harvest and post-harvest management

### Pre-harvest management

Preventing fungal growth is the best method for preventing toxin production. The following are the reasons for aflatoxin contamination in groundnut at pre-harvest stages:

- ✓ The soil population of *A. flavus* are abundant and varies from farm to farm depending on soil types and crop rotations
- ✓ Development of cracks during pods growth
- ✓ Mechanical injury to pods during intercultural operations
- ✓ Infestation of insect-pests (termites, pod borers and wire worm) causing damage to pods
- ✓ Death of plants caused by diseases (stem, root and pod rots) at pod maturity stages making the pods vulnerable to invasion by *A. flavus*
- ✓ Nematode damage to the pod

High atmospheric temperature (30-40°C) in conjunction with reduced soil moisture availability and the crop undergoing protracted dry spell (more than 20 days) before harvest are the main reasons for *A. flavus* infection and subsequent aflatoxin contamination in groundnut. Pre harvest prevention of aflatoxin contamination is probably the best and most widely explored strategy, since *A. flavus* infects all the affected crops prior to harvest. Strategies for groundnut growers to reduce aflatoxin content in groundnut are:

- Remove stubbles of previous crops/weed flora and adopt clean cultivation.
- Deep ploughing (8-10 inches) to expose the soil to sun for 2-3 weeks.
- Apply neem/ castor cake @ 500 kg/ha in furrow at the time of sowing or enriched with 2.5 kg of commercial formulation of *Trichoderma* sp. Application in furrow at the time of sowing to prevent attack of soil borne pathogens.
- Apply well decomposed farmyard manure/compost @ 5-10 tons/ha, if available.
- Inter-row water harvesting by adopting paired row method of planting.
- Select short/medium duration variety, which can escape end of season drought at maturity. Advance sowing by a fortnight with a pre-sowing irrigation to evade end-of- season drought.
- Sow only sound seeds and treat them with carbendazim 50WP (Bavistin) @ 4g/kg one week before sowing. And also treat the seeds again with

commercial formulations of *T. harzianum* or *T. viride* @ 10g/kg seed just before sowing.

- Apply gypsum @ 400-500 kg/ha at flowering.
- Avoid end-of-season drought by providing supplemental irrigation.
- Harvest the crop at right maturity (blackening of inner surface of shell).

### **Harvesting and post-harvesting management**

Strategies for groundnut growers to reduce aflatoxin content in groundnut at the time of harvesting and post-harvestings are:

- Hot spots, the patches of field that have undergone stress or harboured diseases should be harvested, dried, stocked and disposed off separately.
- Avoid mechanical damage to the pods during harvesting.
- Dry the uprooted plants along with the pods in small heaps by keeping them up-side-down *i.e.* foliage towards ground and pods upwards. This facilitates rapid drying and thus shortens the risk-period of invasion by the fungi. Dry the plants till the leaf/pegs become brittle (6-7 days).
- Pick the immature pods first and do not mix them with the main lot of mature pods. If mechanical thresher is used, appropriate sieves should be used to isolate immature pods.
- Remove all the pods showing mechanical or insect damage.
- Dry thoroughly the sound pods to a safe moisture level. Well-dried pods produce rattling sound on shaking a handful of pods.
- Store the produce in new/clean polyethene lined gunny bags and stack them on wooden planks keeping a metre gap from the walls in a well-aerated and well-covered space.
- Keep the storage space free from any kind of seepage or leakage water that may lead to build up of moisture.
- Prevent insect damage to the pods in storage by fumigating with phosphene (use 3-5 aluminum phosphide tablets for every 100 kg of pods for 7-8 days).
- Primary sorting of groundnut pods before processing.
- Improving post-harvest processing technologies *viz.*, blanching, sorting of peanuts with camera or laser sorter.
- In addition to following guidelines of good manufacturing and storage practices framed by agricultural and processed food products export development authority (APEDA), Government of India, New Delhi, separating damaged and bad pods from the bulk purchase shortly after arrival in the unit and storing the good pods in hygienic conditions, avoiding addition of water (conditioning of pods to prevent kernel split) before decortication, use separate decorticators for different sizes of pods etc., may help in controlling the aflatoxin build up in the processing units. Further, discontinuing the practice of mixing well dried kernels (having prescribed moisture content) with kernels having above prescribed level of moisture to increase the unit weight at the time of packing reduces the chances of fungal growth and its toxin.

Groundnuts are stored in new or clean polyethene lined gunny bags and stacked them on wooden planks keeping a metre gap from the walls in a well-aerated and well-covered space. To prevent insect damage to the pods in storage, 3-5 aluminum phosphide tablets (Celphos) are used for every 100 kg of pods for 7-8 days. Further,

use of air and water proof packing materials and vacuum packaging reduces risk of aflatoxin build-up during storage and transit.

**Menace of Aflatoxin in Groundnut  
Worldwide limits for aflatoxin B1 in food**

Limits ( $\mu\text{g}/\text{kg}$ )	Number of countries
20	3
15	2
10	5
5	21
2	29
1	1

**Worldwide limits for total aflatoxins in food**

Limits ( $\mu\text{g}/\text{kg}$ )	Number of countries
35	2
30	3
20	17
15	8
10	8
5	3
4	29
3	1
1	3
0	2

**Worldwide limits for aflatoxin B1 in feed for dairy  
cattle**

Limits ( $\mu\text{g}/\text{kg}$ )	Number of countries
50	2
25	1
20	3
15	1
10	5
5	27

**Worldwide limits for total aflatoxins in feed for dairy  
cattle**

Limits ( $\mu\text{g}/\text{kg}$ )	Number of countries
50	5
30	3
20	7
10	4
Zero (below 0.01)	2

**Maximum limits of aflatoxin in groundnut for human consumption and livestock and poultry feeds**

Country	Maximum permissible level (µg/kg)			
	Foodstuffs		Livestock feed	
	B1	B1+B2+G1+G2	B1	B1+B2+G1+G2
Argentina	2	4	5	20
Australia	2	4	5	20
Brazil	2	4	5	20
Canada	15	30		
China	20	20	20	20
EU countries	2	4	5	20
India	-	30		120
Indonesia	-	20		
Israel	5	15		20
Japan	10		20	
New Zealand	2	4	5	20
USA	10		20	