

## MYCOFLORA FROM WHEAT COLLECTED IN SIND AND PUNJAB

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One hundred and ten seed samples of 22 wheat varieties collected from Punjab and Sind were analyzed for seedborne mycoflora. A total of 36 species of fungi in 16 different genera were isolated. The places from where the seedborne fungi were isolated in higher frequencies were Bahawalpur, Hyderabad, Tandojam and Faisalabad. High level of infection was found in six wheat varieties ('Pavon', 'Yecora', 'Pari-73', 'Lu-26', 'Punjab-81', 'Blue Silver', 'ZA-77') of Punjab and in seven wheat varieties ('Tandojam-83', 'Yecora', 'Kohinoor', 'WL-711', 'Pak-81', 'Pavon', 'Sonalika') of Sind.

**Key words:** Wheat, Seed mycoflora, Distribution.

### Introduction

The annual production of wheat (*Triticum aestivum* L.) in Pakistan more than 12 million tons from 5.5–6 million hectares [8]. Many seedborne diseases of wheat crop caused by the fungi have been reported on worldwide bases [12]. In Pakistan, work on seedborne diseases of wheat were carried out by Kamal and Moghal [10], Husain *et. al.* [9]. However, no systematic work seems to have been done on seedborne fungi and their distribution in different agroecological zones of the country. The following studies were therefore undertaken with two aims in view: first, to isolate seedborne fungi from different varieties of wheat and second to make a distribution of seedborne fungi present in all seed samples collected in Punjab and Sind.

### Materials and Methods

One hundred and ten seed samples of 22 different varieties of wheat were collected from different places of Sind and Punjab during the crop season 1985-86 and 1986-87. The main source from which seeds obtained were: farmer fields, Government godowns and seed processing stations. For the isolation of seedborne fungi, the seed health testing techniques employed by "ISTA" [1] were followed. Fungi, the seed were identified after reference to Barnett and Hunter [4], Booth [6], Ellis [7], Raper and Fennel [11], Barron [5], and Anon [3].

### Results and Discussions

A total of 36 species of fungi isolated from 110 seed samples of wheat collected from different places of Punjab and Sind (Table 1). Among the fungi isolated from wheat seeds *Alternaria alternata*, the main casual fungal of black point diseases was the most predominant fungus and was isolated with an average of 57.7 and 68.2 percent in the seed samples of Punjab and Sind respectively. Other *alternaria* spp, *A. raphani* and *A. tenuissima* were isolated in low

frequencies showing an average infection of 0.63 and 0.25 percent in seed samples of Punjab while showing 0.7 and 0.5 percent average infection in seed samples of Sind. *A. godetiae* was not isolated in seed samples of Sind.

The maximum infection of *A. godetiae* was 1.5 percent in seed samples of Bahawalpur, *A. raphani* was 3.0 percent in seed samples of Hyderabad and *A. tenuissima* was 2.0 percent in seed samples of Tandojam. *Aspergillus flavus*, *A. terreus* and *A. niger* were recorded in higher frequencies in seed samples of Sind with an average infection of 9.3, 0.5 and 8.4 percent as compared to 5.3, 0.1 and 7.0 percent in seed samples of Punjab respectively. *A. candidus* and *A. sulphureus* were showing an average infection of 0.4 and 0.3 percent in seed samples of Punjab while both of the fungi were recorded with an average infection of 0.2 percent in seed samples of Sind. *A. terreus* was not recorded in any seed samples of Punjab while it was recorded with an average infection of 1.1 percent in seed samples of Sind. Two *Chaetomium* spp., *C. globosum* and *C. funicola* were isolated with an average of 5.4 and 0.3 percent in seed samples of Sind and 4.3 and 0.51 percent in seed samples of Punjab. *Cladosporium sphaerospermum* was showing 0.4 and 0.1 percent seed infection in Sind and Punjab respectively. *C. cladosporioides* was showing 0.7 percent seed infection in Sind. *Curvularia clavata* and *C. lunata* were recorded in higher frequencies in seed samples of Punjab showing 4.2 and 4.4 percent infection as compared to 1.2 and 3.3 percent in seed samples of Sind.

The maximum infection of *C. clavata* was 10.8 percent recorded in seed samples of Faisalabad while in Sind, was 3.0 percent recorded in seed samples of Sukkur. *C. lunata* was recorded upto 10.8 percent in seed samples of Bahawalpur as compared to 7.8 percent in seed samples of Tandojam. *C. pallescens* was only recorded with an average of 1.3 percent in seed samples of Sind. Among *Drechslera* spp. *D. rostrata* and *D. spicifera* were recorded in higher frequencies in seed

samples of Sind while *D. halodes* and *D. sorokiniana* were predominant in the seed samples of Punjab. *D. hawaiiensis* was recorded in same percentage in seed samples of Sind and Punjab.

The maximum infection of *D. hawaiiensis* was 5.0 percent in seed samples of Nawabshah, *D. halodes* was 10.9 percent in seed samples of Bahawalpur, *D. rostrata* was 11.5 percent in seed samples of Sukkur, *D. sorokiniana* was 12.6

TABLE 1. RELATIVE PREVALENCE OF SEEDBORNE FUNGI ASSOCIATED WITH WHEAT SEED AT DIFFERENT LOCATION IN PUNJAB AND SIND.

Seedborne Fungi	Punjab							Sind							
	Bahawal- pur	Faisal- abad	Khane- wal	R. Y. Khan	Sargo- dha	Mul- tan	Average	S.D.	Hyder- abad	Nawab- shah	Shikar- pur	Suk- kur	Tando- jam	Aver- age	S.D.
<i>Alternaria alternata</i> (Fr.) Keissler	71.0	69.5	54.0	46.5	70.0	35.5	57.75	14.82	74.0	69.5	72.0	55.0	70.5	68.2	7.5
<i>A. godetiae</i> (Neergaard) Neergaard	1.5	0.0	0.0	0.0	0.0	0.5	0.33	0.60	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>A. raphanii</i> Groves & Skorko	0.5	2.5	0.0	0.0	0.2	0.6	0.63	0.94	3.0	0.0	0.0	0.0	0.5	0.7	1.3
<i>A. tenuissima</i> Kunze ex Pers	1.0	0.5	0.0	0.0	0.0	0.0	0.25	0.41	0.0	0.5	0.0	0.0	2.0	0.5	0.8
<i>Aspergillus candidus</i> Link	0.0	0.0	0.0	0.0	1.0	1.5	0.41	0.66	1.0	0.0	0.0	0.0	0.0	0.2	0.4
<i>A. flavus</i> Link ex Fr.	6.5	4.0	7.0	13.5	0.3	0.5	5.3	4.92	11.5	3.0	12.0	15.0	5.0	9.3	5.0
<i>A. temarii</i> Kita	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	3.0	0.0	1.1	1.5
<i>A. terreus</i> Thom & Charch	0.8	0.0	0.0	0.0	0.2	0.0	0.16	0.32	2.0	0.0	0.0	0.0	0.5	0.5	0.8
<i>A. suppureus</i> (Fres), Thom & Curch	0.0	2.0	0.0	0.0	0.0	0.0	0.33	0.81	0.0	1.0	0.0	0.0	0.0	0.2	0.4
<i>A. niger</i> Van Tiegh.	11.6	9.8	1.5	7.3	0	12.2	7.06	5.54	16.2	2.6	6.8	12.0	4.5	8.42	5.5
<i>Chaetomium globosum</i> Kunze ex Fr.	6.8	10.2	2.0	1.0	0.9	5.1	4.33	3.72	9.2	0.7	3.8	0.8	12.6	5.42	5.2
<i>C. funicola</i> Cooke	0.4	0.9	0.0	0.0	0.0	1.8	0.51	0.72	1.4	0.0	0.0	0.0	0.3	0.34	0.6
<i>Cladosporium cladosporoides</i> (Fresen) devries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	3.0	0.0	0.0	0.7	1.3
<i>C. sphaerospermum</i> Penz.	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.24	1.0	0.0	0.4	0.0	0.9	0.46	0.4
<i>Curvularia clavata</i> Jain	6.5	10.8	0.2	2.0	5.9	0.3	4.28	4.18	1.9	0.0	0.6	3.0	0.6	1.22	1.2
<i>C. lunata</i> (Wakkar) Boedizn	10.8	2.7	5.4	1.2	0.5	6.2	4.46	3.8	2.8	0.6	1.9	3.6	7.8	3.34	2.7
<i>C. pallescens</i> Boedijn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.0	0.0	0.0	2.6	1.36	1.2
<i>Drechslera hawaiiensis</i> (Bugn.) Subramanin and Jain	3.0	4.5	0.5	0.0	0.0	2.5	1.75	1.86	1.5	5.0	0.0	0.0	2.0	1.7	2.0
<i>D. halodes</i> (Drechs.) Subramanin & Jain	10.9	7.8	1.4	8.2	5.9	7.8	7.0	3.17	4.6	4.9	3.1	0.0	5.2	3.56	2.14
<i>D. rostrata</i> (Drechs.) Richardson and Frasier	4.7	3.9	0.8	2.8	3.0	6.0	3.53	1.78	10.0	2.6	9.6	11.5	9.9	8.72	-
<i>D. sorokiniana</i> (Ito & Kuribay) Drechslera & Daster	12.6	10.2	3.4	10.8	9.0	11.4	9.56	3.25	5.3	3.8	1.9	4.0	4.8	3.96	1.3
<i>D. specifera</i> Nelson	14.8	16.2	4.8	15.8	6.2	15.1	12.15	5.19	23.4	21.2	22.8	24.0	28.5	23.98	2.7
<i>Eipococcum purpurascens</i> Ehrenb. ex. Schlecht	1.0	0.0	0.0	0.0	0.0	0.0	0.16	0.40	0.2	0.0	0.0	0.0	1.6	0.36	0.6
<i>Fusarium oxysporum</i> Schlecht emend, Snyd. and Hens.	10.0	11.8	8.5	7.2	10.4	6.1	9.0	2.13	8.6	9.7	1.2	10.4	12.6	8.5	4.3
<i>F. moniliforme</i> Sheldon	29.9	22.4	16.1	28.7	20.2	33.4	25.11	6.59	28.9	21.0	3.0	26.4	23.8	20.62	10.2
<i>F. nivale</i> (Fr) Ces.	9.0	6.3	4.1	8.2	0.0	7.4	5.96	3.49	1.6	0.0	0.7	0.0	0.3	0.52	0.6
<i>F. semitectum</i> Berk and Rav.	3.8	0.4	0.0	9.1	6.8	8.4	4.75	3.97	3.8	4.0	0.0	0.0	6.9	2.94	2.9
<i>F. culmorum</i> (W.G.Smith) Sacc.	0.0	4.0	0.8	1.8	0.0	3.0	1.6	1.64	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Meelanospora zamiae</i> Corda.	1.2	0.0	0.4	0.0	0.0	0.0	0.26	0.48	1.8	0.0	0.6	0.0	0.0	0.48	0.7
<i>Memnoniella echinata</i> (Riv.) Galloway	0.3	0.8	0.0	0.0	0.2	0.4	0.28	0.29	0.5	0.0	0.0	0.0	1.4	0.38	0.6
<i>Myrothecium roridum</i> Tode ex Fr.	1.5	0.0	0.0	0.4	0.4	1.8	0.68	0.77	6.8	5.2	3.2	2.4	8.8	5.28	2.6
<i>Nigrospora oryzae</i> (Berk and Br.) Petch..0	0.0	0.0	0.6	1.2	0.0	0.0	0.30	0.50	0.0	0.0	0.9	0.0	0.0	0.18	0.4
<i>Penicillium purpurogenum</i> Stoll	3.2	3.8	0.0	0.3	0.0	2.6	1.65	1.74	2.8	1.1	0.0	0.0	4.2	1.62	1.8
<i>Stachybotrytis atra</i> Corda	3.5	0.0	1.8	8.4	0.0	0.0	2.28	3.30	0.7	0.0	1.8	0.4	0.6	0.7	0.6
<i>Torula herbarum</i> f. <i>quaternella</i> Sacc.	1.2	0.0	1.4	0.0	0.0	2.0	0.76	0.88	1.8	0.0	0.0	0.0	3.1	0.98	1.4
<i>Trichothecium roseum</i> Linke & Fries	14.8	16.9	18.6	18.0	15.3	17.5	16.85	1.51	4.7	9.2	3.8	13.8	11.9	7.23	4.3
Mean infection percentage	6.78	6.16	3.70	5.20	4.34	5.26	5.26	-	6.49	4.71	4.25	5.14	6.48	5.41	-

percent in seed samples of Bahawalpur and *D. spicifera* was 28.5 percent in seed samples of Tandojam. Farmer's field survey conducted during the year 1985-86 have revealed that in Sind, the incidence of *D. sorokiniana* was from 1 to 1.5 percent whereas in Punjab, the disease incidence was from 0.7 to 10.5 percent [2]. (*Fusarium*) spp., viz, *F. oxysporum*, *F. moniliforme*, *F. nivale* and *F. semitectum* were isolated in higher frequencies showing an average infection of 9.0, 25.1, 5.96 and 4.7 percent in seed samples of Punjab as compared to 8.5, 20.6, 0.5 and 2.9 percent in seed samples of Sind. *F. culmorum* was only recorded in seed samples of Punjab with an average infection of 1.6 percent.

The maximum infection of *F. oxysporum*, *F. moniliforme*, *F. nivale*, *F. semitectum* and *F. culmorum* were recorded in seed samples of Tandojam (12.6%), Multan (33.4%), Bahawalpur (9.8%), Rahimyarkan (9.1%) and Faisalabad (4.0%) respectively. In farmer's field, the incidence of *F. moniliforme* and *F. nivale* on wheat varieties were upto 2.0 and 0.7 percent in Sind and upto 2.5 and 0.5 percent in Punjab respectively [2]. *Stachybotrys atra* and *Trichothecium roseum* were recorded in higher frequencies in seed samples of Punjab showing an average infection of 2.2 and 16.8 percent as compared to 0.7 and 11.2 percent in seed samples of Sind. *T. roseum* and *S. atra* were recorded upto 18.6 and 11.9 percent in seed samples of Khanewal and Rahimyarkhan respectively.

The seed infection of *Myrothecium roridum* was 5.2 percent in Sind as compared to 0.68 percent in Punjab. *Penicillium purpurogenum* was recorded in equal frequencies (1.6%) in seed samples of sind and Punjab. Other seedborne fungi which were recorded in low frequencies were *Epicoccum purpureum*, *Melanospora zorniae*, *Memnoniella echinata*, *Nigrospora oryzae* and *Torula herbarum f. quaternella* showing an average infection of 0.16, 0.26, 0.28, 0.3 and 0.76 percent in seed samples of Punjab and 0.36, 0.48, 0.38, 0.18 and 0.98 percent in seed samples of Sind.

A total of 110 seed samples of 22 varieties of wheat collected from different places of sind and Punjab were used in this study (Table 2). The seed infection due to seedborne fungi in eighteen different wheat varieties of Punjab varied from 1.1 to 13.3 percent with a mean of 5.28 percent. Varieties 'Pavon', 'Yecora', 'Pari-73', 'LU-26', 'Punjab-81', 'Blue Silver', 'ZA-77', were highly infested with a percentage of 13.3, 10.6, 9.9, 8.6, 7.4 and 6.9 respectively. The seed infection in seventeen wheat varieties of Sind ranged between 1.7 and 10.7 percent with a mean of 5.42 percent. Varieties, 'Tandojam-83', 'Yecora', 'Kohinoor', 'WL-711', 'Pak-81', 'Pavon' and 'Sonalika' were highly infested with a percentage of 10.7, 10.0, 8.8, 8.6, 8.5, 8.3 and 8.0 respectively.

The distribution of seedborne fungi of wheat was

TABLE 2. AVERAGE INCIDENCE OF SEEDBORNE FUNGI ENCOUNTERED IN WHEAT CULTIVARS.

Varieties	No. of Seed samples		Average incidence Percentage of fungi	
	Punjab	Sind	Punjab	Sind
Sandal	3	1	4.7	1.7
Kohinoor-83	4	2	1.5	8.8
C-951	3	3	2.3	3.1
Pak-81	5	4	3.4	8.5
Blue Silver	4	5	7.4	2.6
Sind-83	-	1	-	2.7
ZA-77	6	6	6.9	3.5
Pavon	4	3	13.3	8.3
Punjab-81	5	-	7.6	-
BWP-79	3	-	2.8	-
LU-26	4	-	8.6	-
Pari-73	3	-	9.9	-
Pak-83	4	3	3.3	4.2
Sutlaj-86	1	-	2.8	-
Maxi-Pak	1	2	2.7	2.3
Sonalika	-	3	-	8.2
Yecora	2	4	10.6	10.0
WL-711	4	3	3.7	8.6
Local White	2	1	1.1	2.5
Tandojam-83	-	4	-	10.7
Faisalabad-83	-	2	2.6	2.6
Chenab-79	-	1	-	4.2
Mean	-	-	5.28	5.42

summarized by mean infection percentage of total fungi (Table 1,2). The prevalence of seedborne fungi in terms of mean infection percentage was 5.4 in seed samples of Sind as compared to 5.2 in seed samples of Punjab. The places from where the seedborne fungi were isolated in higher frequencies were Bahawalpur (6.7%), Hyderabad (8.495), Tandojam (6.48%) and Faisalabad (6.16%). The fungi isolated were found to be distributed in an appreciable percentage in each area studied.

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