

SCREENING OF COMMERCIAL WHEAT VARIETIES TO SPOT BLOTCH UNDER CONTROLLED AND FIELD CONDITIONS

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Abstract

To determine the resistance level to spot blotch, a lab and field screening of 56 commercial wheat varieties against *Bipolaris sorokiniana* was conducted at National Agriculture Research Centre, Islamabad. Out of 56 commercial varieties 12 varieties showed moderate resistance (MR) at 2 scale reaction under *In vitro* and at 1 scale under *In vivo* conditions and 2 varieties showed moderate resistance at 2 scale under both conditions. Thirty two varieties showed moderate susceptibility (MS) and susceptibility (S) under controlled conditions but had moderate resistance under field conditions, whereas, 9 varieties including Faisalabad-83, Faisalabad-85, Inqilab-91, Kaghan-93, Kirin-95, Kohinoor-83, MH-97, Rohtas-90 and Zarlashata showed moderate resistance at 1 scale under both controlled and field conditions. These lines can further be exploited in breeding program.

Introduction

Spot blotch of wheat caused by *Bipolaris sorokiniana*, is one of the major cereal disease of global concern. The disease is one of the constraints for crops in warmer growing areas and cause significant yield losses (Aftabuddin *et al.*, 1991). Epidemic has been observed in Indian Punjab with the dominant pathogen *B. sorokiniana* followed by *Fusarium* spp. ((Mahto *et al.*, 2002; Mahmood *et al.*, 2011). Satvinder *et al.* (2002) observed the yield losses ranged from 27% - 56.6% during 1998-99 in north eastern and north western plains of India due to the leaf blight caused by *B. sorokiniana*. Due to this pathogen severe losses were estimated up to 15% on several farms over a number of years in Bangladesh (Alam *et al.*, 1994), In Nepal the loss was reported up to 23.8% (Shrestha *et al.*, 1997). This seed and soil borne pathogen affects the seed germination and seedling emergence significantly as reported by Hossain & Hossain (2001) in Bangladesh and by Song *et al.*, 2001 in China. *B. sorokiniana* has also been reported in Pakistan as one of the principal fungus involved in the seedling blight and root rot (Bhatti *et al.*, 1986; Hafiz, 1986; Kishwar *et al.*, 1992) and leaf blotch of wheat (Iftikhar *et al.*, 2006). The abnormal weather conditions play a critical role in leaf blight problem including high moisture and temperature (Fischer, 1985; Hussain *et al.*, 2010). This situation has currently been observed in Bhawalpur district (discussion with CDRP, NARC survey team, 2009). These conditions can cause epidemics where the leaf blight was considered to be of minor importance (Aggarwal *et al.*, 2000).

The best, long term and environmentally safe method for sustainable disease control is the use of resistant varieties. Several sources have been identified in wheat resistant to spot blotch (Duveiller & Gilchrist, 1994). Number of workers has observed the resistance, like *Aegilops squarrosa* crosses has shown impressive resistance to spot blotch in Mexico (Ginkel & Rajaram, 1997). Five resistant germplasm lines have been identified at hot spot of Poza Rica, Mexico (Mujeeb-Kazi *et al.*,

1996). In Pakistan very little information about the sources of resistance to spot blotch is available which act as an initial step in breeding program. Hence current study is concerned to identify the level of resistance which will be helpful in controlling the disease and ultimately provides the cheapest, environment friendly and easiest way of increasing the productivity.

Materials and Methods

The inoculum of *B. sorokiniana* was raised from single spore culture of the most aggressive isolate on potato dextrose agar medium. The most aggressive isolate was selected after aggressiveness analysis of 87 isolates, collected from different agro-ecological wheat producing zones during 2005 (Asad *et al.*, 2007). Fifty six commercial wheat varieties (Table 1) were screened under controlled as well as in field conditions by artificial inoculation.

***In vitro* screening:** Test tube cotton swab method (Iftikhar *et al.*, 2008) was used for *In vitro* screening of wheat cultivars. Seeds of 56 commercial varieties were surface disinfected with 1% sodium hypochlorite (Clorox) solution for one minute and placed on the moist cotton swab in the test tubes at the rate of three seeds per tube. One disc of 5 mm of fungal isolates containing 3.2×10^4 spores/ disc was placed adjacent to the seeds. The tubes were placed in randomized (RCD) manner in the steel racks. After inoculation tubes were again covered with aluminum foil and were placed in growth chamber at 25°C for incubation. The data was recorded on 0-5 scale on the fully developed spots on the leaves or at maturity stage after approximately 28 days. In 0-5 scale, 0 = no symptoms, 1 = 1-5% spots on leaves, 2 = 6-20% spots on leaves, 3 = 21 - 40% spots on leaves, 4 = 41 - 60, 5 = more than 60% (IRRI, 1996). Based on average score, the entries were classified into the following categories: 0= resistant (R), 1-2 = moderately resistant (MR), 3-4 = moderately susceptible (MS) and 5= susceptible (S).

Table 1. Screening of commercial wheat varieties against Spot blotch (*Bipolaris sorokiniana*) under controlled and field conditions during 2007-08.

S. No.	Cultivars	<i>In vitro</i> (0-5)	<i>In vivo</i> (0-5)	S. No.	Cultivars	<i>In vitro</i> (0-5)	<i>In vivo</i> (0-5)
1.	Bakhtawar 92	2	1	29.	Suleman 96	2	1
2.	Chakwal 86	3	1	30.	WL 711	3	1
3.	Sindh 81	3	1	31.	Zardana	2	1
4.	Zarghoon	2	1	32.	Abadgar 93	3	1
5.	Faisalabad 83	1	1	33.	Anmal 91	2	1
6.	Faisalabad 85	1	1	34.	Bahawalpur 2000	2	1
7.	Inqilab 91	1	1	35.	Bahkhar 2002	3	2
8.	Kaghan 93	1	1	36.	Tatara	3	1
9.	Kirin 95	1	1	37.	Takbeer	3	1
10.	Kohinoor 83	1	1	38.	AS 2002	3	1
11.	LU 26	2	2	39.	Iqbal 2000	3	1
12.	Nowshera 96	4	1	40.	Auqab 2000	2	1
13.	Parwaz 94	4	1	41.	Chakwal 86	3	1
14.	Pasban 90	4	1	42.	Watan 94	4	1
15.	Mexi Pak 65	3	1	43.	Moomal 2002	3	2
16.	Punjab 96	3	1	44.	Zarlashata	1	1
17.	Sariab 92	2	2	45.	GA 2002	5	1
18.	Sarsabz	3	1	46.	Wafaq 01	4	1
19.	Shaheen 94	3	1	47.	Magalla 99	3	1
20.	Shahkar 95	3	1	48.	Mantar 3	2	1
21.	Souhat 90	4	1	49.	Saleem 2000	2	1
22.	Tandojam 83	2	1	50.	Khyber 86	2	1
23.	SH 2002	2	1	51.	Pirsabak 2005	3	1
24.	Pak 81	4	2	52.	Punjad 1	3	1
25.	MH 97	1	1	53.	Darawar 97	4	1
26.	Kohistan 97	3	2	54.	V 87094	3	1
27.	Kohsar 95	4	1	55.	Shafaq 2006	4	1
28.	Rohtas 90	1	1	56.	Sehar 2006	4	1

0-5 Scale: 0= resistant @, 1-2 = moderately resistant (MR), 3-4 = moderately susceptible (MS) and 5= susceptible (S)

***In vivo* screening:** The same 56 commercial wheat varieties which were used in controlled conditions were screened in the field of NARC, Islamabad by artificial inoculations in year 2007. The material to be screened was planted in randomized block design manner with 1m row having row to row distance of 30 cm. Three to four days before head initiation inoculum was sprayed thoroughly by atomizer on each variety. That was obtained from pure culture and prepared in distilled water, having 3.4×10^4 conidia/ ml. The field was irrigated just after inoculation. At maturity data was recorded on 0-5 scale.

Results and Discussion

Fifty six varieties (Table 1) were primarily screened under controlled conditions by test tube cotton swab method (Iftikhar *et al.*, 2008). The preliminary screening under controlled conditions is more reliable as is supported by Singh & Rajaram (2008) that initially the screening may require simple tests in the green house at seedling stage. All tested varieties showed moderate resistance to moderate susceptibility at 1-4 scale under *In vitro* but had resistance at 1-2 scale under *In vivo* except GA 2002 which showed susceptibility to *B. sorokiniana* at 5 scale under controlled conditions and moderate resistance (1 scale) in field conditions.

The difference of behaviour under *In vivo* and *In vitro* can be attributed as mainly due to the climatic conditions provided including the load of inoculum pressure. This was agreed by Singh *et al.*, (1997) that screening under controlled conditions provides the best results as it identify the resistance source under maximum disease pressure. However because of the aggressive nature of the pathogen the results of *In vitro* conditions cannot be correlated with that of *In vivo* conditions however the screening under control conditions will at least give a preliminary idea about the resistance/ susceptibility status of certain genotypes against the pathogen (Duveiller, personal communication, 2008).

Out of 23 varieties which showed moderate resistance at 1-2 scale in both (*In vitro* and *In vivo*) conditions, 9 varieties viz., Faisalabad-83, Faisalabad-85, Inqilab-91, Kaghan-93, Kirin-95, Kohinoor-83, MH-97, Rohtas-90 and Zarlashata had moderate resistance at 1 scale under both controlled and field conditions; 12 had resistance at 2 scale in controlled and at 1 in field conditions (Table 1). However 2 varieties showed same scoring 2 (MR reaction) under both conditions. Whereas, 32 cultivars exhibited moderate susceptibility at 3-4 scale under controlled conditions which showed moderate resistance at 1-2 scale in field conditions.

Screening by *In vitro* and *In vivo* methods would be helpful in selecting the best varieties among a lot which have potential to be served as genetic stock for subsequent use of breeders. Therefore during current study 23 varieties (Table 1) having moderate resistance to spot blotch under both conditions may be recommended for further exploitation.

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