Mycopath (2003), **1**(2): 119-123

Effect of seed-borne fungi on seed quality components of different wheat varieties and their response to fungicide seed treatment

M.A. Pathan, M.M. Jiskani and K.H. Wagan

Department of Plant Pathology, Sindh Agriculture University, Tandojam

Abstract

Five different species of seed-borne fungi, i.e., *Alternaria alternata*, *Aspergillus niger*, *Fusarium moniliforme, Curvularia lunata* and *Stemphylium* sp. were isolated from infected seeds of twelve wheat varieties. *Alternaria alternata* was isolated as a predominant fungus with highest frequency from Pak-70 followed by Mehran-89. The maximum growth of seedlings was recorded in Anmol and Sarsabz followed by H-68 and minimum from Pak-70, Mehran-89, Soghat and Johar respectively. The germination percentage of all wheat varieties were significantly increased in seeds treated with Baytan, Vitavax, Benlate and Captan as compared to Derosal and Rizolex. Baytan, Vitavax, Benlate, Captan and Dithane M-45 significantly increased the seedling emergence, plant height, number of seeds per spike, 1000-seed weight and grain yield per plot of wheat variety Pak-70. Rizolex had the least effect among the fungicides studied.
Keywords: Wheat, Seed-borne fungi, Fungicides, Seed quality, Plant height, Yield.

Introduction

Wheat plant at all stages of growth is subjected to numerous injuries and stresses that interfere with normal functioning and development of the plant. Each year about 20% of the wheat that otherwise would be available for food and feed is lost due to diseases. Seed health plays an important role for successful cultivation and yield exploitation of a crop species. Among various factors that affect seed health, the most important are the seed-borne fungi that not only lower seed germination, but also reduce seed vigor, resulting in low yield. Seed-borne pathogens also cause variation in plant morphology, and reduce yield by 15-90%, if untreated seeds are grown in the field (Wiese, 1984). Presence of several fungi in wheat seeds has been reported in Pakistan (Kamal and Moghal, 1968; Bhutta and Hussain, 1999). Martin, *et al*. (1984) reported the occurrence of *Alternaria, Curvularia, Fusarium, Helminthosporium, Stemphylium, Aspergillus* and *Penicillium* in wheat seed. Mahmuda, *et al*. (1987), Randhawa, *et al*. (1985) and Gupta, *et al*. (1990) found Captan, Dithane M-45 and Vitavax as effective fungicides to reduce the incidence of seed-borne pathogens in wheat. Keeping in view the losses caused by stored grain fungi in wheat, the objectives of the study were to test all the available seed-dressing fungicides with broad-spectrum activity against these fungi and their effect on seed quality components.

Materials and Methods

Seed of twelve commercial wheat varieties and candidate lines i.e., Mehran-89, T.J-83, Soghat, Sarsabz, Anmol-91, Johar, C-591, Sindh-81, Pak-70, Mexi-Pak-65, H-68 and Faisalabad-85 were obtained from Wheat Section, A. R. I., Tandojam.

Isolation of stored grain fungi

Isolations were made from five samples of 200 randomly taken seeds of each variety. The symptomatic and a- symptomatic seeds were separated for isolating the stored grain fungi. Isolation was done by standardized International Seed Pathology method (ISTA, 1996). After 7days, the fungi associated with seeds were identified by studying their morphological characteristics using key (Barnett, 1967 and Singh, 1988).

Effect of stored grain fungi on seed germination

Germination studies were conducted by growing 200 seeds of each variety in earthen pots of 22cm dia. containing 2kg steam-sterilized soil. The seeds were covered with a uniform layer of sterilized soil. The plant growth i-e root and shoot length was recorded after 20 days from healthy and infected seeds.

Effect of seed-dressing fungicides on seedling emergence, plant height and yield

Seed of most susceptible variety Pak-70 was treated with seven fungicides: Baytan, Benlate, Captan, Derosal, Dithane M-45, Rizolex and Vitavax @ 2g/kg seed before sowing. The untreated seeds were used as control. The

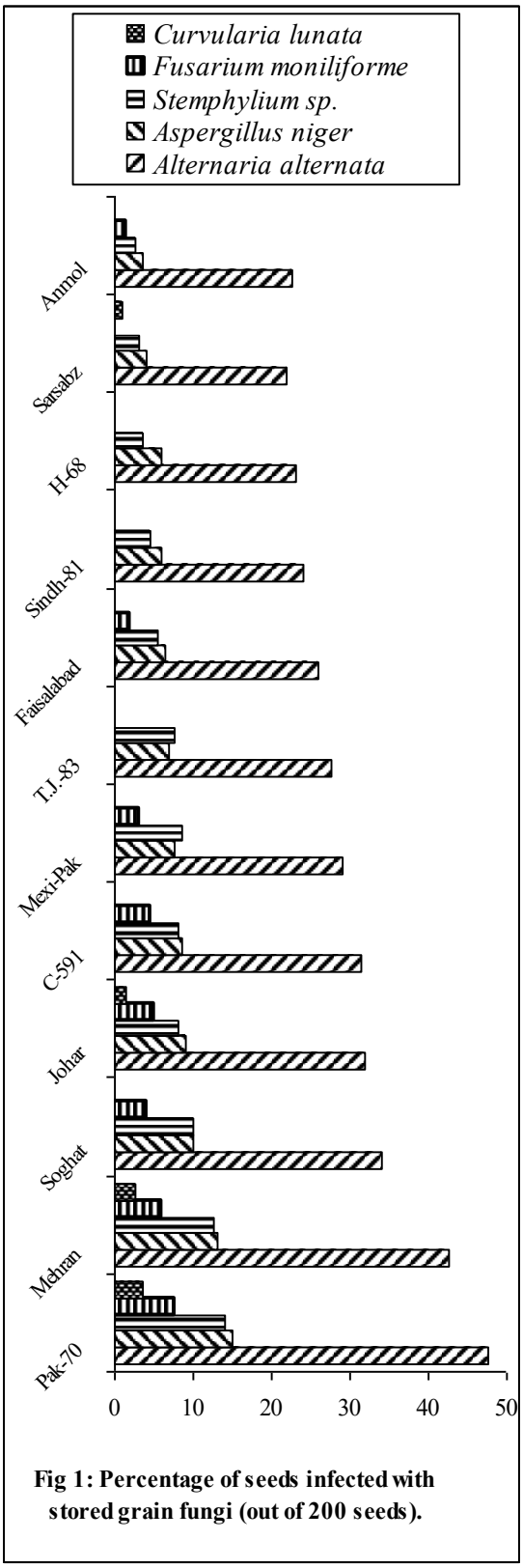

Fig 1: Percentage of seeds infected with stored grain fungi (out of 200 seeds).

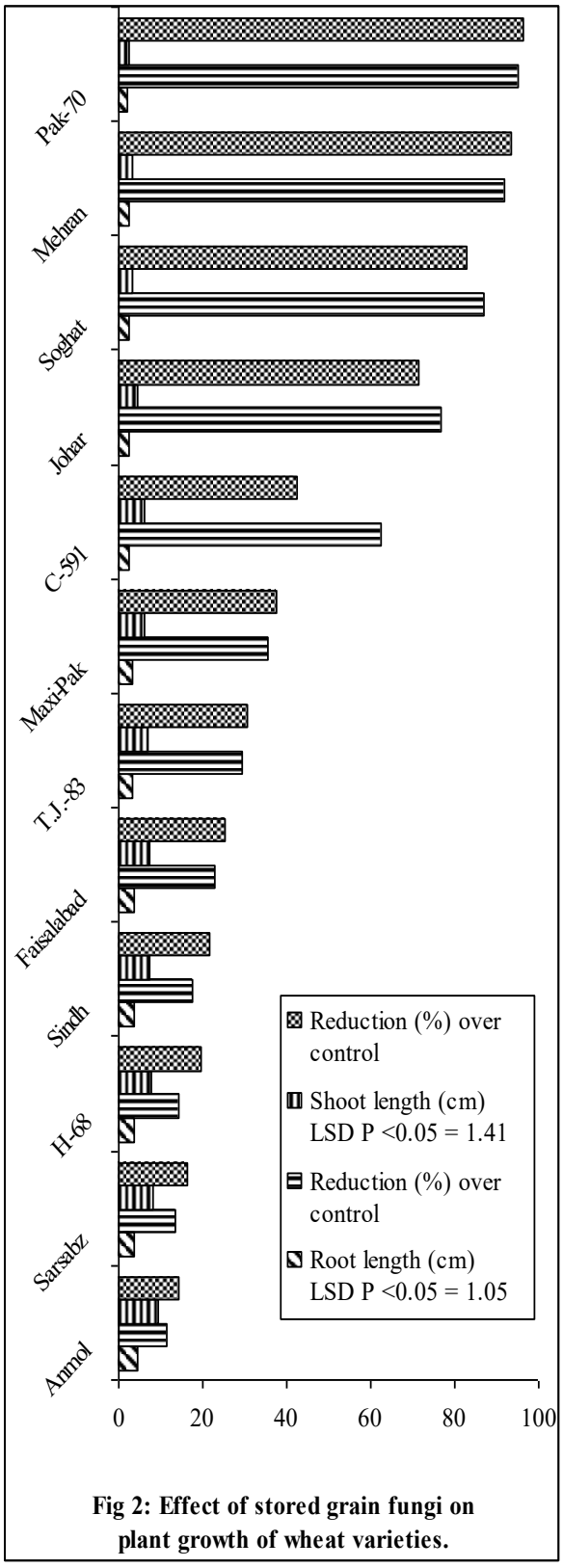

Fig 2: Effect of stored grain fungi on plant growth of wheat varieties.

experiment was arranged as randomized complete block design with four replications, sub plots measuring 4 m x 1.2 m having seven rows with 20 cm apart. The crop was harvested at its full maturity. The following parameters were studied:

i) Seedling emergence,
ii) Plant height (cm) near soil line
iii) Number of seeds/spike
iv) 1000-seed weight
v) Seed yield per plot

Results

Isolation of seed-borne fungi

Five species of seed-borne fungi, i-e *Alternaria alternata, Aspergillus niger, Stemphylium* sp., *Fusarium moniliforme* and *Curvalaria lunata* were found to be associated with seed. The percentage infection showed that *A. alternata* was the predominant fungus isolated in all wheat varieties. The next fungus was *Aspergillus niger* followed by *Stemphylium* sp., *Fisarium moniliforme* and *Curvularia lunata* (Fig.1).

Effect of seed-borne fungi on seed germination

The maximum plant growth was obtained in Anmol followed by Sarsabz. The root and shoot length was lower in plants of Pak-70 (Fig.2). There was no significant difference in root length of plants obtained in Sindh-81 and Faisalabad-85, Soghat and Johar respectively.

Effect of seed-dressing fungicides on seedling emergence and plant height

All the fungicides significantly increased seedling emergence as compared to untreated seeds (control) of Pak-70 wheat variety. The maximum number of seedling emergence was recorded with Baytan followed by Vitavax, Benlate, Captan and Dithane M-45 (Fig.3). The maximum plant height was also recorded with Baytan followed by Vitavax and Benlate (Fig.3). Plant height was not significantly different with Captan, Dithane M-45, Derosal and Rizolex, respectively (Fig.3).

Effect of different fungicides on test yield parameters

The maximum number of grains per spike was obtained with Baytan followed by Vitavax, Benlate, Captan and Dithane M-45 at 2gm/1kg seed (Fig 4). The 1000-grain weight was also significantly increased with Baytan and Vitavax followed by Benlate (Fig 4). The minimum weight grain was recorded with Rizolex. Captan and Dithane M-45 but did not show any significant difference to their 1000-grain weight means (Fig 4). The grain yield per plot was significantly higher with Baytan followed by Vitavax and Benlate (Fig 5). The yield was significantly decreased in seeds treated with Rizolex, Derosal, Captan, Dithane M-45 and in untreated plots (Fig.5).

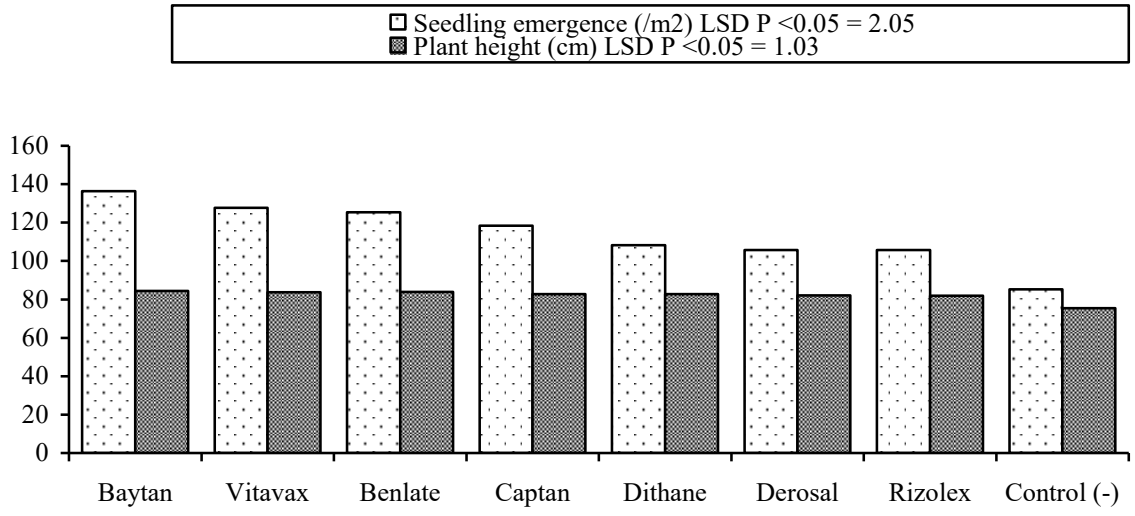

Fig 3: Effect of seed dressing fungicides on seedling emergence and plant height of wheat variety Pak-70.

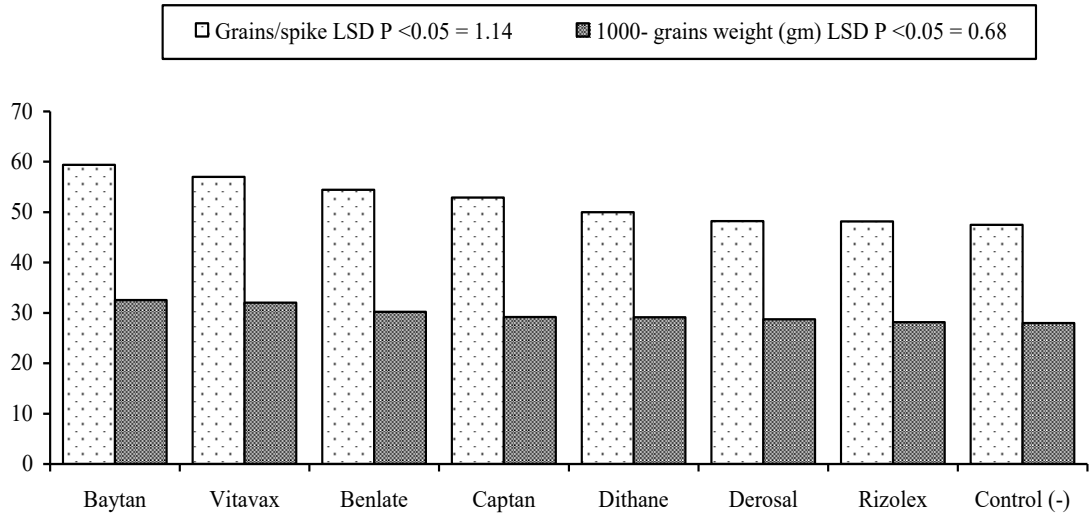

Fig 4: Effect of seed-dressing fungicides on seeds/spike and 1000 seed weight (g).

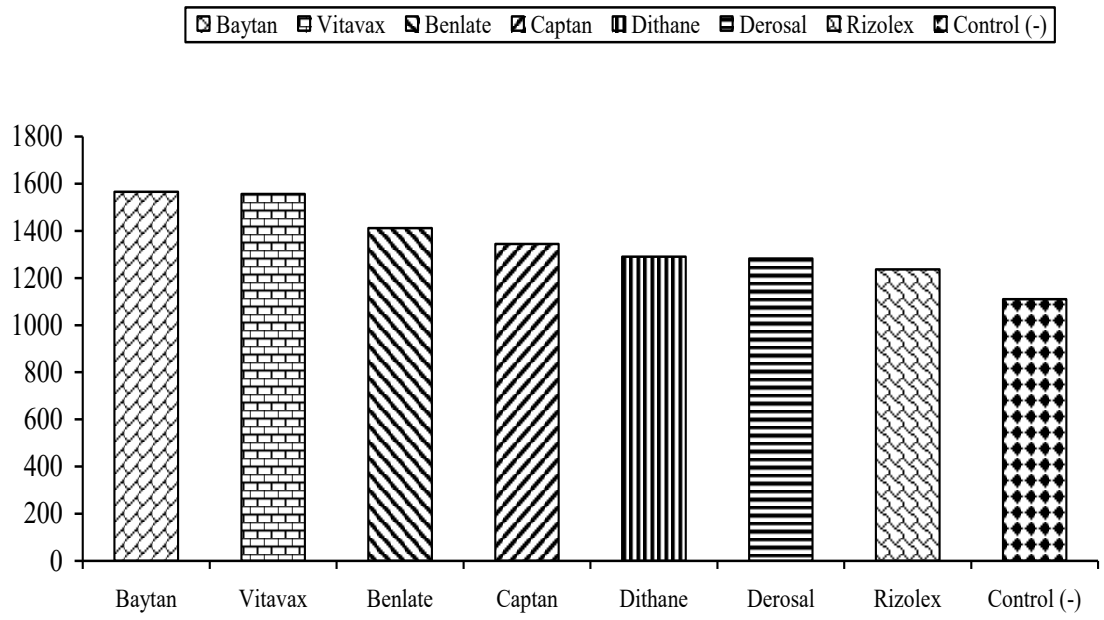

Fig 5: Effect of seed dressing fungicides on seed yield per plot (g), LSD P<0.05 = 3.96.

Discussion

Healthy seed is very important in increasing the yield of any crop. Five species of fungi i-e *Alternaria alternata, Aspergillus niger, Stemphylium* sp., *Fusarium moniliforme and Curvalaria lunata* were isolated from seed of 12 wheat varieties. Kamal and Moghal (1968) observed the association of *Alternaria, Helminthosporium, Fusarium, Curvularia* and *Stemphylium* species from black point of wheat seeds. Kulik (1973) also reported that storage fungi may be very pathogenic on wheat seed before and after harvest of the crop. Kunwar (1989) isolated the same fungi from 50% samples of the stored wheat seeds. The plant growth of wheat varieties was significantly decreased in seeds heavily infected with storage fungi. The

results are in accordance with those of Dorovskaya and Khasanava (1974). Rees, *et al.* (1984) also recorded quality changes in wheat seed by *Alternaria alternata* isolated from surface sterilized grains. Mahmuda, *et al.* (1987) reported *Alternaria alternata* responsible for failure of wheat seedling vigor in the field. The maximum seedling emergence and plant height were obtained in Baytan followed by Vitavax and Benlate. The significant increase in seedling emergence and plant height have been reported when wheat seeds were treated with Vitavax and Captan (Randhawa, *et al*. 1985), Bavistan, Benlate and Dithane M-45 (El-Tayed, *et al*. 1987). The number of grains and 1000 grain weight were significantly increased with Baytan followed by Vitavax, Benlate, Captan and Dithane M-45. Gupta, *et al.* (1999) obtained similar results by using Captan, Dithane M-45 and Benlate. The maximum seed yield per plot was also obtained with Baytan followed by Vitavax, Benlate and significantly less with Derosal and Rizolex. Mahmuda, *et al.* (1987) have recorded the similar results while using Vitavax, Captan and Dithane M-45 against black point disease of wheat.

References

Barnett HL, 1967. Illustrated Genera of Imperfect Fungi. 3rd Ed. Minnesota, Burgess, Pub. Co. 241pp.

Bhutta AR, Hussain SA, 1999. Seed-borne pathogens of Pakistan. *RACHIS*, **18**(2): 66-68.

Dorovskaya LM, Khasanava CSH, 1974. Cause of disease in field germination of spring wheat seeds in the Ural region. *Vesnik Selskhozyal Styen-noi Nauk Kaza Khatana*, **17**: 21-25.

El-Tayed A, Musa A, Makki YM, 1987. Effect of seed treatments on growth and yield of two wheat varieties. *Rev. Pl. Path*., **10**: 445.

Gupta RBL, Majumdar VL, Bhatnagar GC, 1990. Influence of seed-dressing fungicides on mycoflora and viability of wheat seed under storage. *Seed Research*, **18**: 157-159.

ISTA, 1996. International rules for seed testing. Proceedings of International Seed Test Association, Zurich.

Kamal M, Moghal SM, 1968. Studies on plant diseases of South West Pakistan. Pak. Govt. Printing Press, Karachi. 207pp.

Kulik MM, 1973. Retention of germinability and invasion by storage fungi of hand –threshed and machine threshed seeds of wheat in storage. *Seed. Sci. Technol*., **1**: 805-810.

Kunwar IK, 1989. Mycoflora associated with stored wheat and its milling fractions in India. Plant Science **99**: 437-443.

Mahmuda K, Yasmin N, Khanzada AK, 1987. Effect of black point disease on the germination of wheat varieties. *Pak. J. Agric. Res*., **8**: 467-473.

Martin JW, Seaman WL, Attinoson TG, 1984. Diseases of Field Crops in Canada. APS, St. Paul, Min. 160 pp.

Randhawa HS, Sharma HL, Kaur J, Dhaliwal AS, 1985. Effect of fungicides on germination and seed mycoflora on wheat under different storage conditions. *Pesticides*, **19**: 36-38.

Rees RG, Martin DJ, Law DP, 1984. Black point in bread wheat: effect on quality, germination and fungal associations. *Rev. of Pl. Path*., **64**: 2249.

Singh RS, 1988. Plant pathogens (The fungi). 2nd Ed. Oxford & IBH Pub. Co. New Delhi. 443pp.

Wiese MV, 1984. Compendium of Wheat Diseases 3rd Ed. The American Phytopathological Society, St. Paul, Min. U.S.A. 106 pp.