

Study of Mycotoxin Contamination in Crop Seeds and Animal Feeds of Sagar District (M.P.).

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Mycotoxins are the secondary metabolites of fungi and most of them have been implicated in some mycotoxicoses in mammals, avians and fish species. When toxin contaminated food or feed are consumed by man or animals, they may suffer from illness or in-severity, toxicity may result in death of the consumers. In the present investigation an effort has been made to determine the prevalence of mycotoxin contamination in the food and feed samples collected from various places of Sagar District, M.P. All the crop seeds and feeds were found positive for mycotoxin contamination ranging from 37.5% in Rice to 100% in Wheat straw. The data indicate the importance on surveys for the enumeration of microbial contaminants and evaluation of the quantity of mycotoxins present in the agricultural commodities sold for the consumption of man and animals.

Key words: Mycotoxins, Toxin, Seeds, Feed, Fungi, Contamination.

Ever since matter has been used by man it has been subjected to attack by microorganisms. However, importance of mouldy food and feed has been recognized following the deaths of poultry and fish in 1960 due to their potent toxic nature. The active ingredient which has been isolated from mouldy feeds which made it toxic is indicated by the presence of aflatoxins (Hueper & Payne, 1961; Newberne & Butler, 1969). Mirocha &

Christensen (1974) reported that Aflatoxin, Zearalenone, Ochratoxin-A, and Penicillic acid are the toxins implicated with some cases of natural toxicity. Aflatoxin producing strains can grow on a number of food grains such as peanut, wheat, oat, rye, rice, corn, sorghum (Hesseltine *et.al.*, 1966). Reports are there for presence of Ochratoxin in feed ingredients (Scott *et.al.*, 1972), stored cereals and legume crops for poultry feeds (Munro *et.al.*, 1973).

Deleterious effects of some of the mycotoxins are well established in many cattle, birds and fishes (Wyllie & Moorehouse, 1978). Death of more than a hundred Bhil tribals in Western India in 1974-75 due to consumption of mouldy maize is one of the examples of aflatoxicoses in human beings (Krishnamachari *et.al.*, 1975 a & b). In India investigation has been done to evaluate the conditions of food and feed from Southern and North-Eastern part of the country (Gopalan *et.al.*, 1972; Reddy *et.al.*, 1983).

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The present study was planned to investigate the mycotoxin contamination in food and feed samples of Central India, M.P.(Sagar District).

MATERIAL AND METHODS

Samples of six crop seeds i.e. Barley, maize, rice, sorghum, and wheat and animal feeds i.e. oil cakes and wheat straw were collected from various places of Sagar Districts for the study of mycotoxin contamination, brought to laboratory and kept at low temperature (2-6^o C) to avoid their deterioration. Extraction of mycotoxins from collected sample was done following the method of Eppley (1968). The extracted mycotoxins were analyzed by Thin Layer Chromatography and this separates Aflatoxin, Ochratoxin-A, Zearalenone and Sterigmatocystin. The Rf values of each spot was compared with the Rf as given by Josefsson and Moller(1977) and identification was made. For

proper identification of Aflatoxins i.e. Aflatoxin B₁, B₂, G₁, and G₂, method for TLC of aflatoxins given by Eppley (1968) was followed using Chloroform: Methanol (97:03) as solvent system.

RESULTS

All the six crop seeds, oil cakes and wheat straw were found positive for the presence of mycotoxin contamination and are presented as percentage of samples for Aflatoxin, Ochratoxin-A, Zearalenone and Sterigmatocystine. Maximum contamination of Aflatoxin was recorded on maize seeds followed by wheat straw, barley and minimum contamination was recorded in sorghum. Ochratoxin-A was recorded only in rice, soybean, wheat grains, oil cakes and wheat straw where as Zearalenone was found positive for all except wheat grains (Table 1).

Table 1. Mycotoxin contamination in various food and feed samples collected from Sagar District, M.P.

S. No.	Test Samples	Positive samples for Mycotoxins (%)	Aflatoxins* in (%)	Ochratoxin-A* in (%)	Zearalenone* in (%)	Sterigmatocystin* in (%)
1.	Barley	100.00	66.60	-	66.60	-
2.	Maize	100.00	100.00	-	33.30	-
3.	Rice	37.50	37.50	12.50	12.50	-
4.	Sorghum	42.80	28.50	-	28.50	-
5.	Soybean	75.00	50.00	50.00	50.00	-
6.	Wheat	60.00	40.00	40.00	-	-
7.	Oil Cakes	80.00	50.00	16.60	50.00	-
8.	Wheat Straw	100.00	80.00	60.00	40.00	-

*Data obtained by TLC using Solvent System Benzene : Ethyl acetate : Formic acid(80:20:0.5)

Table 2. Aflatoxin contamination in samples of foods and feeds collected from Sagar District (M.P.)

S. No.	Test Samples	Samples Positive for Aflatoxin (%)	Aflatoxin - B ₁ *	Aflatoxin - B ₂ *	Aflatoxin - G ₁ *	Aflatoxin - G ₂ *
1.	Barley	66.60	33.30	-	-	16.60
2.	Maize	100.00	33.30	-	66.60	-
3.	Rice	37.50	37.50	-	-	-
4.	Sorghum	28.50	-	-	28.50	-
5.	Soybean	50.00	25.00	-	25.00	-
6.	Wheat	40.00	-	-	40.00	-
7.	Oil Cakes	50.00	-	-	-	50.00
8.	Wheat Straw	80.00	20.00	20.00	-	50.00

*Data obtained by the TLC using solvent system Chloroform : Methanol (97:3).

Samples of positive aflatoxins for contamination of aflatoxins revealed Aflatoxin B₁ in rice, barley, maize, soybean, and wheat straw, whereas Aflatoxin B₂ was present only in wheat straw, 20%. Aflatoxin G₁ was found to be maximum in Maize i.e.66.6% followed by wheat, sorghum, and soybean, and was absent in all others. Aflatoxin G₂ was found only in oil cakes, wheat straw and barley in different percentages and was not found in other grain seeds (Table 2).

DISCUSSION

Maize, Rice, Sorghum and Wheat are the important cereal crops of India. In the present survey Maize samples collected from different places of Sagar district were found to contain detectable amount of aflatoxins in them and was maximum amongst all the seeds and feeds tested. Stoloff *et.al.*, 1976, reported 44% aflatoxin in Corn, Bilgrami *et.al.*, 1981 & Sinha 1983 recorded 25% aflatoxin in standing Maize crop samples. Maize is considered as one of the most susceptible crops for mycotoxin contamination as its crevices provide ideal habitat for lodging and germination of fungal spores (Bilgrami, 1983). Maize is therefore a high risk crop and should be properly checked before it reaches to the consumers.

Barley and Wheat are attacked by many fungi and natural occurrence of some mycotoxin in them are reported by some workers (Scott *et.al.*, 1970). In present survey mycotoxin contamination in Barley was 100% and only 60% in Wheat. The aflatoxin in Wheat and Barley is regarded primarily a storage problem (Neergaard, 1977).

Sorghum poor mans cereals was found to have 42.8% mycotoxins and aflatoxin contamination only in 28.5% samples. Aflatoxin production in sorghum was found during the first three months of storage irrespective of environmental conditions showing seed constituents to be the major cause of aflatoxin production in seeds (Bhadraiah & Rama Rao, 1983).

In Soybean mycotoxin contamination was 75% and that in Rice samples was quite less in comparison to other samples. The contamination of Aflatoxin, Ochratoxin-A and Zearalenone was noted in both, being 50% test samples in Soybean. Reports indicate that mycotoxin development in these occur mostly during their storage (Wyllie &

Morehouse, 1977, 1978).

Oil cakes and Wheat straw, two major feed of cattles were found to contain mycotoxins. Presence of mycotoxins in animal feed is important from the point of view of animal health as well as their residual effect on those consuming milk or meat of these animals.

CONCLUSION

Present survey on the mycotoxin contamination in the samples of food and feed indicate the importance on surveys for the enumeration of microbial contaminants and evaluation of the quantity of mycotoxins present in the food grains and animal feeds sold for the consumption of man and animals. Assessment of plant products which are used as food and feed may give an idea about the possible health hazards in consumers in due course of time.

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