SEED-BORNE PATHOGENS ASSOCIATED WITH CERTIFIED SEED LOTS OF WHEAT IN PAKISTAN

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ABSTRACT

Ten seed-borne pathogens were detected from 335 wheat seed samples that were collected from twelve major wheat-growing areas in Pakistan during 1997-98,1998-99 and 1999-2000. Fusarium spp were the major pathogen, with infection ranging from 0.5 to 34.0 per cent. Bipolaris sorokiniana was the second major pathogen, with infection ranging from 0.50 – 28.0 per cent. Acremonium spp. was isolated from Peshawar and D.I.Khan, while Microdochium nivalis was isolated only from D.I.Khan. Bipolaris tetramera, Curvularia lunata, Phoma spp.. and Stemphylium spp. were detected, with infection less than 2 per cent.

Variation in number of pathogens and their incidence was found from year to year. High incidence of pathogens suggests that wheat seed should be tested for their health status, regularly and infected seed-lots should be treated with seed-dressing fungicides before sowing. Alternaria tenuis, Aspergillus spp., Bipolaris hawiiensis, Cladosporium spp., Epicocum spp., Penicillium spp., and Rhizopus spp. were also identified, but were not counted.

Key words. Seed-borne pathogens , wheat seed lots , Pakistan

INTRODUCTION

The major diseases of wheat in Pakistan are rusts, loose smut, bunts, septoria leaf spot, foot rot, root rot, black point complex and ear cockle (Kausar, 1955). Spot blotch caused by *Bipolaris sorokiniana* is the most severe disease of warmer areas. Yield-loss from 40% to 85% had been reported in Philippines and Zambia, respectively.(Lapis, 1985 and Raemaekers, 1988) Pink snow mold, caused by *Microdochium nivale,* has also caused substantial yield-loss (Mathur & Cunfer, 1993). In Pakistan, losses due to different wheat-diseases are also considered high. In view of this scenario, 335 seed samples of wheat were collected from fields that were inspected and certified by the Federal Seed Certification and Registration Department for seed-production and were tested for their health-status using ISTA techniques. Data about the incidence and association of pathogens with wheat seed may be very useful to the breeders and seed technologists, at national and international level, for planning better strategies on disease-management in wheat crop.

MATERIALS & METHODS

A total of 335 wheat-seed samples were collected from different agro-ecological regions, as described in Agro-ecological regions of Pakistan (Anonymous, 1980) according to ISTA rules(1985), during 1997-98, 1998-99 and 1999-2000. The seeds were tested by the standard blotter-paper method (Neergard, 1979). Three blotter papers, well moistened in sterilized water, were placed in each Petri dish .Four hundred seeds were placed in such a manner that each Petri dish may contain 25 seeds. Seeds were incubated at 20°C±2°C for 7 days and on 8th day, seeds in Petri dishes were examined under stereo-microscope and, wherever identification was difficult, slides were prepared and examined under binocular electric microscope on the basis of spore shape, size, its attachment with fruiting body directly from seed. (Chidambaram et al, 1973, Nath et al, 1970, and Barnette, 1960). Detail and percentage infection of the pathogens is given in Table-1.

RESULTS AND DISCUSSION

Ten important seed-borne pathogens were identified from the infected seed-samples out of 335 tested during this study (table-1). The most commonly occurring pathogens were *Fusarium spp. (Fusarium moniliforme, F.oxysporum, F. semitectum and F. solani). F. moniliforme,* with infection of 34.00 and 19.50 per cent, was found in samples collected from Khanewal and D. I. Khan and, similarly, *F. semitectum* was found as 11.00 and 10.50 per-cent in seed samples from Khanewal and Sakrand, during 1997-98 and 1998-99, respectively. Seeds infected with high percentage of *Fusarium spp*. may fail to germinate or may give rise to blighted seedlings, especially if infected seeds are planted in warm dry soil (Mathur and Cunfer 1993*).Fusarium spp.,* primarily soil-borne pathogen to many crops (Trenholm et al, 1981), are

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Table - 1: Wheat seed samples tested for fungal pathogens, during 1997-98 to 1999-2000

1997-98			1998-99			1999-2000		
No. of sample tested	Locality and Pathogen	Infection %age range	No. of samples tested	Locality & Pathogen	Infection %age range	No. of samples tested	Locality & Pathogen	Infection %age range
1	***2***	**3**	**4**	**5**	**6**	**7**	**8**	**9**
3	***Islamabad***		4			9		
	Bipolaris sorokiniana						B.s	0.00- 0.50
	Bipolaris tetramera						B.t	0.00- 0.50
	Fusarium moniliforme	0.00-7.50		F.m	0.50-5.50		F.m	0.50- 2.00
	Fusarium semitectum	0.50-1.50		F.s	0.50-1.50		F.s	0.00- 0.50
	Phoma spp.			Ph. spp.	0.00-1.50			
12	***Lahore***		4			12		
	Bipolaris sorokiniana	0.50-6.50		B.s	0.50- 9.50		B.s	0.00- 0.50
	Curvularia lunata			C.l	0.50-1.50			
	Fusarium moniliforme	0.50-2.00					F.m	0.50- 1.00
	Fusarium semitectum	0.00-0.50		F.s	1.00-2.50		F.s	0.00- 0.50
	Stemphelium spp.			St. spp.	0.50- 1.50			
11	***Sahiwal***		5			18		
	Bipolaris sorokiniana	0.00-0.50		B.s	0.00- 1.00		B.s	0.50- 2.00
	Fusarium moniliforme						F.m	0.50- 2.00
	Fusarium semitectum	0.00-1.00		F.s	0.00- 1.00		F.s	0.00- 0.50
	Phoma spp.						P.spp	0.05- 1.00
	R. Y. Khan		10			19		
	Bipolaris sorokiniana			B.s	1.00- 3.50		B.s	0.50- 2.00
	Fusarium moniliforme						F.m	0.50- 2.50
	Fusarium semitectum						F.s	0.50- 2.50
	Phoma spp.						P.spp.	0.00- 0.50
	Khanewal		52			10		
	Bipolaris sorokiniana			B.s	3.00- 28.00		B.s	0.00- 0.50
	Fusarium moniliforme			F.m	0.50-34.00		F.m	0.50- 2.50
	Fusarium semitectum			F.s	0.50-11.00			
	Fusarium solani				0.00-0.50			
	Phoma spp				0.00-1.50			
	Multan		(-)			23		
	Bipolaris sorokiniana						B.s	0.50- 4.00
	Bipolaris tetramera						B.t	0.50- 1.00
	Fusarium moniliforme						F.m	0.00- 0.50
	Phoma spp.						P.spp	0.50- 1.00
12	***Peshawer***		4			39		
	Bipolaris sorokiniana	0.50-14.50		B.s	2.00- 3.00		B.s	0.50- 4.00
	Curvularia lunata.	0.50-7.50						
	Fusarium moniliforme			F.m	0.00- 1.00		F.m	0.50- 8.00
	Fusarium semitectum	0.00-2.50		F.s	0.50- 2.00		F.s	0.50- 5.50
	Phoma spp			P. spp.	0.00- 0.50			

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	Acremonium spp.			Ac. sp.	0.00- 0.50			
12	***D.I. Khan***		10			10		
	Acremonium spp.	0.00-0.50						
	Bipolaris sorokiniana	0.50-12.0		B.s	1.00-2.50			
	Bipolaris tetramira	1.00-1.50						
	Cuvularia lunata.			C.l.	0.5 -1.50			
1	***2***	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	Fusarium moniliforme	0.00-19.50		F.m	0.00- 0.50		F.m	0.50- 2.50
	Fusarium semitectum	0.50-4.00		F.s	0.50-1.50		F.s	5.00- 3.50
	Microdochium nivalis	0.00- 0.50						
	Phoma spp.	0.00- 0.50		P. spp.	0.00- 0.50		P.spp.	0.00- 1.00
3	***Quetta***		2			2		
	Bipolaris sorokiniana			B.s	0.50- 1.50		B.s	0.50- 1.50
	Bipolaris tetramera						B.t	0.00- 0.50
	Curvularia lunata.			C.l.	0.00-1.00			
	Fusarium moniliforme	1.50- 6.50					F.m	0.50- 1.00
	Fusarium semitectum	0.00- 1.00					F.s	0.00- 0.50
	Stemphylium spp.			St.spp.	0.00- 1.00			
11	***Hyderabad***		14			9		
	Bipolaris sorokiniana	0.50- 1.50		B.s	0.50- 1.00		B.s	0.50- 2.00
	Bipolaris tetramera	0.50 -1.00						
	Curvularia lunata.			C.l.	0.50- 1.00			
	Fusarium moniliforme	1.00- 8.00					F.m	1.00- 2.50
	Fusarium semitectum	0.50- 2.00					F.s	0.00- 1.00
	Phoma spp.	0.50- 1.00						
	Stemphylium spp.			St. spp.	0.00-1.50			
3	***Sakrand***		8			(-)		
	Bipolaris sorokiniana	0.50- 1.50		B.s	0.50- 4.00			
	Curvularia lunata.			C.L.	0.50-1.50			
	Fusarium moniliforme	2.50-10.50						
	Fusarium semitectum	0.50- 3.00						
	Stemphylium spp.				0.00-1.50			
4	***Sukkur***		(-)			(-)		
	Bipolaris sorokiniana	0.50- 5.50						
	Fusarium moniliforme	1.50- 2.50						
	Fusarium semitectum	1.50-10.50						
	Fusarium solani	0.00-1.50						

(-) Seed samples were not available.

known to produce mycotoxin viz. *Zeralenone, moniliformine* and fusaric acid (Diener et al, 1981).

The second most commonly occurring pathogen was *Bipolaris sorokiniana* (sacc.) shoem., identified from all localities except Islamabad, during 1998-99, and from D.I.Khan during 1999-2000. Its highest infection was found up to 28.00 per cent from Khanewal area, during 1998-99, but minimum infection level of 0.50% was found in seed samples from Sahiwal, during 1997-98, and from Islamabad, Khanewal and Lahore during 1999-2000. Bhutta and Hussain (1999) have also reported 0.5 to 11% infection of *B. sorokiniana* in samples collected all over Pakistan .This pathogen can adversely affect germination and sometime kills the seedlings (Mathur & Cunfer, 1993)Yield losses caused by this fungus are not known yet in Pakistan.

Acremonium spp. was identified from Peshawar and D.I.Khan seed samples, while *Microdocium nivalis* (Fr.) Samuels & I.C. Hallet was found only from D.I.Khan. *Phoma spp*. was identified from samples of central and southern Punjab, Sindh and southern part of NWFP provinces. Other pathogens, such as *Bipolaris tetramera* (Mckinney) shoem, *Curvularia lunata* (wakker) Boedijn and *Stemphylium spp*. were also detected from some localities, with infection percentage range from 0.5 to 2.0. In previous studies, it was reported that seed-borne pathogens showed decreasing trend in southern part of the country (Khan and Bhutta, 1994), but in this study, increasing trend was observed. It may be due to the fact that movement of untreated seed from one part of the country to other part of the country has been very often by the private sector.

Keeping in view the distribution and incidence of fungal seed-borne pathogens, wheat seed lots should be regularly monitored for their health-status using seed-health technology and the seed must be treated at pre-basic and basic level for control of plant-diseases, under strict seed health certification and production programme of the country (Bhutta et al, 1992) . There is a need to test germ-plasm and other breeding materials before their exploitation in wheat breeding programme of the country. Some seed-borne fungi considered to be saprophytes, such as *Alternaria tenuis., Aspergillus spp., Bipolaris hawaiiensis, Cladosporium spp., Epicocum spp., Penicillium spp.* and *Rhizopus spp.,* were also recorded but not counted.

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