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Wheat Genotype Evaluation for Spot Blotch Disease Resistance: Unveiling Resilient Varieties

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Spot blotch, caused by *Bipolaris sorokiniana* (Sacc.) Shoemaker is a major disease of wheat (*Triticum aestivum* L.), in all the six agro climatic zones of India. Estimation of losses due to this disease vary from location to location, due to diverse environmental conditions. The use of resistant cultivars is the most effective, long-lasting, cost-effective, and environmentally friendly technique for sustainable disease control. The experiment was conducted at Crop Research Centre, Chirodi farm of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.). Among the tested varieties, disease index and AUDPC values varied significantly for both years' data viz. 2021-22 and 2022-23. In this experiment 32 wheat varieties were screened against *B. sorokiniana* under artificial epiphytotic conditions in the field. Each variety were sown in two row of three-meter length with three replications, two line of susceptible check RAJ 4015 was sown at every ten

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genotypes of interval. Among 32 wheat varieties, two varieties were found to be resistant, eleven varieties were found moderately resistant, fourteen varieties were found moderately susceptible and five varieties were found susceptible, none of the variety was found immune and highly susceptible against spot blotch disease. Area Under Disease Progress Curve (AUDPC) calculated for the thirty- two wheat varieties on the basis of disease index. AUDPC varies from 212.90 to 1143.9 and 198.80 to 1144.90 during the 2021-22 and 2022-23 years' data. The pooled mean, Area Under Disease Progress Curve varied from 205.85 to 1144.40, showing the fast progress of disease in all genotypes. It was observed that different wheat varieties expressed varied type of disease response against *B. sorokiniana*.

Keywords: Spot blotch; varieties; wheat; Bipolaris sorokiniana; AUDPC.

1. INTRODUCTION

Wheat (*Triticum aestivum* L.) is an important crop which belongs to family Poaceae (Graminae). This is one of the oldest cereals [1] and typically a self-pollinating, hexaploid plant. *Triticum aestivum* L. (Bread wheat), *Triticum durum* Desf. (Macaroni or durum wheat) and *Triticum dicoccum* Schrank. (Emmer wheat) are the three species of wheat grown in India [2]. Approximately 95% of the wheat grown is bread wheat, with the remaining 4% being durum wheat and 1% being *dicoccum* wheat [2]. Major wheat producing countries around the world are China, India, Russia, USA, France, Canada, Germany, Pakistan and Australia. Globally, total area under wheat cultivation is 215.48 million ha with production 731.4 million tonnes with an average productivity of 3390 kg/ha (Anonymous, 2022). In India wheat is cultivated in an area of 30.47 million hectares with a production of 106.84 million tonnes and productivity of 3507 kg/ha (Ministry of Agriculture & Farmers Welfare, 2022). Uttar Pradesh is usually considered to be at the top of the list in terms of wheat production with a total record production of 33.95 million tonnes (31.77%), 9.47 million hectares' area under cultivation and productivity of 3604 kg/ha, followed by Madhya Pradesh 22.42 mt (20.98%) [3].

A variety of diseases affect the wheat crop. One of these, the hemibiotrophic, phytopathogenic fungus *Bipolaris sorokiniana* (Sacc.) Shoem, is common in warmer and more humid wheat-growing regions of the world [4], is responsible for the spot blotch disease of wheat. The pathogen survives in soil, plant debris, and on seed [5]. Estimation of losses due to this disease vary from location to location, due to diverse environmental conditions, varieties prevalent in the area fertigation scheduling and strategies adopted against the devastating disease [6,7]. The major goal of disease control measures in wheat is to prevent outbreaks or epidemics through the use of chemical pesticides and host-plant resistance. Chemical pesticides are expensive to employ, poisonous to non-target creatures, and harmful to the environment since they have a negative impact on soil fertility, soil micro fauna, and human health [8]. Management of this disease through host resistance has become a prime concern of scientists. The control strategy for the diseases caused by *Bipolaris sorokiniana* is based on an integrated approach where genetic resistance is a prominent factor, because economic returns have not always led to commercial grain production from fungicidal inputs [9]. Therefore, it is crucial to look for non-fungicidal methods of controlling spot blotch disease. The use of resistant cultivars was employed in this study because it is the most effective, long-lasting, cost-effective, and environmentally friendly technique for sustainable disease control.

2. MATERIALS AND METHODS

2.1 Experimental Site

The experiment was conducted at Crop Research Centre, Chirodi farm of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.), India, during two consecutive rabi season 2021-22 on sandy loamy soil. The site is situated at 29^0 4' North latitude and 77^0 42'East longitudes with an elevation of 237 m above mean sea level.

2.2 Seed Collection

Seed of thirty-two wheat varieties were received from ICAR- Indian Institute of Wheat and Barley Research, Karnal. The details of wheat varieties are presented below (Table 1). The seeds were sown in two lines for each variety and normal agronomic practices were followed to ensure proper plant growth. The experiment was

conducted in randomized block design (RBD), each genotype was sown in line of 3m length with row to row spacing of 25cm and row to row spacing between each variety was 50cm with a total of three replications that were maintained for each variety. Two lines of susceptible check RAJ 4015 were sown for every ten genotypes of interval [10].

2.3 Mass Multiplication of *Bipolaris sorokiniana* on Wheat Grains

Mass multiplication of *B. sorokiniana* was done on wheat grains. Wheat grains were soaked overnight in tap water and dried under the fan, after getting dried 1mg/500g of chloramphenicol was added, mixed thoroughly with wheat grains to prevent the saprophytic bacterial contamination. Conical flasks (250 ml) containing 50g of wheat grains were filled and sealed with non-absorbent cotton before being autoclaved (15 lb pressure) at 121°C for 20 minutes to ensure complete sterilization. The sterilized grain were kept for cooling, meanwhile the Laminar Air Flow chamber was cleaned with the rectified sprit followed by exposed UV light for 20 minutes' prior to inoculation. After cooling of the wheat grains, it was inoculated with pure culture of *Bipolaris sorokiniana* grown in the Petri plate by cutting 5mm bit with the sterilized cork borer. After inoculation the flasks were kept for incubation in the BOD incubator at 25±1°C for 20 days for the mass multiplication of the pathogen. The flask was shaken every day to remove the clumps and mix the wheat grains for good colonization and sporulation. The inoculum raised on wheat grains was used for inoculation with spray atomizer.

2.4 Preparation of Spore Suspension

The sporulated wheat grains were filtered using muslin cloth in distilled water to harvest spores of *B. sorokiniana* and to make aqueous solution which was adjusted to spore density $4x10^4$ conidia per ml of water. The conidial concentration count was made under microscope with a magnification of 40x.

2.5 Pathogen Inoculation

The experimental wheat field was uniformly inoculated with spore suspension of *Bipolaris sorokiniana* at booting stage and second field inoculation was made again in the same manner after the 15 days of the first inoculation. This suspension was sprayed by using hand atomizer. The field was irrigated after inoculation to maintain proper humidity. After inoculation, the entries were regularly monitored for recording the observations of disease severity.

2.6 Disease Observation

Assessment of spot blotch was done using double digit scale, based on percent blighted area on the flag leaf and one leaf just below flag leaf as mentioned in Table 2. (Kumar et al. 1998). Fifty leaves per replication from each variety were selected randomly for recording the

Table 1. List of wheat varieties

S.No.	Variety	S.No.	Variety
1.	DWR 185	17.	HS 507 (PUSA SUKETI)
2.	HI 8713 (PUSA MANGAL)	18.	PBW 343
3.	DBW 14	19.	PBW 644
4.	DBW 71	20.	RAJ 4083
5.	DBW 90	21.	WH 1021
6.	DBW 93	22.	WH 1080
7.	HD 2329	23.	WH 1105
8.	HD 2864 (URJA)	24.	WH 1124
9.	HD 2888	25.	WH 1142
10.	HD 2932	26.	PBW 723
11.	HD 2967	27.	HD 4728 (PUSA MALWI)
12.	HD 2985	28.	WB 2
13.	HD 3086	29.	PBW 757
14.	HS 375 (HIMGIRI)	30.	HD 3226 (PUSA YASHASVI)
15.	HS 490	31.	DBW 303
16.	HUW 234	32.	WH 147

Table 2. The double-digit scale, based on percent blighted area on the flag leaf and one leaf was recorded following Kumar et al., [13]

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	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*

observation of per cent foliar infection (severity). The mean of replication was given and the overall reaction of the pathogen to particular varieties.

2.6.1 Percent disease index

The Observations of per cent foliar infection were recorded after disease appearance. Percent disease index (PDI) for spot blotch were calculated by using formula given by wheeler [11].

$$PDI = \frac{\text{Sum of all disease ratings}}{\text{Total number of plants/Leaves}} \times \frac{1}{\text{maximum rating scale}} \times 100$$

2.6.2 Area under Disease Progress Curve (AUDPC)

Area under Disease Progress Curve were calculated separately for all varieties using the following formula given by Simko and Piepho [12].

$$AUDPC = \sum_{i=1}^{n-1} \left(\frac{Yi+Yi+1}{2}\right)(t_{i+1}\text{-}t_i)$$

Where,

Y_i = disease severity (%) at the 1st observation
T_i = Time (days) of the first observation
n = Total number of observation

3. RESULTS AND DISCUSSION

3.1 Disease Reaction on Variety

Use of resistant variety is a cheapest and most economical method of disease control. Thirty-two varieties (Table 3) 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 of the crop. Out of which, none of the varieties was completely immune. Two varieties were resistant namely PBW 757 & DWR 185, eleven varieties were moderately resistant namely HD 2967, HS 490, WH 1080, DBW 303, DBW 71, WH 1021, HD 2864, PBW 723, WB2, HS 507, HS 375, fourteen varieties were moderately susceptible namely PBW 644, HD 2888, HD 2932 DBW 14, WH 1105, HD 3226, HD 3086, HD 4728, WH 1124, RAJ 4083, WH 1142, DBW 93, DBW 90, HD 2985, five varieties were susceptible HUW 234, WH 147, PBW 343, HI 8713, HD 2329 and none of the varieties was highly susceptible for spot blotch under field conditions. Singh et al. [10] screened 176 genotypes for resistance against *Bipolaris sorokiniana* under artificial epiphytotic conditions. Each genotype was sown in last week of November in single row of one-meter length. Out of 176 genotypes, one namely KARAWANI/4NIF3/SOTY/NAD63/CHRIS was found immune, 31 genotypes (VL 892, MP 1277, HD 3043, PBW 644, K8027, WH 592, HS 583, HS 590, HS 596, HS 597, HS 598, UP 2917, VL 1006, VL 4001, DBW 147, DBW 150, HI 1605, HUW 688, K 1313, NW 6024, PBW 707, PBW 716, UP2883, WH 1179, HD 3171, GW 463, DBW 181, KB 2012, HPBW 02, HPBW 07, HPBW 08, HUW 711, WB 1, VL 829, PBW 660 and K 8027) were found resistant, 75 genotypes (HS 562, HS 375, HS 542, HD 4530, WH 1164, DBW 88, DBW 90, DPW 621, HD 2967, HD 3059, PDW 314, WH 1021, GW 322, HD 2864, HD 2932, HI 8498, HI 8737, MACS 3927, NIAW 2030, MACS 6222, MACS 6478, NI 5439, NIAW 1415, UAS 347, PBW 723, HW 1098, PBW 343, TL 2 942,TL 2969, HPW 394,HPW 413, HPW 422, HS 580, HS 599, HS 600, HS 601, UP 2918, VL 1005, VL 3009, DBW 148, DDW 31, DDW 32, HD 3159, HD 3165, HD 3174, HI 1604, K 1312, K 1314, MACS 4024, PBW 709, PBW 718, UP 2883, K 1317, CG 1015, HI 8765, K

1315, PBW 721, UAS 360, UAS 361, DBW 182, DBW 184, DBW 185, DDK 1049, KRL 350, KRL 351, MACS 5043, TL 3001, TL 3004, DWR-NIL 01, DWR-NIL 02, HD 3209, HPBW 01, HPBW 05, HPBW 09, HUW 695, WB 2, WB 5, HUW 712 and MACS 6507) were moderately resistant, 52 genotypes (HPW 251, HPW 349, HS 490, HS 507, VL 804, VL 892, VL 907, HD 3086, PDW 233, PDW 291, WH 1021, WH 1105, WH 1124, WH 1142, C 306, HD 2888,HD 4728, HI 4730, HI 1544, MP 3336, PM 4010, MPO 1215, DBW 93, UAS 428, UAS 446, HD 2932 + Lr19/Sr25, MMBL 283, DBW 14, HD 2985, HI 1563, K 0307, Kharchia 65, KRL 210, RAJ 4883, HPW 393, HPW 421,VL 3002, VL 3008, MACS 3949, HI 8759, HD 3164, MACS 3970, MACS 3972, TL 3005, DBW 183, DDK 1048, MACS 5041, WH 1309, TL 3002, UAS 453, UAS 455 and USA-316) were moderately susceptible and 17 genotypes (AKDW 2997, DDK 1029, HUW 234, KRL 19, VL 1006, VL 3007, NE - LS - 0 5, NE -R F - 0 1, C Z - TS - 0 2, CZ-TS-03, CZ-TS-04, CZTS-07, CZ-TS-08,GW 1315,DWS 712, MACS 4020 and TL 3003) were found susceptible against spot blotch disease of wheat under field conditions. The findings were also similar with Ojha et al. [14] who evaluated 100 entries out of these 20 number of genotype found to be highly resistant or Immune to the disease, whereas 28 genotype were resistant, 22 genotypes moderately resistant, 15 moderately susceptible and 15 genotypes susceptible. Indian germplasm lines tended to be more susceptible as compared to lines originated from CIMMYT and China. The recent findings were also similar with Singh et al. [15] screened 200 genotypes for resistance against *Bipolaris sorokiniana* under artificial epiphytotic conditions. Out of these 200 genotypes, thirty-six genotypes were found resistant, 91 were moderately resistant, 43 were moderately susceptible and 30 were found susceptible against spot blotch disease of wheat. In the above investigation large number of moderately resistance, susceptible and a smaller number of susceptible genotypes were observed during screening might be due to the prevalence of low disease pressure throughout growing season owing to adverse weather conditions. It also depends upon their genetic constitution; some may be resistant or some may be susceptible for leaf blight disease and also upon the favorable environmental conditions prevailing. The genotypes that have been discovered as resistant to spot blotch disease may be valuable for breeding programmes to combat the disease as well as for use in areas that have experienced significant disease pressure for a number of years to reduce yield losses.

3.2 Area under Disease Progress Curve (AUDPC)

The Area under Disease Progress Curve (AUDPC) was calculated for thirty- two wheat varieties on the basis of disease index. Area under disease progress curve varies from 212.90 to 1143.9 and 198.80 to 1144.90 during the 2021-22 and 2022-23 years' data. The pooled mean, Area under Disease Progress Curve varied from 205.85 to 1144.40, showing the fast progress of the disease in all genotypes. It was observed that different wheat varieties expressed varied type of disease response against *B. sorokiniana* under artificial epiphytotic conditions in the field. Area under Disease Progress Curve was found between 205.85 to 305.82 with and 443.82 to 634.52 under the resistant and moderately resistant disease reaction. The range of Area Under Disease Progress Curve was recorded between 687.15 to 883.97 and 930.40 to 1144.40 under the moderately susceptible and susceptible disease reaction. Variety WH 147 showed highest value (1144.40) while, DWR 185 showed least value (205.85) of Area under Disease Progress Curve among the varieties line (Table 4). Most of the wheat varieties showed moderately susceptible reaction. Kumar et al. [13] studied variability for spot blotch resistance and their revealed a AUDPC value from the 92.6 to 123.5 across the resistant lines. The recent findings were also similar with Singh et al. [16] screened sixty-two wheat genotypes against spot blotch disease. Out of sixty-two genotypes, eight genotypes (HD-2967, HD-3043, HP-1102, HS-277, JAUW-598, PBW-660, PBW-692 and VL-907) were identified as resistant, with disease severity ranging from 34.26 to 35.0% and a AUDPC value of 330.90-402.80. While as, Twenty-four genotypes DBW-88 , DL-784-3, DPW-621-50, HD-2733, HD-3059, HD3086, HI-1563, HS-1138, HS-207, HS-375, HS-490, HS-507, HS542, JAUW-584, JAUW-595, Narmada-112, PDW-291, PDW314, RAJ-4037, RSP-561, WH-1021, WH-1080, WH-1105 and WH-1124) were found to be moderately resistant, with disease severity ranging from 39.45% to 57.00% and a AUDPC value of 429.60-742.10. The remaining wheat genotypes are moderately susceptible AKW-1071, DBW-14, DBW-39, DBW-90, Durgapur-65, G-W40, HD-2851, HD-2888, HD-2985, K-1006, K-8027, MP-3382, PBW-175, PBW-550, PBW-590, PBW-644, PDW-233, RAJ3077, RAJ-3765, RAJ-4083,

Table 3. Screening of wheat varieties for resistance against spot blotch disease under field conditions during 2021-22 and 2022-23

S. No.	Variety	Percent disease index (2021-22)			Percent disease index (2022-23)			*AUDPC (2021-22)	*AUDPC (2022-23)	Pooled Mean
		28th February	8th March	18th March	6th March	16th March	26th March			
1	DWR 185	4.20	10.08	18.22	5.86	9.10	15.70	212.9	198.8	205.85
2	HI 8713	19.46	40.12	79.55	21.36	44.22	83.11	896.25	964.55	930.4
3	DBW 14	13.29	35.80	58.20	13.00	37.20	56.00	715.45	717	716.22
4	DBW 71	13.00	25.26	46.22	10.32	20.46	39.03	548.7	451.35	500.02
5	DBW 90	12.90	34.86	65.62	12.08	32.78	63.11	741.2	703.75	722.47
6	DBW 93	12.10	32.41	64.70	10.90	32.28	57.78	708.1	666.2	687.15
7	HD 2329	27.22	57.12	85.78	24.48	57.83	80.29	1136.2	1102.15	1119.17
8	HD 2864	9.85	18.36	38.22	10.25	23.32	35.85	423.95	463.7	443.82
9	HD 2888	11.20	33.74	65.33	12.26	39.68	60.00	720.05	758.1	739.07
10	HD 2932	12.06	34.21	64.88	13.08	39.41	59.18	726.8	755.4	741.1
11	HD 2967	13.15	30.86	50.36	13.33	33.48	48.29	626.15	642.9	634.52
12	HD 2985	18.24	42.31	71.11	16.20	40.61	65.78	869.85	816	842.92
13	HD 3086	13.00	35.91	59.70	13.24	39.62	56.14	722.6	743.1	732.85
14	HS 375	12.90	24.41	43.18	11.94	25.13	36.59	524.5	493.95	509.22
15	HS 490	12.22	35.56	48.07	12.00	33.58	43.18	657.05	611.7	634.37
16	HUW 234	27.30	57.28	86.67	26.32	58.10	81.33	1142.65	1119.25	1130.95
17	HS 507	12.00	34.12	44.81	11.48	30.21	40.22	625.25	560.6	592.92
18	PBW 343	18.12	44.26	82.22	17.82	48.30	78.67	944.3	965.45	954.87
19	PBW 644	21.80	42.30	70.66	20.76	44.33	67.11	885.3	882.65	883.97
20	RAJ 4083	17.23	39.12	68.45	15.10	34.12	58.22	819.6	707.8	763.7
21	WH 1021	11.41	32.26	45.92	10.32	27.22	34.37	609.25	495.65	552.45
22	WH 1080	12.84	24.43	43.18	11.78	34.20	35.18	524.4	576.8	550.6
23	WH 1105	13.38	42.13	58.12	13.68	44.56	56.44	778.8	796.2	787.5
24	WH 1124	25.21	41.84	62.30	24.32	43.30	56.89	855.95	839.05	847.5
25	WH 1142	23.72	30.58	68.16	22.62	36.73	61.77	765.2	789.25	777.22
26	PBW 723	11.43	21.41	40.22	12.47	24.65	38.51	472.35	501.4	486.87
27	HD 4728	12.80	38.21	66.96	13.00	42.28	63.25	780.9	804.05	792.47
28	WB 2	12.00	24.58	48.88	12.08	29.51	46.36	550.2	587.3	568.75

S. No.	Variety	Percent disease index (2021-22)			Percent disease index (2022-23)			*AUDPC	*AUDPC	Pooled
29	PBW 757	6.32	13.83	25.03	8.43	18.78	17.33	295.05	316.6	305.82
30	HD 3226	15.12	36.20	62.07	15.32	40.51	58.35	747.95	773.45	760.7
31	DBW 303	12.04	30.21	45.33	13.76	29.81	39.25	588.95	563.15	576.05
32	WH 147	28.12	56.33	88.00	30.14	57.20	84.44	1143.9	1144.9	1144.4

**AUDPC – Area Under Disease Progress Curve*

Table 4. Categorization of resistance response exhibited by wheat varieties based on PDI obtained from the years 2021-22 and 2022-23

S. No.	Disease reaction	Double digit scale	*AUDPC value (Pooled mean)	No. of varieties	Varieties
1.	Immune (I)	00-01		0	
2.	Resistant (R)	12-24	205.85 – 305.82	2	PBW 757, DWR 185
3.	Moderately Resistant (MR)	34-46	443.82 – 634.52	11	HD 2967, HS 490, WH 1080, DBW 303, DBW 71, WH 1021, HD 2864, PBW 723, WB2, HS 507, HS 375
4.	Moderately Susceptible (MS)	56-68	687.15 – 883.97	14	PBW 644, HD 2888, HD 2932 DBW 14, WH 1105, HD 3226, HD 3086, HD 4728, WH 1124, RAJ 4083, WH 1142, DBW 93, DBW 90, HD 2985
5.	Susceptible (S)	78-89	930.40 – 1144.40	5	HUW 234, WH 147, PBW 343, HI 8713, HD 2329
6.	Highly susceptible (HS)	99		0	

**AUDPC- Area under Disease Progress Curve*

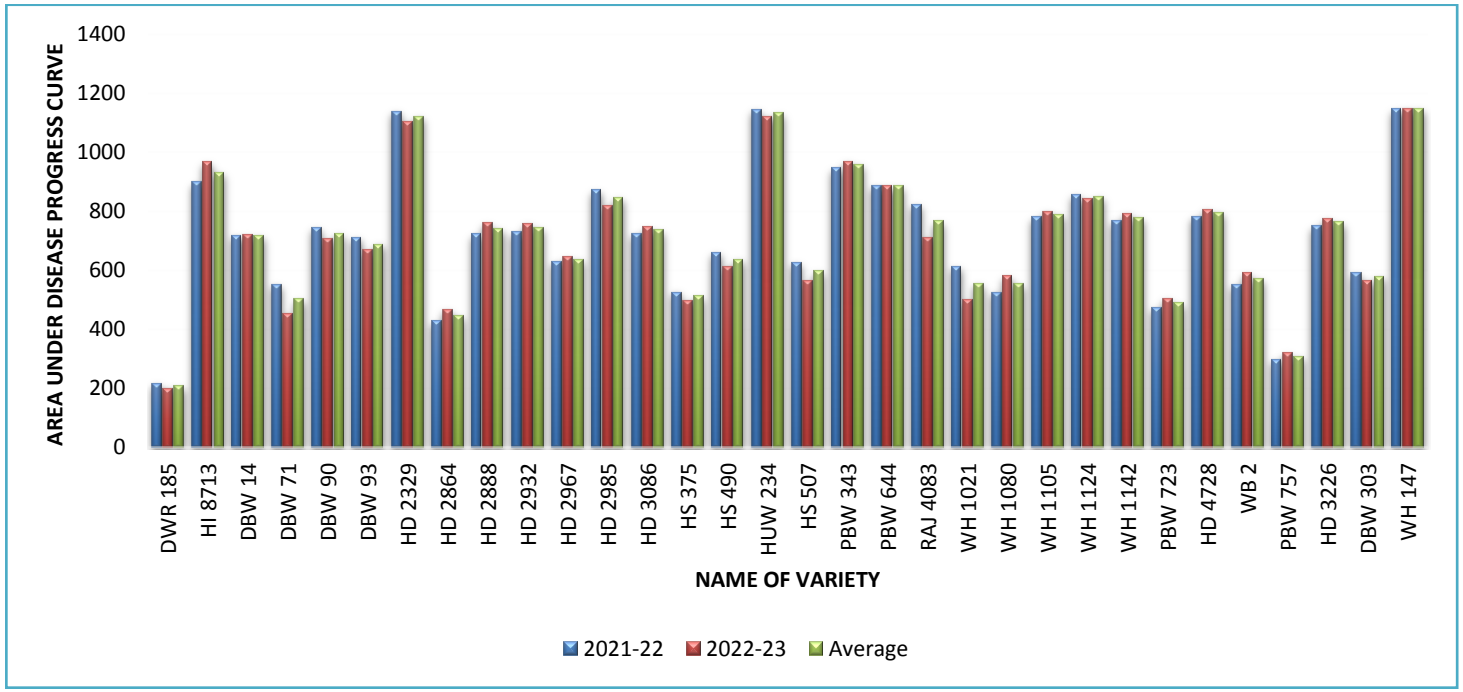

Fig. 1. Area under disease progress curve of wheat varieties during 2021-22 and 2022-23

Sarbati Sonara, VL-804, VL-829 and VL892) and highly susceptible (Agra Local, K-0307, Kharchia 65, PBW-343, RAJ-4015 and Sonalika) with high disease severity and AUDPC values. In our findings, out of thirty-two wheat varieties, two varieties (DWR 185 and PBW 757) was found AUDPC between 205.85 to 305.82 with disease index ranging from 15.70 to 25.03 percent under the resistant and eleven varieties (HD 2967, HS 490, WH 1080, DBW 303, DBW 71, WH 1021, HD 2864, PBW 723, WB2, HS 507 and HS 375) was found AUDPC between 443.82 to 634.52 with disease index ranging from 35.85 to 50.36 percent under the moderately resistant disease reaction during two-years crop season. While, in fourteen varieties (PBW 644, HD 2888, HD 2932 DBW 14, WH 1105, HD 3226, HD 3086, HD 4728, WH 1124, RAJ 4083, WH 1142, DBW 93, DBW 90 and HD 2985) the range of Area Under Disease Progress Curve was recorded between 687.15 to 883.97 with disease index ranging from 57.78 to 70.66 percent and in five varieties (HUW 234, WH 147, PBW 343, HI 8713 and HD 2329) 930.40 to 1144.40 with disease index ranging from 79.55 to 88.00 percent under the moderately susceptible and susceptible disease reaction during two-years crop season. Pandey et al. [17] reported that Genotype BL 4699 and NL 1247 were found to be resistant with AUDPC value 141.7 and 140.6 and yield 3.335MT/ha and 3.604MT/ha respectively. Similarly, genotype BL 4708, NL 1327 and BL 4707 were found to be tolerant with AUDPC value 567.2, 570.6 and 274.6 and yield 3.761MT/ha, 3.642MT/ha and 3.681Mt/ha respectively.

4. CONCLUSION

The results from the current study revealed that wheat varieties varied significantly for spot blotch severity and Area Under Disease Progress Curve under artificial epiphytotic conditions. Among 32 wheat varieties, none of the variety was found immune and highly susceptible. Two varieties were found to be resistant, eleven varieties were found moderately resistant, fourteen varieties were found moderately susceptible and five varieties were found susceptible against spot blotch. The disease under artificial epiphytotic condition can be utilized in breeding programme to develop high yielding varieties. Area under disease progress curve (AUDPC) calculated for 32 wheat varieties on the basis of plant disease index varied from 205.85 to 1144.40 showing the fast progress of disease in all varieties. It was observed that different wheat varieties used in this study showed varied types of disease reaction against *Bipolaris sorokiniana* under artificial epiphytotic conditions in field.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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