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Estimation of Aflatoxin Content in Chilli Samples Collected from Cold Storage and Market

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A B S T R A C T

Aflatoxins are toxins produced by moulds in food commodities both before and after harvest. After harvest of the produce, if the chilli fruits are not properly dried, it leads to mouldy growth and subsequent aflatoxin production. With regard to influence of storage period on aflatoxin, ten cultivars of chilli at three months interval for a period from Feb 2013 till Nov 2013 varied to an extent of 4.2 µg/kg. Among ten cultivars, Byadagi dabbi varied in aflatoxin content from three months (4.2 µg/kg) to 12 months of storage (2.5 µg/kg) interval. Similarly, cultivar Super 10 had the variation of 1.3 µg/Kg (three months) to 2.3 µg/kg (nine months), Indaf 9 had 3.2 µg/kg and Indaf 5 had 1.5 µg/kg at three month interval. Whereas the aflatoxin was not detected at all in the remaining cultivars *viz*., Byadagi, Number 5, Namadhari, 355, 009 and 99. Eighteen chilli samples collected from Raichur market and nineteen chilli samples from Byadagi market of Haveri district of Karnataka were analyzed for aflatoxin B_1 content by ELISA technique. The average aflatoxin content of samples from Raichur market had very less quantity of aflatoxin (0.35 µg/kg) which was containing less than the permissible limit of 20 µg/kg. Similarly the samples from Byadagi market had an average aflatoxin content of 0.49 µg/kg, much below the permissible limit.

Introduction

Spices export is one of the major foreign exchange earners to India. The aflatoxin adulterated chilli and their product has become a major problem as it causes health hazards to the consumers and it affects the global market as well. After harvesting of the chilli crop, the farmers wait for the good price in the market. The produce undergoes various means of transportation, storage and marketing. During the interval, *Aspergilli* are the predominant contaminant which readily colonize and have potential to produce toxin. The infection occurs on stored fruits and the contamination with aflatoxin deteriorates quality and make

the produce unfit for consumption, thereby hitting the export trade in the international market. Post-harvest aflatoxin contamination is most attributable to improper storage. The possible presence of such acutely toxic and carcinogenic substance in foods and in animal feeds had a profound effect on the utilization and trade. Processor and importing countries have placed limits on the levels of aflatoxins permissible in many products. Even when the product reaches to the consumer, the contamination continue to occur as the spore of *A. flavus* common in air and water and the exposed food may be colonized.

Materials and Methods

Collection of chilli samples from cold storage

As chillies are often preserved in bulk in cold storages, an attempt was made to determine natural contamination of aflatoxin B_1 in chillies. Chilli samples collected from Raichur Cold Storage Private Limited Unit, Askihala and Raichur from Feb 2013 were used for estimation of aflatoxin content in different chilli genotypes. Ten commercially cultivable genotypes like Byadagi, Byadagi Dabbi, Number 5, Namadhari, 355, Super 10, 009, Indaf 9, Indaf 5 and 99 were selected for the study. The samples were kept in cold storages after 20 days of harvesting. Samples were then drawn at three month intervals till Nov 2013 as per the standard sampling methods followed by International Seed Testing Association (ISTA). A sample from seed lot was obtained by drawing out small representative portions as primary sample of 1kg at random from different portion of the seed lot measuring from 1000 to 5000 kg. The samples were mixed thoroughly to constitute the composite sample of 500 g. Again submitted sample of 200 g was made and finally reduced to 50 g of working sample for aflatoxin estimation. The next subsequent sampling was drawn from the same varieties and the same lot in next three months interval. The temperature of 4 ^{0}C was maintained during the study. The aflatoxin content was estimated by using indirect competitive ELISA method.

Collection of chilli samples from market

Eighteen samples of chilli from Raichur and nineteen samples from Byadagi (Haveri) market were collected during 2013-14 in the same manner as explained earlier. 500 g of samples were collected and were analysed for aflatoxin contamination. Care was taken in such a way that the samples from same field were not repeated. The chilli samples brought to the market 20 to 30 days after harvesting. The samples collected from the Raichur and Byadagi market are from the different villages and the detail of the source of collection of the sample was mentioned.

Results and Discussion

Aflatoxin content was estimated from ten cultivars of chilli at three months interval for a period from Feb 2013 till Nov 2013 (Table 1). Results from ELISA analysis revealed that the samples were contaminated with aflatoxin B_1 to the extent of 4.2 µg/kg. Among ten cultivars, Byadagi dabbi varied in aflatoxin content from first month (4.2 µg/kg) to 9 months (2.5 µg/kg) of storage. Similarly cultivar Super 10 had the variation in aflatoxin contamination of 1.3 µg/kg at three months to 2.3 µg/kg after nine months of storage. The cultivar Indaf 9 showed 3.2 µg/kg and Indaf 5 had 1.5 µg/kg after three months of storage. The aflatoxin was not detected in all the remaining cultivars *viz*., Byadagi, Number 5, Namadhari, 355, 009 and 99. If the farmer does not find a remunerative price in the market he is forced to opt for storing the produce in the cold storage until he gets a good price.

Table.1 Analysis of aflatoxin content from ten genotypes of chilli at three months interval from cold storage during Feb 2013 to Nov 2013

Chilli varieties/hybrids	Aflatoxin content (µg/kg)			
	0 month	3 month	6 month	9 month
Byadagi	0.0	0.0	0.0	0.0
Byadagi Dabbi	4.2	2.3	3.1	2.5
Number 5	0.0	0.0	0.0	0.0
Namadhari	0.0	0.0	0.0	0.0
355	0.0	0.0	0.0	0.0
Super 10	0.0	1.3	0.0	2.3
009	0.0	0.0	0.0	0.0
Indaf 9	0.0	3.2	0.0	0.0
Indaf 5	0.0	1.5	0.0	0.0
99	0.0	0.0	0.0	0.0

Table.2 Estimation of aflatoxin content of chilli samples from Raichur and Byadagi market during Feb 2013

Sample No.	Raichur market			Byadagi market		
	Source of sample	Fruit infection (Per cent)	Aflatoxin content (µg/kg)	Source of sample	Fruit infection (Per cent)	Aflatoxin content (µg/kg)
1	Nellahal1	0	0.0	Adoni1	0	0.0
2	Nellahal2	0	0.0	Adoni2	0	0.0
3	Nellahal3	0	1.7	Adoni3	0	0.0
4	Nellahal4	5	2.5	Kosagi	2	0.0
5	Gareldinni1	5	2.2	Guntur	0	0.0
6	Gareldinni2	1	0.0	Ananthpur	0	0.0
7	Merchethal1	0	0.0	Havale	0	0.0
8	Merchethal2	0	0.0	Byadagi	0	3.6
9	Merchethal3	0	0.0	Samshi	0	0.0
10	Merchethal4	0	0.0	Shiroor	0	0.0
11	Merchethal5	2	0.0	Gudigeri	0	0.0
12	Nagalapura1	0	0.0	Kundagola	0	0.0
13	Nagalapura2	0	0.0	Manavi	0	0.0
14	Arakere1	0	0.0	Sirivara	6	5.6
15	Arakere2	0	0.0	Bellary1	1	0.0
16	Singanodi1	0	0.0	Bellary2	0	0.0
17	Manvi1	0	0.0	Bellary3	0	0.0
18	Manvi2	0	0.0	Bellary4	0	0.0
19				Kaggallu	0	0.0
Average			0.35			0.49

If the produce is not stored and maintained in proper storage conditions, it might lead to development of moulds particularly *A. flavus* and ultimately aflatoxin contamination. Estimation of toxin at various intervals of storage confirms the presence or absence of toxin till it reaches to the consumer as safe product. The variation in aflatoxin production at different storage interval could be due to the temperature and relative humidity prevailing in the cold storage and the sampling size. The variation between the genotype is due to the resistant mechanism offered by the genotype.

Eighteen samples from Raichur market and nineteen samples from Byadagi market of Haveri district of Karnataka were analyzed for aflatoxin B_1 content by ELISA technique (Table 2). The average aflatoxin content of samples from Raichur market had very less quantity of aflatoxin (0.35 µg/kg) which was less than the permissible limit of 30 µg/kg prescribed by India. Similarly, the samples from Byadagi (Haveri district) market had an average aflatoxin content of 0.49 µg/kg suggesting that the samples are fit for consumption purpose.

After harvesting of the crop, sometimes the farmers sell their produce immediately to get a remunerative price in the market. If the produce is contaminated with the aflatoxin, it then reaches to the traders and then to the consumer. The detection of aflatoxin immediately after the harvest before it reaches to the consumer is very important.

The average aflatoxin content of samples from Raichur market was very less (0.35 µg/kg) which was remarkably much lower than the permissible limit of 20 µg/kg. Similarly, the samples from Byadagi market showed an average aflatoxin content of 0.49 µg/kg suggesting that the samples are acceptable for consumption purpose.

The average aflatoxins in 110 samples covering storage length from one year to over 10 year in maize, whole grain rice and brown rice were found to be 0.99, 3.87 and 0.88 mg/kg, respectively at Liaoning Province, China (Liua *et al.*, 2006). An attempt has been made by Ravi Kiran *et al.*, (2005) to estimate aflatoxin content in chillies collected from the cold stores at monthly intervals for a period of one year between December 2002 and November 2003 at Guntur region in Andhra Pradesh.

Natural occurrence of aflatoxin B_1 in chilli pods kept in cold storage was contaminated with aflatoxin B_1 to the extent of 5.5 mg/kg. One hundred and twenty groundnut samples collected by Chala *et al.*, (2013) from farmers' stores and markets of Ethiopia were used for aflatoxin analysis. Of 120 samples, 93 were positive while the remaining 27 were negative in aflatoxin content. The total aflatoxin levels in the positive samples varied between 15 mg/kg and 11,900 mg/kg. Groundnut samples from 21 selected markets in 10 regions of Ghana yielded high levels of the aflatoxigenic fungus *A. flavus*. A total of 196 nuts and their products marketed in Penang, Malaysia were assessed by Leong *et al.*, (2010) for aflatoxins. Thirty two out of 196 samples (16.30 %) were contaminated with aflatoxins, ranging in levels from 16.60 µg/kg up to 711 µg/kg.

The aflatoxin contamination in chilli produce stored in cold storage was high compared to the samples collected from market. This indicates that the samples collected from market were free from aflatoxin contamination at the permissible level. This is safe for consumption.

So the consumer and the trader have to take precautions to store the chilli produce in cold storage in order to reduce the risk of aflatoxin contamination

References

Chala, A., Mohammed, A., Ayalew, A., Skinnes, H., 2013. Natural occurrence of aflatoxins in groundnut (*Arachis hypogaea* L.) from eastern Ethiopia. Food Control. 30: 602-605.

Leong, Y., Ismail, N., Latif, A.A., Ahmad, R., 2010. Aflatoxin occurrence in nuts and commercial nutty products in Malaysia. Food Control. 21: 334–338.

Liua, Z., Gaoa B.J., Yuc, J., 2006. Aflatoxins in stored maize and rice grains in Liaoning Province, China. *J. Stored Products Res.*, 42: 468–479.

Ravi Kiran, D., Narayana K.J.P., Vijayalakshmi, M., 2005. Aflatoxin B1 production in chillies (*Capsicum annuum* L.) kept in cold stores. *African J. Biotechnol.*, 4(8): 791-795.

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