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# EFFECT OF FUNGICIDES ON AFLATOXIN PRODUCTION IN SUNFLOWER SEED

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**Abstract**

Sunflower seeds inoculated with toxigenic strain of *Aspergillus flavus* showed a reduction in seed germination whereas seed treatment with fungicides viz., Captan, Baytan and Benomyl significantly increased seed germination and decreased infection of *A. flavus*. Seed treatment with fungicides before inoculation with *A. flavus* was found more effective in reducing infection by *A. flavus* and aflatoxin production.

## Introduction

Sunflower (*Helianthus annuus* L.) an oil seed crop is planted over 25,899 hectares in Pakistan (Anon., 1990). The seeds contain 32-45% edible oil which is a rich source of polyunsaturated fatty acids used for human consumption (Ambasta *et al.*, 1986). The seed-borne fungi produce seed rot, seedling blight and root rot diseases which decrease the quality and quantity of sunflower seeds (Singh & Prasad, 1971). Of the seedborne fungi, *Aspergillus flavus* is known to produce aflatoxin $B_1$, $B_2$, $G_1$ and $G_2$ which are carcinogenic. Seed treatment with fungicides is a simple, cheap and effective method for the control of seed-borne and soilborne diseases of crop plants. There are reports where sunflower seed has been found to be quite tolerant to most seed treatment chemicals where Arasan or Captan @ 1/2 oz per 100 lb of seed is a safe dose for treatments of sunflower seeds (Rahman & Aslam, 1991). Experiments were therefore carried out to study the effect of seed treatment with fungicides on germination and aflatoxin production in sunflower seeds inoculated with a toxigenic strain of *A. flavus*.

## Materials and Methods

A 6 day old culture of a toxigenic strain of *A. flavus* (KUMH 67) isolated from sunflower seed on PDA medium was used. Sunflower seeds were inoculated with conidial suspension of *A. flavus* in water containing $1.7 \times 10^7$ cfu/ml @ 2ml/25g seeds. Inoculated and uninoculated seeds were treated with fungicides viz., Benomyl, Baytan and Captan @ 0.2% w/w. Untreated seeds were used as control. In another set seeds were first treated with fungicides and then inoculated with toxigenic strain of *A. flavus*. After 10 days of incubation at 30°C, the germination of seeds and seed-borne mycoflora was detected using ISTA technique (Anon., 1976). Production of aflatoxin was calculated by AOAC method (Anon., 1975). Data were subjected to analysis of variance (Gomez & Gomez, 1984).

## Results and Discussion

Sunflower seeds inoculated with *A. flavus* showed reduction in seed germination whereas treatment of seeds with fungicides after inoculation with *A. flavus* significantly increased seed germination ($p<0.001$) (Fig. 1). Benomyl showed better results as compared to Baytan or Captan. Highest infection of *A. flavus* was observed where seeds were inoculated with *A. flavus*. Treatment of seeds with fungicides decreased infection of *A. flavus*. Naturally infected seeds when treated with Benomyl, Baytan or Captan showed a reduction in infection of *A. flavus* (Fig. 1). Seed treatment with Captan before inoculation with *A. flavus* was found effective in reducing the infection of *A. flavus*. Seed treatment with Benomyl, Baytan and Captan also showed a reduction in infection of other fungi viz., *Alternaria* sp., *A. niger* and *Fusarium* spp., (Fig.1).

In treatment where naturally infected seeds were treated with fungicides, Benomyl showed an increase in the production of aflatoxin $B_1$ whereas Baytan and Captan decreased the production of aflatoxin $B_1$ and $B_2$. Production of aflatoxin was highest in seeds inoculated with toxigenic strain of *A. flavus* where $B_1$ was 535μg/kg and $B_2$ was 316μg/kg. In seeds treated with Captan before inoculation with toxigenic strain of *A.*

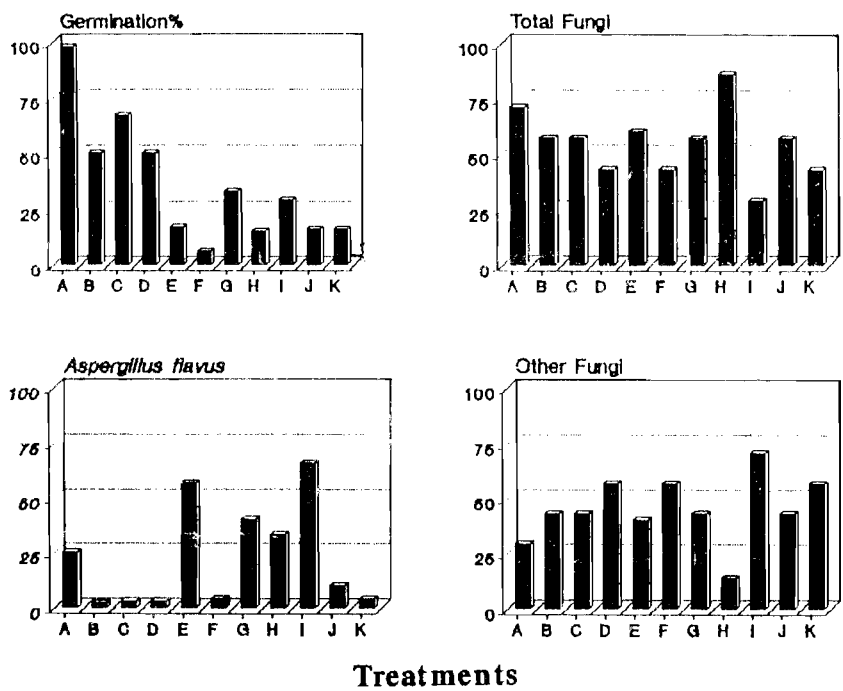


Fig.1. Effect of fungicides on germination and infection of *Aspergillus flavus* on sunflower seed.
A = Control; B = Benlate; C = Baytan; D = Captan; E = Inoculated with *A. flavus*; F = Inoculated with *A. flavus* + Benlate; G = Inoculated with *A. flavus* + Baytan; H = Inoculated with *A. flavus* + Captan; I = Benlate + Inoculated with *A. flavus*; J = Baytan + Inoculated with *A. flavus*; K = Captan + Inoculated with *A. flavus*.

**Table 1. Effect of fungicides on production of aflatoxins in sunflower seeds.**

| Treatment | Aflatoxin $B_1$ µg/kg | Aflatoxin $B_2$ µg/kg |
|---|---|---|
| Control (seeds not inoculated with *A. flavus*) | 39 | 36 |
| + Benlate | 88 | 32 |
| + Baytan | 12 | 3 |
| + Captan | 29 | 22 |
| Seeds inoculated with *A. flavus* | 535 | 316 |
| + Benlate | 73 | 18 |
| + Baytan | 73 | 26 |
| + Captan | 44 | 36 |
| Treatment with Benlate then inoculated with *A. flavus* | 73 | 0 |
| Treatment with Baytan then inoculated with *A. flavus* | Traces | 0 |
| Treatment with Captan then inoculated with *A. flavus* | 0 | 0 |

*flavus* the production of aflatoxin $B_1$ and $B_2$ was not detected. Seed treatment with Baytan and Captan before inoculation with *A. flavus* was found effective ($p<0.001$) in reducing the infection of *A. flavus* and aflatoxin production (Table 1).

Present results showed that sunflower seed treated with fungicides viz., Benomyl, Captan and Baytan increased seed germination. Such similar reports have been made by Mahajan & More (1991) where Captan @ 2% showed better germination and increased yield of sunflower. Similarly, Sheikh *et al.*, (1989) reported that Benomyl increased seed germination and reduced seedling mortality of groundnut. In the present study infection of *A. flavus* and other seed-borne mycoflora was reduced where Benomyl treated sunflower seeds were inoculated with toxigenic strain of *A. flavus*. Similarly Zaidi *et al.*, (1991) have also found that treatment of chickpea seeds with Captan and Benomyl increased germination and effectively controlled the seed-borne mycoflora. There are reports where fungicide like iprodione effectively reduced production of Cyclopiazonic acid by *A. flavus* (Munimbazi *et al.*, 1997). Maize seeds treated with 0.1% Thiabendazole either at the time of inoculation with *A. flavus* or 1-2 days before inoculation was found free from infection and aflatoxin contamination after 2 weeks incubation (Quitco, 1991). Garcia (1987) also observed that Benomyl applied @ 5g/kg on maize grains resulted in lower infection of storage fungi than the control and even after 9 weeks of storage, aflatoxin was not detected in Benomyl treated seeds. Similarly, Garcia (1989) reported that high concentration of Benomyl and Captan reduced the growth of *A. flavus* in rice and maize. A reduction in production of aflatoxin $B_1$ and $B_2$ in inoculated seeds treated with Baytan and Captan corroborate well with these results.

It would suggest that fungicides could be used to increase the germination of sunflower seed to control mould growth and aflatoxin production.

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