Short Communication

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SCREENING ANALYSIS AND QUANTITATION OF MYCOTOXINS SCREENED BY DIFFERENT FUNGAL PATHOGENS CAUSING FRUIT ROTS

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For screening the mycotoxin production, different species of fungi were isolated from various fruits obtained from local market. Aspergilli, Fusaria and Penicillia have had maximum frequency of occurrence on fruits. All the fungal isolates were screened for mycotoxin production, though only few of them secreted aflatoxin B_1 and B_2, zearalenone and citrinin. Aflatoxin B_1 was the common toxicant and was produced by maximum number of isolates. Some fungi elaborated more than one mycotoxin while same mycotoxin was produced by more than one fungal species.

Key words : Fruit rots, pathogens, mycotoxins.

Mycotoxins are highly hazardous for human beings. In the past pathologists mostly focussed their attention on the study of diseases of economically important crop plants, and the fruits and vegetables were grossly neglected (Tandon, 1967). Fruits and vegetables are prone to mouldiness due to their soft tissues and high moisture content. Therefore present study deals with the screening, analysis and quantitation of mycotoxins produced by different fungi associated with common fruits.

Samples of apple, banana, grape, mango sweet orange and ash gourd were collected from local market of Agra. The associated fungi were isolated and purified on Czapek's dox agar medium. Test species of fungi were grown on SMKY liquid medium (Diener and Davis, 1966) at 30 ± 1°C for 10 days. Chloroform extract obtained from culture filtrate of different test fungi was used for primary mycotoxin screening by using florisil test outlined by Velasco (1972). The tentative toxin producing isolates thus identified were subjected to quantitation methods. Quantitative estimation of aflatoxin was done by the method of Nabney and Nesbitt (1965) and those of other mycotoxins by Coker *et al.* (1984).

In all 14 fungal associates of various fruits were found to be toxigenic (Table 1). Out of the total 303 isolates, only 117 isolates secreted one or the other mycotoxin. Of 95 isolates of *Aspergillus flavus,* 33 isolates secreted aflatoxins and of 57 isolates of *Penicillium citrinum* 19 isolates produced aflatoxin and citrinin. Both these fungi were found on apple. In addition, 10 isolates of *A. fumigatus,* 6 of *A. tamarii* and 3 of *A. niger* also produced aflatoxins. Third major group of toxicant fungi was *Fusarium.* Four species of this group namely *F. moniliforme, F. oxysporum, F. semitectum* and *F. solani* were identified. Of 27, 15, 20 and 10 isolates of these species 11,4,4 and 5 isolates produced mycotoxins respectively. Apart from these, species of *Aureobasidium cladosporium* and *Curvularia* also contributed toxigenic isolates. It is thus evident that toxin producing fungi exist in all major toxinomic groups. This conforms to the observation of Bilgrami (1987).

The results further reveals that Aspergilli were dominant forms among fruit rot fungi both in terms of occurrence and toxin elaboration, followed by Fusaria and Penicillia. In majority of earlier studies also these were found to be widely spread common contaminant, especially in food and feed (Singh, 1983) and fruits (Verma *et al.*, 1980). These results also strengthened the earlier observations of Agarwal *et al.* (1983), and Prasad *et al.* (1986) that there exist some sort of specificity in toxin elaboration because only a few of the prevailing isolates producing toxins.

Two isolates of *A. flavus* from apple and 4 isolates of *P. citrinum* each from apple and sweet orange produced two toxins. Similarly Sinha (1983) has detected four aflatoxin a B_1, B_2, G_1 and G_2 from the same fungus. In contrast, the same toxin is produced by a range of fungi (Moreau, 1979). This is borne out by the fact that aflatoxin B_1 was produced by *A. flavus, A. fumigatus, A. tamarii, A. niger,* and *P. citrinum* and

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Table 1: Mycotoxin producing potentials of fungal associates of various fruits.

A fungal species tested	Fruits	Mycotoxins produced	Range of mycotoxin concentration
1. *Aspergillus flavus*	(30) Apple	Aflatoxin B_1 (10)	0.89 to 4.90
		Aflatoxin B_2 & B_1 (2)	0.85 & 2.20 and 0.90 & 4.70
	(25) Banana	Aflatoxin B_1 (7)	0.72 to 0.90
	(15) Mango	Aflatoxin B_1 (7)	0.90 to 3.10
	(25) Pear	Aflatoxin B_1 (7)	0.90 to 4.71
2. *Aspergillus fumigatus*	(18) Apple	Aflatoxin B_1 (10)	0.85 to 2.20
3. *Aspergillus tamarii*	(10) Apple	Aflatoxin B_1 (6)	0.92 to 5.0
4. *Aspergillus niger*	(10) Banana	Aflatoxin B_1 (2)	0.69 & 1.51
		Aflatoxin B_2 (1)	0.63
5. *Aureobasidium pullulans*	(2) Sweet Orange	Zearalenone (2)	in traces
6. *Cladosporium cladospoiriodes*	(10) Apple	Zearalenone (2)	in traces
7. *Cladosporium herbarum*	(5) Apple	Zearalenone (3)	in traces
	(10) Sweet Orange	Zearalenone (7)	0.82 to 4.51
8. *Curvularia lunata*	(8) Pear	Citrinin (8)	0.99 to 5.90
9. *Fusarium moniliforme*	(27) Banana	Zearalenone (11)	0.90 to 5.32
10. *Fusarium oxysporum*	(15) Ashgourd	Zearalenone (4)	0.99 to 6.21
11. *Fusarium semitectum*	(20) Sweet Orange	Citrinin (4)	0.69 to 0.91
12. *Fusarium solani*	(10) Ashgourd	Zearalenone (5)	0.82 to 4.51
13. *Penicillium citrinum*	(18) Apple	Citrinin (3)	1.20 to 5.0
		Citrinin & Aflatoxin B_2 (4)	1.0 to 4.31 & 0.69 to 0.91
	(20) Sweet Orange	Aflatoxin B_1 & Citrinin (4)	0.69 to 0.91 & 0.82 to 1.45
	(19) Pear	Citrinin (8)	0.99 to 5.90
14. *P. implicatum*	(6) Apple	Citrinin (4)	0.91 to 4.50
Total isolates	(303)	(117)	

citrinin was elaborated by *P. citrinum*, *P. implicatum*, *Fusarium semitectum* and *Curvularia lunata*. Similarly zearalenone was produced by *Aureobasidium*, *Cladosporium*, *Fusarium moniliforme*, *F. oxysporum* and *F. solani*.

A considerable degree of variation was noticeable in the amount of toxins elaborated by different isolates, even from the same fungi (Table 1). Existence of weaker isolates is well known (Prasad *et al.*, 1986). Ciegler (1977) opined that the mycotoxin producing potentials of the fungus depends upon their genetic makeup, susceptibility of the host plant or community.

REFERENCES

Agarwal G P, P S Bisen & S A Washi 1983 Aflatoxin producing potentials of *Aspergillus flavus* isolates associated with stored wheat grains. *Proc Sym Mycotoxins in Food and Feed Bhagalpur* pp 73-78.

Bilgrami K S 1987 Fungal toxin : their biological effect and ecological significance in seventy fourth Indian Science Congress Bangalore, 2 p.

Coker R D B D Jones, M J Nagler, G A Gilman, A J Wallbridge & S Panigrahi 1984 Determination of concentration of septrophotomeric parameters for various mycotoxins. *Mycotoxin training mannual*. Tropical Deveiopment and Research Institute, London, B-2, 3p.

Diener U L & N D Davis 1966 Effect of temperature on aflatoxin produced by isolates of *Aspergillus flavus* and *Aspergillus parasiticus*. *Proc Nat. Peanut* Res Conf Tifton Ga, 95 p.

Diener U L & N D Davis 1977 Aburn Unv Bul!, 493 p.

Moreau C 1979 In Moulds, *Toxin and Food* (Translated and edited by MO Moss) John Wilay & Sons. New York.

Prasad T, R K Sinha, P Jeswal 1986 Aflatoxin problem in paddy under various storage system in Bihar. *Indian Bot Reptr* **5 (1)** 45-49.

Robert B A & DSP Patterson 1975 Detection of twelve mycotoxins in mixed animal food stuff using novel membrane clean-up procedure. *J Assoc Off Anal Chem* **58** 1178-1181.

Singh Anjana 1983 Mycotoxin contamination in dry fruits and spices, *Proc Symp Mycotoxins in Food and Feed*. (Eds) Bilgrami *et al.*, Allied Press, Bhagalpur, pp. 55 - 68.

Sinha K K 1983 *Aflatoxin problem in storage and standing crop*. Ph.D. Thesis Bhagalpur University, Bhagalpur.

Tandon R N 1967. Observations on storage disease of certain fruits. *Indian Phytopathology* **20**(1): 1-12.

Vêlasco J 1972 Detection of aflatoxin using small columns of florisi. *Js Am Oil Chem Soc* **49** 141-142