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Incidence and management of wheat seed borne fungi collected from Baghlan Province, Afghanistan

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Wheat (*Triticum aestivum* L.) is most important food grain crop of Afghanistan. It is cultivated in every province of Afghanistan and is grown approximately in 2.5 million hectares (Anonymous 2010). During 2017, the country harvested 4.3 m tonnes of wheat (FAO 2018). Wiese (1998) reported 15 to 90% losses in wheat yield due to seed borne fungi. Seed borne fungi, viz. *Alternaria alternata, Cladosporium oxysporum*, *Curvularia lunata*, *Drechslera sorokiniana, D. tetramera, Gibberella zeae* and *Bipolaris sorokiniana* have been reported from wheat (Ilyas *et al.* 1998). The most dominant mycoflora isolated from wheat seeds were *Tilletia*, *Ustilago*, *Bipolaris*, *Fusarium*, *Alternaria*, *Drechslera*, *Stemphylium*, *Curvularia*, *Cladosporium*, *Rhizopus*, *Aspergillus* and *Penicillium* (Rehman *et al.* 2011). The present study was undertaken for knowing the seed mycoflora in wheat genotypes grown in different locations of Baghlan Province, Afghanistan and also to devise the suitable eco-friendly management.

The experiment was conducted during 2020–21 at the research farm of Baghlan University, Baghlan, Afghanistan. The seed samples of 20 wheat genotypes were collected from 11 districts (Table 1). To study the association of seed borne fungi, grains of 9 genotypes were collected from different locations of Baghlan and were examined by following standard blotter method (Anonymous 1985).

The results obtained in the present study revealed that out of 20 seed samples tested (Table 1), *Alternaria alternata* was reported in all 20 samples accounting maximum seed association of 51% with wheat variety, Kabul-013 seed sample from Central Baghlan. *Bipolaris* spp. were observed in 13 samples and the maximum seed association of 8% was recorded with Kabul-013 from Central Baghlan seed sample. Fifteen out of 20 samples tested for seed borne fungi showed the maximum seed association of 9% due to *Gibberella zeae,* recorded with variety, Lalmi-4 from Puli Khumri and Kabul-013 from Dushi seed samples. While mnimum association of 1% was recorded with variety, Ghori-96 from Khinjan and Lalmi-2 from Banu. *Curvularia lunata* was found associated with seven seed samples accounting maximum seed association of 6.0% with Lalmi-4 from Puli Khumri samples (Table 1).

The pathogen, *Rhizopus stolonifer* was found in 12 samples and maximum association of 39% with Ghori-96 from Khinjan. *Aspergillus flavus* was found in 3 samples (Table 1). *Aspergillus niger* was recorded in 4 samples of variety, Roshan from Khost samples. *Penicillium* spp was found in 18 seed samples and maximum association of 39% was recorded with variety, Roshan from Khost. Sixteen seed samples showed the association of *Cladosporium cladosporioides* and maximum seed association of 64% was recorded with variety, Herat-99 from Banu seed samples. *Acremonium* spp. was found in association with 11 samples, accounting maximum seed association of 17% with variety, Daima-17 from Guzargah-a-Noor. *Ulocladium* spp. was found associated with 17 seed samples with maximum association of 33% with variety, Mazar-99 from Khinjan. Twelve samples showed the association of *Arthrobotrys oligospora*, with maximum seed association of 25% with variety, Baghlan-09 from Guzargah-a-Noor. *Tillitia indica* was found associated with only 3 seed samples of varieties, Mazae-99 (3%) from Khinjan and Herat-99 (2%) from Banu district. Seed samples collected from Central Baghlan, Khinjan, Banu and Guzargah-a-Noor recorded highest seed borne fungi (Table 1). This result is in agreement with Kesho and Abebe (2020), who also reported similar mycoflora associated with the wheat seeds. Khan *et al.* (2023) reported 21 fungal species from seeds lots of diversified gene pool, collected from farmer fields and grain markets of South Punjab. The most frequently isolated fungi were *Alternaria alternata*, *Gibberella fujikuroi, Aspergillus flavus*, *Helminthosporium* spp., *Curvularia* spp., *Bipolaris sorokiniana*, *Phoma* spp. and *Penicillium* spp.

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Table 1 Incidence of seed borne fungi in wheat varieties collected from different locations of Baghlan province of Afghanistan

Location	Genotype	Seed germination (%)	Per cent seed borne fungi													
			Alternaria alternata	*Bipolaris* spp.	*Gibberella zeae*	*Curvularia lunata*	*Rhizopus stolonifera*	*Aspergillus flavus*	*Aspergillus niger*	*Penicillium* spp	*Cladosporium cladosporioides*	*Acremonium* spp.	*Ulocladium* spp.	*Arthrobotrys oligospora*	*Tillitia indica*	Total seed borne fungi
Puli Khumri	Lalmi-4	97	49	4	9	6	0	0	8	0	0	8	0	8	0	92
	Chonta-1	96	40	0	8	3	0	0	0	0	0	2	5	11	0	69
Central Baghlan	Kabul-013	93	51	8	6	4	21	4	0	11	41	9	8	0	0	163
	Chonta-1	99	44	0	0	0	0	0	0	3	11	12	4	0	0	74
Khinjan	Mazar-99	98	43	0	2	3	24	0	0	4	35	0	33	0	3	147
	Ghori-96	99	39	3	1	4	39	0	0	8	19	0	11	0	0	124
Dushi	Mazar-99	98	27	3	4	0	24	0	0	1	0	0	3	2	0	64
	Kabul-013	97	40	4	9	0	0	0	0	1	0	1	7	2	0	64
Banu	Herat-99	92	42	0	0	2	0	0	0	17	64	0	7	3	2	137
	Lalmi-2	96	38	4	1	0	0	0	0	3	23	6	12	0	0	87
Khost	Mazar-99	97	29	0	6	0	5	0	2	1	4	0	0	1	0	48
	Roshan	89	24	4	5	0	21	8	19	39	8	4	2	3	0	137
Farang	Baghlan-09	94	34	5	6	0	0	0	0	3	41	13	11	3	0	116
	Roshan	96	46	3	4	0	32	1	1	7	27	10	7	0	0	138
Guzargah-a-Noor	Daima-17	95	29	3	6	0	0	0	0	5	32	17	0	6	0	98
	Baghlan-09	92	37	5	6	0	1	0	0	2	4	0	3	25	0	83
Dahana-i-Ghori	Koshan-09	93	31	5	0	2	19	0	0	21	51	0	8	2	0	139
	Lalmi-2	97	41	1	0	0	12	0	0	6	20	3	3	0	0	86
Dih Salah	Kabul-013	96	47	0	0	0	2	0	0	13	52	0	9	0	0	123
Nahrin	Mazar-99	98	16	0	6	0	15	0	0	25	59	0	7	2	0	130

Screening of seeds of wheat genotypes collected from one Zonal Agricultural Research Station, Baghlan Afghanistan revealed the association of 10 fungi (Table 2). *Alternaria alternata* was recorded in all seed samples. Highest fungal association of 59% was recorded with variety, Kabul-013. Out of 9 seed samples collected from Agricultural Research Station, 5 samples showed association of *Bipolaris* spp, with maximum fungal association of 17% with variety, Mazar-99. *Ulocladium* spp. were found in 6 samples. Out of 10 samples tested, 6 samples showed association of *Acremonium* spp. with maximum seed association of 36% with variety, Chonta-1. *Gibberella zeae* was recorded in 4 samples. *Curvularia lunata* was associated with 4 samples while *A. flavus* was associated with 3 seed samples. *Pencillium* spp were associated with 3 seed samples with maximum seed association of 9% with variety, Daima-17. *Cladosporium cladosporioides* was associated with 5 seed samples, recording maximum seed association of 27% with variety, Lalmi-4 (Table 2). *Alternaria alternata* and *Bipolaris* spp. were predominant in the tested seed samples. Among different genotypes tested for seed borne fungi, highest number of seed borne fungi were recorded in varieties, Mazar-99, Afghan-015 and Kabul-013.

Seeds of the highly infected wheat variety Kabul-013 from Central Baghlan were selected for management of seed borne fungi. The seeds were treated with four different fungicides and two bio agents (Table 3). Three replications of 100 seeds per treatment were tested by standard blotter method. The untreated seeds served as control. Observations on per cent infection were recorded on 8th day of incubation. The proposed experiment was laid out in a completely randomized design (CRD), consisting of 19 treatments, replicated thrice (Table 3). The significant treatment effect was judged with the help of F-test (@P=0.05) and to judge the significant difference between treatments, the critical difference (CD @P=0.05) was worked out. The efficacy of fungicides and bio agents for controlling of seed borne fungi infection in variety Kabul-013 was analyzed (Table 3). All fungicides and biocontrol agents reduced the per cent seed infection significantly. The lowest per cent infection (1.33%) was recorded in treatment Ridomil @2.5 g/kg seed and the highest per cent infection of 52% was recorded in control (untreated). Among fungal bioagents, the lower infection of 17.33% was recorded in treatment *Trichoderma viride* @8.0 g/kg seed. Pathak and Razia (2013) also reported

Table 2 Screening of seeds of popular wheat varieties grown in Afghanistan for seed borne fungi

Genotype	Seed germination (%)	Per cent seed borne fungi										
		Alternaria alternata	*Bipolaris* spp	*Ulocladium* spp	*Acremonium* spp	*Gibberella zeae*	*Curvularia lunata*	*Aspergillus flavus*	*Aspergillus niger*	*Pencillium* spp	*Cladosporium cladosporioides*	Total seed borne fungi
Baghlan-09	92	56	0	7	19	0	0	0	0	0	0	82
Kabul-013	98	59	7	3	24	8	11	0	0	0	0	112
Koshan-09	92	47	8	0	32	0	0	3	1	2	13	106
Durum-1	96	58	0	13	0	0	0	0	2	0	0	73
Afghan-015	96	41	11	0	0	5	17	4	5	7	23	113
Mazar-99	95	54	17	21	19	13	21	6	7	0	0	158
Lalmi-4	93	54	9	21	0	0	0	0	0	0	27	111
Daima-17	92	57	0	0	0	0	3	0	0	9	18	87
Chonta-1	97	49	0	8	36	12	0	0	2	0	0	107

Table 3 Effect of different seed treatment with fungicides and bioagents on seed borne infection of wheat variety, Kabul-013

Treatment	Infection (%)
T_1: Captan @2.5 g/kg seed	2.67
T_2: Captan @2.0 g/kg seed	4.00
T_3: Captan @1.5 g/kg seed	6.67
T_4: Vitavax @2.5 g/kg seed	4.00
T_5: Vitavax @2.0 g/kg seed	5.33
T_6: Vitavax @1.5 g/kg seed	13.33
T_7: Bavistin @2.5 g/kg seed	5.33
T_8: Bavistin @2.0 g/kg seed	6.67
T_9: Bavistin @1.5 g/kg seed	8.00
T_{10}: Ridomil @2.5 g/kg seed	1.33
T_{11}: Ridomil @2.0 g/kg seed	2.67
T_{12}: Ridomil @1.5 g/kg seed	4.00
T_{13}: *Trichoderma viride* @8.0 g/kg seed	17.33
T_{14}: *Trichoderma viride* @6.0 g/kg seed	22.67
T_{15}: *Trichoderma viride* @4.0 g/kg seed	25.33
T_{16}: *Bacillus subtilis* @3.0 ml/litre water	26.67
T_{17}: *Bacillus subtilis* @2.5 ml/litre water	29.33
T_{18}: *Bacillus subtilis* @2.0 ml/litre water	33.33
T_{19}: Control (Untreated)	52.00
F-test (P=0.05)	S
CD (P=0.05)	6.90

seed treatment with different fungicides, viz. carbendazim, mancozeb and biocontrol agents on the incidence of seed-borne fungi. Arshad *et al*. (2006) reported mancozeb and dithane most effective fungicides for managing seed borne fungi infection in wheat.

SUMMARY

To identify the association of seed borne fungi in wheat seed samples (20 wheat genotypes collected from 11 different districts of Baghlan province), the standard blotter method was used. Thirteen seed borne fungi, viz. *Alternaria alternata, Bipolaris* spp*, Gibberella zeae, Curvularia lunata, Rhizopus stolonifer, Aspergillus flavus, A. niger, Penicillium* spp*, Cladosporium cladosporioides*, *Acremonium* spp, *Ulocladium* spp*, Arthrobotrys oligospora* and *Tilletia indica* were observed from the seeds. Nine wheat varieties collected from Zonal Agricultural Research Station, Baghlan, Afghanistan were analyzed for the association of seed borne fungi. Ten fungi, viz. *A. alternata, Acremonium* spp*, Cladosporium cladosporioides*, *Ulocladium* spp*, Curvularia lunata, Bipolaris* spp*, Gibberella zeae, A. flavus, A. niger* and *Penicillium* spp. were recorded. Among them *A. alternata* and *Bipolaris* spp. were predominant in most of the seed samples. Minimum per cent infection of 1.33% was recorded with treatment having Ridomil @2.5 g/kg seed whereas maximum seeds infection of 52% was recoded in control. Present study revealed the occurrence of seed borne fungi in different wheat genotypes in Baghlan province of Afghanistan. Studies helped in identifying suitable fungicides and bioagents for managing seed borne fungi in wheat.

REFERENCES

Anonymous. 1985. International rules for seed testing (ISTA). *Seed Science and Technology* **13**: 356–513.

Arshad Jawaid, Asma Ashraf, Naureen Akhtar, Hanif M and Asad Farooq M. 2006. Efficacy of some fungicides against seed borne mycoflora of wheat. *Mycopathology* **4**(1): 45–49.

Anonymous. 2010. Agricultural Prospect Report. Ministry of Agriculture, Irrigation and Livestock. Government of Islamic Republic of Afghanistan. Kabul, Afghanistan.

FAO. 2018. International wheat production statistics. WWW.FAO. org/faostat/en/#data/QC(accessed 2018/6/ 25).

Ilyas M B, Bokhari S A A and Khan M A. 1998. Fungi detected from wheat seeds exhibiting black point's symptoms and their control by seed treatment. *Pakistan Journal of Phytopathology* **10**: 86–89.

Kesho and Abebe W. 2020. Detection of seed borne fungi associated with some cereals and legume crops of seeds grown in main season at Holetta Agricultural Research Center. *American Journal of Life Sciences* **8**(5): 91–95.

Khan A M, Khan M, Salman H M, Ghazali H M Z U, Ali R I, Hussain M, Yousaf M M, Hafeez Z, Khawja M S, Alharbi S A, Arifi M and Nabeel M. 2023. Detection of seed-borne fungal pathogens associated with wheat (*Triticum aestivum* L.) seeds collected from farmer fields and grain market. *Journal of King Saud University Science* **35**: 102590

Pathak N and Razia Z K. 2013. Comparative study of seed dressing fungicides and C*alotropis procera* latex for the control of seed-borne mycoflora of wheat. *Annals of Biological Research* **4**(4): 1–6.

Rehman A K, Sultana N, Minhas M, Gulfraz G K Raja and Anwar Z. 2011. Study of most prevalent wheat seed-borne mycoflora and its effect on seed nutritional value. *African Journal of Microbiology Research* **5**(25): 4328–37.

Wiese M V. 1998. *Compendium of Wheat Diseases,* 3rd edn, pp. 112. St. Paul, APS Press, USA.