International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 358-360

Received: 14-05-2019
Accepted: 18-06-2019

Sandeep Kumar
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

SP Singh
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Shivam Singh
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Vikas Upadhyay
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Dibya
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Ankur Katiyar
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Jay Kumar Yadav
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Arun Kumar Jaiswal
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Correspondence
Sandeep Kumar
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Evaluation of wheat genotypes for resistance against spot blotch disease

Sandeep Kumar, SP Singh, Shivam Singh, Vikas Upadhyay, Dibya, Ankur Katiyar, Jay Kumar Yadav and Arun Kumar Jaiswal

Abstract
Spot blotch caused by *Bipolaris sorokiniana* (Sacc.) Shoem is one of the most important wheat leaf disease all over world; it appears in almost all wheat growing areas and causes severe yield loss every year. A field study was conducted during *Rabi*, 2017-18 and 2018-19 crop seasons at Main Experiment Station, NDUA and T, Kumarganj, Ayodhya to test the resistance of 209 genotypes against *Bipolaris sorokiniana* under artificial epiphytotics conditions. Each genotype was sown in last week of November in single row of one meter length. Variety Raj 4015 was used as check and was sown after every 20 genotypes. Pure culture of pathogen was inoculated on genotypes by using cleaned sprayer, at evening. Disease data was recorded using double digit scale based on per cent blighted area on flag leaf and one leaf just below. Out of 209 genotypes, five namely NEIR-109, NEIR-110, NEIR- 111, NEIR-113 and HS-645 genotypes were found resistant, 117 were moderately resistant, 68 were moderately susceptible and 19 were found susceptible against spot blotch disease of wheat.

Keywords: Wheat, spot blotch, *B. sorokiniana*, screening

Introduction
Wheat (*Triticum aestivum* L.) crop belongs to family Poaceae (Graminae), is one of the oldest and most important cereal crop. It is the most important cereal crop after rice in India and major staple food of South Asian region countries. Generally, wheat is a self-pollinated and hexaploid plant. Globally, total area under wheat production is 215.48 million hectares with production 670.87 million tons and productivity of 31.17 q/ha. India is second largest producer of wheat after China with an area of 29.90 million hectares, production of 94.88 million tons and productivity of 3173.24 kg/ha covering 12 per-cent of world production (FAO Statistics Division 2015-16). It has good nutritional value than other food grains comprising 71.2g carbohydrates, 11.8g proteins, 1.5g fat, 1.2 g crude fiber, 306 mg phosphorus and 41 mg calcium per 100g grains (Rai and Mauria, 1999) [7]. Spot blotch caused by *Bipolaris sorokiniana* (Sacc.) Shoem. (syn. *Helminthosporium sativum*, teleomorph *Cochliobolus sativus*) is an important wheat disease in warmer and humid growing regions of the world such as Eastern India, South East Asia (Joshi *et al*., 2007) [4]. Yield losses were estimated to be 18-22 per cent in India (Saari, 1998) [4]. The control strategy for the diseases caused by *B. sorokiniana* is based on an integrated approach where genetic resistance is a major element, because economic returns have not always resulted in commercial grain production from fungicide inputs (Duveiller and Sharma, 2009) [1]. Hence, search of effective non-fungicidal control of spot blotch disease is of utmost importance. The best, long term, economically and environmentally safe method for sustainable disease control is the use of resistant varieties.

Material and Methods
The experiment was conducted at main experiment station of Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during crop season *Rabi*, 2017-18. Seeds of 209 genotypes were collected from All India Co-ordinated Wheat and Barley Improvement Project, Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.). Each genotype was sown (fourth week of November) in single row of one meter length at a distance of 25 cm row to row and 5 cm plant to plant. Two rows of susceptible varieties (A-9-30-1 and Raj 4015) to foliar blight were sown as border rows around all the sites of experiment. The ten days old pure culture of *Biopolaris sorokiniana* multiplied on potato dextrose Agar and sorghum seeds were used for

inoculating on entries. The spore suspension was prepared in sterilized distilled water having a spore load of 50-75 per microscopic field (10x). This suspension was sprayed at 3-4 leaf stage by using hand atomizer. The second field inoculation was made again in the same manner after the 15 days of the first inoculation.

Table 1: The double digit scale, based on per cent blighted area on the flag leaf and one leaf just below given by Kumar *et al.* (1998) [6].

A double digit* scale for appraising blight severity				
S. No.	Severity**		Rating	
	Flag leaf	Flag-1 leaf	Disease response	Range of value
1.	0	0-1	Immune (I)	00-01
2.	1-2	2-4	Resistant (R)	12-24
3.	3-4	4-6	Moderately Resistant (MR)	34-46
4.	5-6	6-8	Moderately susceptible (MS)	56-68
5.	7-8	8-9	Susceptible (S)	78-89
6.	9	9	Highly susceptible (HS)	99

* First and second value respectively, represents per cent blighted area on the flag leaf and flag-1 leaves.
** Values 1,2,3,4,5,6,7,8, and 9, respectively correspond to 10,20,30,40,50,60,70,80 and 90 per cent blighted area.

After inoculation, the entries were regularly watched for recording the observations of disease severity. The first observations were made after ten days of inoculation on ten plants selected randomly. The disease score of each selected plants were recorded by using Kumar *et al.* (1998) [6] double digit scale (Table 1) based on per cent blighted area on the flag and one leaf just below. The maximum disease score of each genotype was recorded finally.

Results and Discussion

Use of resistant variety is a cheapest and most economical method of disease control. Two hundred nine varieties (Table 2) were screened under field conditions by double digit scale based on per cent blighted area on the flag and flag-1 leaf at hard dough stages. Out of which, five namely NEIR-109, NEIR-110, NEIR- 111, NEIR-113 and HS-645 genotypes were rated as resistant, 117 genotypes moderately resistant, 68 genotypes moderately susceptible and 19 genotypes namely CZTS-101, CZTS-105, CZTS-106, CZTS-108, CZTS-109, CZRI-302, CZRI-305, CZRI-306, PZTS-111, PZRI-301, PZRI-303, PZRI-304, PZRI-305, PZRI-306, PZRI-308, HI-8759(d), RKD-283(d), RKD-292(d), UAS-459(d) were found susceptible for spot blotch disease under field conditions.

Similar observations were recorded by other workers Kenganal *et al.* (2008) [5] screened wheat cultivars against *Helminthosporium sativum* [*Cochliobolus sativus*] occurring on wheat. Out of 15 wheat cultivars screened, NIDW-295 and MACS-2496 were found immune; DDK-1013, DWR-185, DWR-225, RAJ-4037 and MACS-2846 were highly resistant; GW-344 and DWR-195 were resistant; GW-322, DDK-1001 and DWR-162 were moderately resistant, DWR-2006 and DWR-1006 were susceptible and DDK-1009 was highly susceptible. Singh *et al.* (1995) [9] in field inoculation trials only 15 of 257 genotypes were consistently resistant to *H. sativum* (*Cochliobolus sativus*). A further 47 were moderately resistant and 158 moderately susceptible, with 33 rated susceptible and 4 highly susceptible. No genotype was free from infection during the 3 test years.

Table 2: Categorization of wheat genotypes against the response of spot blotch disease under artificial disease pressure (2017-18 & 2018-19).

S. No.	Disease reaction	Score	No. of genotypes	Genotypes
1	Immune (I)	00-01	NIL	NIL
2	Resistant (R)	12-24	5	NEIR-109, NEIR-110, NEIR-111, NEIR-113, HS-645
3	Moderately Resistant (MR)	34-46	117	NHESZ-1701, NHESZ-1702, NHESZ-1703,NHESZ-1704, NHESN- 1705, NHESZ-1706, NHESZ-1708, NHESZ-1709, NHESZ-1710, NHESZ-1711, NHESZ-1712, NHTSZ-1703, NHTSZ-1704, NHTSZ-1705, NHTSZ-1706, NHTSZ-1707, NHLSZ-1702, NHLSZ-1703, NHLSZ-1704, NHLSZ-1705, NHLSZ-1710, NWTS-101, NWTS-103, NWTS-104, NWTS-109, NWTS-110, NWTS-111, NWTS-113, NWTS-114, NWTS-115, NWLS-203, NWLS-204, NWLS-205, NWLS-206, NWLS-207, NWLS-208, NWRI-301, NWRI-302, NWRI-303, NWRI-305, NWRI-306, NWRI-307, NWRI-308, NWRI-309, NWRI-310, NEIR-101, NEIR-102, NEIR-103, NEIR-105, NEIR-107, NEIR-108, NEIR-112, NEIR-114, NEIR-115, NEIR-302, NEIR-303, NEIR-304, NEIR-305, NEIR-306, NEIR-307, NEIR-308, NEIR-309, CZTS-102, CZRI-301, CZRI-304, PZTS-102, PZTS-103, PZTS-104, PZTS-106, PZTS-107, PZTS-108, PZTS-112, PZTS-116, PZRI-311, DIC-106, VLS-102, VLS-104, VLS-106, VLS-107, VLS-108, VLS-109, HI-1612, HS-630, HS-647, UP-2993, UP-2942, VL-1013, HPW-423, HS-622, PBW-725, PBW-760, VL-3002, VL-3012, WH-1181, WH-1216, WH-1310, HS-627, WH-1184, HD-3171, WB-2, AKAW-4842, DBW-179, DBW-216, DBW-217, DBW-219, VL-4001, WH-1215, UP-2955, VL-3011, DBW-220, HPW-424, NW-6046, UP-2954, DBW-88, HD-2967, HD-3171, HD-3043
4.	Moderately Susceptible (MS)	56-68	68	NHESZ-1707, NHTSZ-1701, NHTSZ-1702, NHLSZ-1701, NHLSZ-1706, NHLSZ-1707, NHLSZ-1708, NHLSZ-1709, NWTS-102, NWTS-105, NWTS-106, NWTS-107, NWTS-108, NWTS-112, NWLS-201, NWLS-202, NWLS-209, NWRI-304, NEIR-104, NEIR-106, NEIR-301, CZTS-103, CZTS-104, CZTS-107, CZRI-303, CZRI-307, PZTS-101, PZTS-105, PZTS-109, PZTS-110, PZTS-113, PZTS-114, PZTS-115, PZTS-117, PZRI-302, PZRI-307, PZRI-309, PZRI-310, PZRI-312, PZRI-313, DIC-101, DIC-102, DIC-103, DIC-104, DIC-105, VLS-101, VLS-103, VLS-105, VLS-110, HI-8774(d), HPPAU-05, HPW-433, HS-623, HS-626, HS-628, PBW-756, TL-3006(T), TL-3007(T), TL-3008(T), TL-3009(T), DDK-1051(dic), MACS-5044(dic), MACS-5046(dic), NW-6054, PBW-621, PBW-757, HPPAU-10, PDW-344(d)
5.	Susceptible (S)	78-89	19	CZTS-101, CZTS-105, CZTS-106, CZTS-108, CZTS-109, CZRI-302, CZRI-305, CZRI-306, PZTS-111, PZRI-301, PZRI-303, PZRI-304, PZRI-305, PZRI-306, PZRI-308, HI-8759(d), RKD-

				283(d), RKD-292(d), UAS-459(d)
6	Highly Susceptible (HS)	99	NIL	NIL

Iftikhar *et al*., (2012) [3] screened 56 commercial wheat varieties against spot blotch resistance under controlled and field conditions. Out of 56 commercial varieties, 12 varieties showed moderate resistance (MR) reaction under *in vitro* and *in vivo* conditions and 2 varieties showed moderate resistance at 2 scales under both conditions. Thirty two varieties showed moderate susceptible (MS) and susceptibility (S) under controlled conditions but had moderate resistance under field conditions, whereas, 9 varieties including Faisalabad-83, 85, Inqilab-91, Kaghan-93, Kirin- 95, Kohinoor- 83, MH-97, Rohtas-90 and Zarlashata showed moderate resistance under both controlled and field conditions at 1 scale level.

Singh *et al*., (2002) [10] evaluated 325 genotypes against the spot blotch. Out of these 256 genotypes 3 genotypes namely, NW-2043, MACS-2942 and HUWL-99003 gave resistant reaction, while 75 showed moderately resistant reaction.

References

1. Duveiller E, Sharma RC. Genetic improvement and crop management strategies to minimize yield losses in warm non-traditional wheat growing areas due to spot blotch pathogen *Cochliobolus sativus*. J Phytopathol. 2009; 157: 521-534.
2. Faostat. Food and Agriculture Organization of the United Nations. Food Outlook, 2015.
3. Iftikhar S, Shahzad A, Munir A, Rattu AR, Fayyaz M. Screening of commercial wheat varieties to spot blotch under controlled and field conditions. Pakistan Journal of Botany. 2012; 44(1):361-363.
4. Joshi AK, Kumari M, Singh VP, Reddy CM, Kumar S, Rane J *et al*. Stay green trait: variation, inheritance and its association with spot blotch resistance in spring wheat (*Triticum aestivum* L.). Euphytica. 2007; 153:59-71.
5. Kenganal MY, Hanchinal RR, Nadaf HL. *In vitro* screening of wheat genotypes against *Helminthosporium sativum*. Res. Crops. 2008; 9(2):450-455.
6. Kumar J, Singh G, Nagarajan S. A field scale for leaf blight recording. Indian Wheat Newsletter. 1998; 4:3.
7. Rai M, Mauria S. Coarse cereals, not for poor alone. The Hindu Survey of Indian Agriculture, 1999, 55-59.
8. Saari EE. Leaf blight disease and associated soil borne fungal pathogens of wheat in south and south East Asia. CIMMYT, Mexico D.F., 1998, 37-51.
9. Singh RV, Singh BN, Singh AK, Singh D, Singh VB. Screening of wheat genotypes against foliar blight caused by *Helminthosporium sativum.* Plant Diseae Rec. 1995; 101:88-90.
10. Singh AK, Singh RN, Kumar S, Singh BN. Bread Wheat genotypes resistant to spot blotch of wheat. Indian Phytopathology. 2002; 55(3):378.