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Mycotoxins are the secondary metabolites of fungi and most of them have been implicated in some mycotoxicoses in mammals, avian and fish species. Depending on the nature of mould and the susceptibility of host or the physical and chemical status of the substrate, the production of the toxic metabolites by fungi may occur in the field on growing plants or on plant products during storage. When toxin contaminated food or feed are consumed by man or animals, they may suffer from some sort of illness or in severity, toxicity may result in death of the consumers. Assessment of plant products which are used as food and/or feed may give an idea about the possible health hazards in consumers in due course of time.

In the present investigation an effort has been made to determine the prevalence of mycotoxin contamination in the samples collected from various places of Sagar district, Madhya Pradesh. Samples collected from different grocers were examined for the presence of aflatoxins, ochratoxin A, sterigmatocystin and zearalenone. A total
of 60.0, 50.0, 40.0, 16.6 and 12.5 per cent samples of wheat straw, soybean, wheat grains, oil cakes and rice were found positive for the presence of ochratoxin A. Zearalenone contamination was recorded in 66.6, 50.0, 40.0, 33.3, 28.5 and 12.5 per cent samples of barley, soybean, oil cakes, wheat straw, maize, sorghum and rice, respectively. All the samples of maize seeds were found to contain aflatoxins. Next to this, presence of aflatoxins was noted in 80.0, 66.6, 50.0, 50.0, 40.0, 37.5 and 28.5 per cent test samples of wheat straw, barley, soybean, oilcakes, wheat grains, rice and sorghum, respectively. Aflatoxin B₁ contamination was detected in 37.5, 33.3, 33.3, 25.0 and 20.0 per cent test samples of rice, barley, maize, soybean and wheat straw. None of the test samples of barley, oil cakes and wheat straw were found positive for aflatoxin G₁ while 66.6 per cent samples of maize were found positive for its occurrence. Aflatoxin B₂ was recorded in 20.0% wheat straw samples. Presence of aflatoxin G₂ was noted in samples of oil cakes (50.0%), wheat straw (40.0%) and barley (16.6%) only.

The fungi, which are contaminating food and feed are of diversified characteristics, whether judged on the basis of morphology, nutritional characteristics or synthetic abilities. However, the major toxins are elaborated by some species of three fungal genera i.e., Aspergillus, Fusarium and Penicillium under favourable
conditions of growth these may poison the substrate which on consumption may cause various deleterious biological effects in man and livestock.

In all 31 fungal species belonging to 17 genera were recorded from the grain samples of all the test crops. Animal feed samples yielded fewer number of species in comparison to food grains. Aspergillus flavus strain I was recorded from almost all the samples of maize grains, while its frequency was noted in 60-90 per cent samples of other four test crops, i.e., rice, sorghum, soybean and wheat. A. niger was isolated from more than 60% samples of all the test crops. It was found with 100% frequency in rice grain samples but its maximum density was recorded in maize samples. Other Aspergilli, i.e., A. candidus, A. ochraceus, A. terreus and A. fumigatus have also been recorded from most of the test crops. Penicillium chrysogenum was recorded from 70% samples of maize, while test samples of rice, sorghum, soybean and wheat grains indicated its low frequency, i.e., 20-30 per cent. P. citrinum and one unidentified species of Penicillium were recorded from 10-20 per cent samples of rice, soybean and wheat. In all three species of genus Fusarium were collected from all the test grain samples, these were recorded with very low frequency and density. Besides these, some well known field fungi such as species of Alternaria, Curvularia, Helminthosporium, Bipolaris
and some mucoraceous fungi have also been recorded with their varied frequency and density from test grain samples.

Oil cake samples were found contaminated from more number of fungal species than wheat straw samples. *Aspergillus flavus* strain I and *Mucor* sp. were recorded from 90% samples of oil cakes while only 70 and 80 per cent samples of wheat straw were found positive for their occurrence, respectively. Except *A. niger*, all other contaminating fungi were not found with more than 50% frequency in test feed samples i.e., oil cakes and wheat straw.

Metabolites of four fungi, i.e., *Aspergillus candidus*, *A. flavus*, *A. niger* and *A. terreus* were tested against seed germination and seedling vigour of eight crop plants. The fungi were grown in YES broth medium and cell free culture filtrates were used as fungal metabolites. The seeds were treated with test metabolites for 24 hour before germination. The metabolites of all the test fungi were found to inhibit seed germination in *Cicer arietinum*, *Glycine max*, *Lens esculentus*, *Pisum sativum* and *Sorghum vulgare*. While, metabolites of all the test fungi have indicated their stimulatory effect on seed germination in *Triticum vulgare* (i.e., 1.37 to 3.09 per cent) and in *Linum usitatissimum* (46.64 to 241.32 per cent). Metabolites of *A. flavus* and *A. candidus* showed
their maximum inhibitory effect i.e. 98.13 and 78.41 per cent, respectively, against seed germination in Pisum sativum. Whereas maximum inhibition, i.e., 91.31 and 90.09 per cent was found in Cicer arietinum and Lens esculentus when their seeds were given pregermination treatment of metabolites of A. niger and A. terreus, respectively.

The vigour of emerging seedlings of germinated seeds was determined using root and shoot length as criteria. From the data it can be concluded that the effect of metabolites of test fungi can not be generalised for the seedling vigour and seed germination in various crops. Metabolites of all the test fungi (i.e., A. candidus, A. flavus, A. niger and A. terreus) were found to reduce both root and shoot length in the seedlings of Cicer arietinum, Glycine max, Lens esculentus, Linum usitatissimum and Triticum vulgare. It is interesting to note that culture filtrates of all the test fungi stimulated the shoot length in sorghum (Sorghum vulgare) seedlings while, an inhibition of 41.73 to 60.19 per cent in root length in sorghum seedlings was noted. Maximum inhibition of root length was found in seedlings of sorghum when its seeds were treated with metabolites of A. candidus. Whereas metabolites of A. flavus caused maximum stimulation of shoot growth in this crop. Although both stimulatory and inhibitory effect of test fungal metabolites was noted
on root or shoot growth in some cases but the total length of seedling in the treated seeds was found less in all such cases when compared with control.

A detailed cytological study of metabolites of *Aspergillus candidus*, *A. flavus*, *A. niger*, *A. ochraceus* and *A. terreus* has been carried out to find out their mito-depressive activity by using *Allium cepa* as experimental material. The germinating roots of *Allium cepa* were treated with 25% and 50% concentrations of test fungal metabolites for one to four hour durations and then were kept in distilled water for 24 hour of recovery.

In the present investigation almost all the test fungal metabolites inhibited cell division process to a considerable extent when compared with control. The mito-depressive effect of all the test metabolites was found increased with the increase in treatment durations. Higher concentrations of fungal metabolites (i.e., 50% culture filtrates) of *Aspergillus flavus*, *A. niger*, *A. terreus* and *A. ochraceus* were found lethal for cell division process when samples were treated for 4 hour duration. After 24 hour of recovery in distilled water, the mitotic index (MI) in most of the treated samples was found decreased instead of any recovery of mito-depressive effect on meristematic cells of *Allium cepa*. This indicates, the active components present in test fungal metabolites have delay effect on cell division process.
It is noteworthy that the metabolites of *Aspergillus flavus* caused maximum inhibition in cell division process. On the basis of mean mitotic index (MI) values in the samples treated with 25% concentration, mitodepressive effect of fungal metabolites was found in the following order: *A. flavus* > *A. candidus* > *A. niger* > *A. terreus* > *A. ochraceus*, but when the samples were treated with 50% concentration, the mitodepressive effect of test fungal metabolites was recorded in following order: *A. flavus* > *A. ochraceus* > *A. candidus* > *A. niger* > *A. terreus*. In the present study metabolites of the test fungal species did not induce any chromosomal abnormalities in the test treatment time (i.e., 1-4 hour duration) and concentrations (i.e., 25 and 50% culture filtrates). In general, the repression of mitosis as revealed by significant reduction in mitotic index (MI) indicates that the fungal metabolites have some anti-mitotic / mitodepressive principle(s) which affect some vital unit of the cell during treatment.

In the preliminary investigations the test strain of *A. flavus* was found to synthesize 0.0147 ug/ml and 0.0120 ug/ml of aflatoxin B₁ and G₁, respectively, in its cultures grown in YES broth medium. In order to know, whether the observed mito-depressive effect of *Aspergillus flavus* culture filtrate (metabolites) is due to presence of aflatoxin or certain other metabolites, two sets of
experiments were run to study the effect of different concentrations of aflatoxin B₁ on seed germination and seedling vigour of *Cicer arietinum* (gram) and *Triticum vulgare* (wheat), and on mitotic cell division process in *Allium cepa* roots. The seeds of test crops were treated with five concentration of aflatoxin B₁ i.e., 0.5, 1.0, 2.5, 5.0 and 10.0 ppm for 24 hours before germination. Only 1.0 and 2.5 ppm concentrations of this toxin were found little inhibitory for seed germination in *Cicer arietinum* whereas other concentrations of this toxin showed no effect on seed germination in *Cicer arietinum*. In the case of *Triticum vulgare* lower concentrations of aflatoxin B₁ (i.e., 0.5, 1.0 and 2.5 ppm) have not been found effective against seed germination but higher concentrations (i.e., 5.0 and 10.0 ppm) caused inhibition in seed germination in this crop. Maximum inhibition in the seed germination in wheat was noted (i.e. 10.17 percent) in samples treated with 10.00 ppm concentration of this toxin.

In general, all the concentrations of aflatoxin B₁ reduced seedling vigour in wheat crop. Stimulation in shoot growth was noted in the seedlings developed from the seeds treated with 0.5, 1.0, 2.5 and 5.0 ppm concentration. While, 10.0 ppm concentration of aflatoxin B₁ showed its inhibitory effect on shoot growth in this crop. Though both inhibitory and stimulatory effect of aflatoxin
$B_1$ was noted on shoot growth in some treated seeds but in almost all the cases total length of seedling was found less in treated samples than controls. Thus, affecting seedling vigour.

In order to study the effect of aflatoxin $B_1$ on cell division process, six concentrations (i.e. 0.05, 0.10, 0.50, 1.0, 5.0 and 10.0 ppm) were tested using Allium cepa as test material. The mean values of mitotic index (MI) in 12 hour treated and control samples showed that the cell division process was inhibited by all the test concentrations of aflatoxin $B_1$. The MI values in samples treated with 0.05, 0.1, 0.5, 1.0, 5.0 and 10.0 ppm concentrations were 2.66, 2.37, 2.36, 1.82, 1.72 and 2.12, respectively, against the MI value 4.01 in control samples. The mitotic index (MI) values in the samples treated with 0.05-0.50 ppm concentrations of aflatoxin $B_1$ for 24 hour, gradually decreased with an increase in the concentration upto 0.50 ppm and it reached to zero in the samples treated at or above 1.0 ppm concentration of this toxin. The mito-inhibitory effect of aflatoxin was found further increased in the samples kept for 12, 24 hour recovery. It is noteworthy that the 24 hour treated samples when given 36 hour recovery, the cell division process was found completely stopped. None of the concentrations of aflatoxin $B_1$ was found to produce chromosomal abnormalities in the samples after treatment and during 36 hour of recovery.
On comparing the effect of different concentrations of aflatoxin $B_1$ on cell division process following conclusions can be drawn:

(i) At all the concentrations (i.e., 0.05 to 10.0 ppm), aflatoxin $B_1$ showed its mito-depressive effect.

(ii) Mito-depressive effect of aflatoxin $B_1$ increased with the increase in treatment durations and its concentration.

(iii) 5 ppm concentration of aflatoxin $B_1$ was the most inhibitory for cell division process.

(iv) Mitoinhibitory effect of this toxin increased during recovery thus indicating its delay effect on cell division process in plant system (i.e., *Allium cepa*).