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Original Research Paper

# Fungal Diversity and Mycotoxin Effect on Seed-borne Fungi, Seed Germination and Seedling Vigour of Some Cereals of Nashik District

**D. N. Khairnar, A. S. Kelhe and A. B. Khairnar**
Mycology and Plant Pathology Research Laboratory, K.A.A.N.M.S.Arts, Commerce & Science College Satana-423 301, Maharashtra

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## ABSTRACT

Twenty seven fungal species were reported from the seeds of six cereals. The fungal metabolites played significant role in reducing the number of population of seed mycoflora. Fungal metabllites of *A. flavus, Fusarium oxysporum* and *F. moniliformae* were more effective as they showed 100 percent germination inhibition and root and shoot elongation of all cereals.

## INTRODUCTION

Seed-borne fungi are chiefly responsible for the deterioration of seeds in storage, thus reducing their viability. Seed germination and seedling vigour are greatly influenced by seed-borne fungi (Christensen & Kaufman 1965, Vidhysekaran & Parsmbaramani 1973). Effect of fungal metabolites on seed germination and seedling growth on some wheat varieties has been studied by Thakur (1983) and Khairnar (1987). The present work deals with the fungal diversity and mycotoxin effect of fungal metabolites on seed-borne fungi and germination of seeds of some cereals. Metabolites of *Aspergillus carbonarius, A. flavus*, *Fusarium oxysporum* and *F. moniliformae* were used as they dominant seed-borne fungi of some cereals like wheat, sorghum, pear millet, finger millet, maize and rice. Tweny seven fungal species have been isolated from stored seeds but only four fungi were used in the present study.

## MATERIALS AND METHODS

Seed samples of different cereals were collected in three random samples (half kg each) from various storehouses and markets. Standard blotter and agar plate method with Wakman's acid agar and Rose Bengal agar medium was used as recommended by ISTA (1960) for isolation of seed-borne fungi of six cereals. *A. carbonarius*, *A. flavus*, *Fusarium moniliformae* and *F. oxysporum* were grown separately in 250 mL conical flasks each containing 150 mL sterilized Czapek's liquid medium and incubated for 8 days at 28° ± 5°C. The cultures (mycotoxins) were filtered through Whatman No. 44 filter paper.

To study the effect of fungal metabolites on seed mycoflora, 100 seeds of each of the test cereals were soaked in the fugal metabolites for 24 h. Seeds soaked in sterilized distilled water served as control. The treated seeds were placed in each dish and 10 replicate dishes each were kept for six cereals. After seven days of incubation at 28° ± 5°C mycoflora was observed. The effect of metabolites on seed germination was studied by soaking seeds in the fungal metabolites for 24 h. The seeds were sterilized in 0.1 % $HgCl_2$ solution. The treated seeds were placed in sterile Petri plates containing sterile moist blotting papers. Five mL of the filtrate was added to each Petri dish over the blotting papers for adequate supply of the fungal metabolites. Seeds treated with sterile distilled water and sterile Czapek's liquid medium under the same conditions served as control. The number of seeds germinated after five days was observed and percent germination was recorded.

To study the efficacy of metabolites on shoot and root elongation, seeds were allowed to germinate in water for 3 days. Ten such seeds of ach cereal were placed on sterile Petri dish over blotting paper moistened with 5 mL culture filtrates of *A. carbonarius, A. flavus, Fusarium moniliformae* and *F. oxysporum* separately. Blotting papers moistened with sterile distilled water, Czapek's liquid medium, sterile Waksman's medium and sterile glucose nitrate medium served as controls. The shoot and root lengths of germinated seedlings were measured after four days of incubation.

## RESULTS AND DISCUSSION

Twenty seven fungal species were isolated from the seeds of

Table 1: Effect of fungal metabolites of *A. carbonarius, A. flavus, F. moniliformae* and *F. oxysporum* on seed germination (%) in different cereals.

| Cereals | Control | CZ | CW | CG | A. carb | A. flav | F. moni | F. oxy |
|---|---|---|---|---|---|---|---|---|
| Wheat | 100 | 70 | 90 | 80 | 40 | 00 | 00 | 00 |
| Sorghum | 70 | 60 | 70 | 70 | 30 | 00 | 00 | 00 |
| Pearl millet | 80 | 80 | 75 | 80 | 40 | 00 | 00 | 00 |
| Maize | 100 | 70 | 90 | 100 | 50 | 00 | 00 | 00 |
| Rice | 70 | 70 | 80 | 70 | 50 | 30 | 00 | 00 |
| Finger millet | 80 | 70 | 80 | 100 | 40 | 00 | 00 | 00 |

CZ-control sterile Czapek's liquid medium, CW-control sterile Waksman's solid medium, CG- control sterile glucose nitrate medium

Table 2: Effect of fungal metabolites of *A. carbonarius, A. flavus, F. moniliformae* and *F. oxysporum* on shoot and root elongation in different cereals.

| Cereals | Shoot/Root length (cm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cont | CZ | CW | CG | A.carb. | A.flavus | F.moni. | F.oxysp. |
| Wheat | 5/8 | 5/5 | 4/6 | 4/6 | 4/4 | 0/0 | 0/0 | 0/0 |
| Sorghum | 4/9 | 3/8 | 4/6 | 4/6 | 4/5 | 0/0 | 0/0 | 0/0 |
| Pearl millet | 4/9 | 3/7 | 3/7 | 4/7 | 2/4 | 0/0 | 0/0 | 0/0 |
| Maize | 2/7 | 1/5 | 2/4 | 1/6 | 1/4 | 0/0 | 0/0 | 0/0 |
| Rice | 3/8 | 3/6 | 3/7 | 3/8 | 0/6 | 0/0 | 0/0 | 0/0 |
| Finger millet | 4/9 | 3/5 | 3/7 | 4/6 | 3/6 | 0/0 | 0/0 | 0/0 |

CZ-control sterile liquid medium, CG- control sterile glucose nitrate medium, CW- control sterile Waksman's medium

six cereals by blotter as well as agar plate method.

The fungal metabolites played significant role in reducing the number and population of seed mycoflora. Further, metabolites of *A. flavus F. moniliformae* and *F. oxysporum* were more effective than those of *A. carbonarius*.

Table 1 indicates that the fungal metabolites of all fungi reduced considerable seed germination in all cereals, except rice. Germination was suppressed by the presence of inbibitory substances in the fungal culture filtrate and the secretion of some mycotoxins caused seed rotting. Percent germination increased in control, seeds treated with sterile distilled water, and it was followed by seeds treated with four different liquid media.

Table 2 reveals that the metabolites of *A. flavus*, *F. moniliformae* and *F. oxysporum* were more inhibitory showing no shoot and root elongation in all cereals expect rice. Maximum elongation in shoot and root length was observed in control seeds. The reduction in seed germination and suppression of seedling vigour might be due to the presence of some inhibitory substances in the fungal culture filtrates and the secretion of some phytotoxic ingredients (mycotoxins) in growth medium as reported by Lalithakumari et al. (1974) in castor seeds, Tripathi (1974) in sorghum seeds and Khairnar (1987) in pearl millet seeds.

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