

Original Research Article

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Screening of Resistencia for Spot Blotch in Barley (*Hordeum vulgare* L.) Genotypes

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ABSTRACT

Keywords

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One hundred fifty genotypes of Barley (*Hordeum vulgare* L.) were screened for spot blotch disease caused by *Bipolaris sorokiniana* under natural condition. The crop was sown on 4th week of October 2015 and 2016 respectively. The RD-2503 genotype was used as check every after 20 lines and on the borders of the experimental plot. Out of one hundred fifty tested genotypes, nine genotypes were moderately resistant, eighty six were moderately susceptible, fifty-three genotypes was susceptible and rest two was found highly susceptible during crop season. Moderately resistant genotypes could be used for breeding programme for management of Spot Blotch of Barley.

Introduction

Barley (*Hordeum vulgare* L.) is a crop of international importance and stands fourth major food grain crop in the world, except the tropical regions. In India cultivated as a *Rabi* crop. Whereas in Uttar Pradesh the crop covers an area of about 1.70 lakh hectares with estimated production of 2.87 lakh tonnes and productivity of 16.90q/ha. The sowing being undertaken from October to December and harvesting from March to May, it is first cereal to be domesticated in Middle East at least 9000 year ago.

Vedas christen it as 'Yav' and mentioned its use in different religious ceremonies. It is a major source of food for large number of

people living in the cooler semi- arid areas of the world. The crop is being used as food, animal feed and industrial raw material in food and beverages industry. However, the crop suffers significant yield losses from biotic stresses.

Among biotic stresses, Spot Blotch caused by *Bipolaris sorokiniana* (Sacc. in Sorok.) Shoemaker, syn. *Helminthosporium sativus*, Teleomorph *Cochliobolus sativus* (Ito and Kuribayashi) Dreschsl., Ex Dastur. is a serious fungal disease with a wide geographical distribution. It is a major disease in warmer and humid growing regions of the world (Kuldeep *et al.*, 2008).

Materials and Methods

The experiment was conducted at agriculture experimental station of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) during 2015-16 and 2016-17. Seeds of 150 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, Faizabad (U.P.). Each genotype / lines was sown (4th week of October) in single row of one meter length at a distance of 25 cm row to row and 5 cm plant to plant in augmented design The RD-2503 genotype was used as check every after 20 lines and on the borders of the experimental plot. All the recommended agronomical and cultural practices were followed for raising the crop. The observations on disease severity were recorded from the date of first appearance of disease in both year at flowering, soft dough and hard dough stage, randomly 5 plants were selected and tagged in each row. The disease score of each selected plant were recorded by using Kumar *et al.*,

(1998)'s double digit scale based on per cent blighted area on the flag and flag-1 leaf as given in table-1.

Results and Discussion

Since the use of resistant varieties is considered to be the best method for disease management, therefore, the present studies were carried out for the search of sources of resistance against the spot blotch of barley caused by *Bipolaris sorokiniana*. A sum total of 150 genotypes of Barley were screened against *Bipolaris sorokiniana* under natural field condition (Table 2). It is evident from the (Table.2) that the disease first appeared in the lower leaves of the every genotype. Among screened one fifty genotypes, none was found immune (score 00-01) and resistant (score 12-24) (Table 3). Nine genotypes were found moderately resistant against spot blotch. Some of these were DWR46, DWR47, DWR49, K861, K863, K878, K846, K868, and NDB1413 (score 34-46) (Table3). Eighty six genotypes were found moderately susceptible against spot blotch.

Table.1 Double digit scale, based on percent blighted area on the flag leaf and one leaf just below given by Kumar *et al.*, (1998)

Sl. No.	Severity		Rating	
	Flag leaf	Flag-1leaf	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 & second value respectively, represents percent blighted area on the flag leaf & flag-1 leaves.
- Values 1,2,3,4,5,6,7,8,& 9, respectively correspond to 10,20,30,40,50,60,70,80 & 90 percent blighted area.

Table.2 Response of barley genotypes against spot blotch disease (*B. sorokiniana*) under natural disease pressure 2015-16 & 2016-17

S.No.	Genotypes	Date of first appearance of disease 2015-16	Date of first appearance of disease 2016-17	Foliar blight score (0-9dd)					
				Flowering stage		Soft dough stage		Hard dough stage	
A	Moderately resistant			2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
1.	DWR 46	06/02/2016	17/02/2017	12	02	24	24	46	46
2.	DWR 47	04/02/2016	20/02/2017	02	13	25	24	35	34
3.	DWR 49	10/02/2016	16/02/2017	12	12	24	23	34	35
4.	K861	19/02/2016	23/02/2017	14	13	25	24	34	36
5.	K863	25/01/2016	18/01/2017	12	12	23	23	36	35
6.	K878	24/02/2016	28/02/2017	13	13	24	13	46	46
7.	K846	24/02/2016	26/02/2017	12	02	25	24	36	36
8.	K 868	11/02/2016	13/02/2017	02	13	23	13	35	36
9.	NDB 1413	25/02/2016	28/02/2017	13	12	24	24	36	46
B	Moderately Susceptible								
1.	RD 2676	04/01/2016	10/01/2017	12	13	35	36	68	67
2.	RD 2670	02/01/2016	20/01/2017	12	02	35	35	67	68
3.	BH 648	01/01/2016	04/02/2017	13	12	36	36	57	67
4.	BH 657	28/12/2015	01/01/2017	12	13	36	37	67	68
5.	HUB 173	29/12/2015	01/01/2017	12	01	46	45	57	68
6.	RD 2035	26/12/2015	04/01/2017	13	12	45	45	58	58
7.	RD 2634	27/12/2015	04/01/2017	12	01	35	34	57	58
8.	K729	26/12/2015	01/01/2017	12	13	46	45	58	57
9.	RD 2552	26/12/2015	25/01/2017	25	24	56	56	68	59
10.	RD 2668	15/12/2015	05/01/2017	12	13	45	45	68	58
11.	NDB 1245	12/12/2015	26/01/2017	02	13	36	34	57	67
12.	K 551	25/12/2015	25/01/2017	12	13	35	37	67	67
13.	Lakhan	25/12/2015	25/01/2017	01	12	46	46	56	68
14.	RD 2624	25/12/2015	25/01/2017	12	02	47	47	58	68
15.	K791	25/12/2015	25/01/2017	12	13	37	35	59	67

16.	NDB1276	25/12/2015	26/01/2017	13	13	46	46	57	58
17.	RD 2696	25/12/2015	29/12/2016	12	13	37	36	67	57
18.	HUB 181	24/12/2015	30/12/2016	12	02	46	47	67	67
19.	HUB182	24/12/2015	29/12/2016	02	12	36	34	67	67
20.	HUB 182	24/12/2015	04/01/2017	12	13	35	37	68	67
21.	HUB186	15/12/2015	05/01/2017	13	12	36	37	68	57
22.	HUB106	17/12/2015	07/01/2017	13	02	45	46	57	68
23.	K822	27/12/2015	05/01/2017	01	12	46	45	57	67
24.	K823	27/12/2015	06/01/2017	12	13	47	47	58	57
25.	K825	27/12/2015	07/01/2017	12	01	35	36	59	67
26.	K830	07/12/2015	07/12/2016	12	02	45	46	67	57
27.	NDB1319	28/12/2015	07/01/2017	14	12	36	37	68	58
28.	NDB1402	27/12/2015	02/01/2017	13	12	56	36	57	57
29.	NDB1405	28/12/2015	08/01/2017	02	01	45	45	58	58
30.	PL801	25/12/2015	01/01/2017	12	12	36	37	67	68
31.	PL802	26/12/2015	06/01/2017	13	12	37	37	57	68
32.	RD2701	28/12/2015	08/01/2017	02	12	45	46	58	57
33.	RD 2704	24/12/2015	16/01/2017	13	12	45	45	69	67
34.	RD2708	25/12/2015	06/01/2017	12	13	56	45	68	56
35.	RD2711	26/12/2015	06/01/2017	02	13	36	37	68	58
36.	RD2714	26/12/2015	20/01/2017	12	12	45	46	57	59
37.	RD 2717	28/12/2015	08/01/2017	13	02	56	56	58	57
38.	RD 2719	26/12/2015	20/01/2017	12	02	36	37	59	67
39.	RD 2720	26/12/2015	30/12/2016	13	03	56	57	57	67
40.	RD 2722	26/12/2015	02/01/2017	02	13	36	36	68	67
41.	UPB1	26/12/2015	04/01/2017	12	01	47	47	68	68
42.	UPB4	23/12/2015	01/01/2017	02	12	46	46	67	68
43.	JB123	15/12/2015	05/01/2017	13	12	45	46	68	57
44.	JB126	26/12/2015	06/01/2017	12	13	36	37	69	57
45.	JB127	24/12/2015	08/01/2017	02	13	36	35	57	58
46.	JB129	20/12/2015	03/01/2017	02	13	45	34	58	59
47.	JB134	24/12/2015	04/01/2017	12	01	56	56	59	67

48.	K839	01/12/2015	01/01/2017	13	02	34	45	57	68
49.	K853	16/12/2015	16/01/2017	24	23	56	45	68	57
50.	K 856	26/12/2015	06/01/2017	02	02	34	35	68	58
51.	K 857	24/12/2015	04/01/2017	13	13	46	47	67	67
52.	K858	27/12/2015	07/01/2017	02	01	37	37	67	57
53.	K859	16/12/2015	16/01/2017	13	12	36	36	67	58
54.	K860	28/12/2015	15/01/2017	23	12	46	46	68	69
55.	K 862	25/12/2015	15/01/2017	02	12	35	35	57	68
56.	K864	25/12/2015	20/01/2017	13	02	37	37	58	68
57.	K865	25/12/2015	26/01/2017	02	13	35	35	58	57
58.	K866	25/12/2015	26/01/2017	12	02	35	37	67	58
59.	NDB 1411	28/12/2015	26/01/2017	12	13	36	36	67	59
60.	NDB 1412	28/12/2015	26/01/2017	01	12	37	34	68	57
61.	NDB 1414	05/12/2015	15/01/2017	13	12	46	46	68	56
62.	NDB 1417	28/12/2015	27/01/2017	02	01	35	46	69	57
63.	NDB1418	25/12/2015	24/01/2017	13	12	45	45	69	67
64.	NDB1419	01/12/2015	05/01/2017	13	12	46	46	68	68
65.	NDB1420	28/12/2015	05/01/2017	13	02	34	34	67	69
66.	NDB1173	08/12/2015	04/01/2017	02	13	37	37	67	57
67.	NDB1442	07/12/2015	01/01/2017	02	13	46	46	68	58
68.	NDB1414	15/01/2015	26/01/2017	02	13	45	45	67	59
69.	NDB1448	20/01/2015	26/01/2017	12	03	35	35	68	57
70.	NDB1452	26/12/2015	08/01/2017	13	12	37	37	68	68
71.	NDB1456	26/12/2015	01/01/2017	12	13	46	46	58	68
72.	NDB1459	26/12/2015	05/01/2017	01	12	37	37	58	67
73.	NDB1461	26/12/2015	04/01/2017	12	13	45	45	57	67
74.	NDB1465	15/12/2015	01/01/2017	01	12	36	36	59	67
75.	NDB1467	27/12/2015	26/01/2017	01	12	34	34	58	68
76.	NDB1473	24/12/2015	26/01/2017	02	12	36	36	67	57
77.	NDB1474	05/12/2015	08/01/2017	02	12	35	35	67	58
78.	NDB1477	05/12/2015	05/01/2017	13	02	34	34	68	58
79.	NDB1486	04/12/2015	04/01/2017	12	12	45	46	68	67

80.	NDB1487	01/12/2015	01/01/2017	24	23	34	34	67	67
81.	NDB1488	26/12/2015	26/01/2017	23	23	36	37	58	68
82.	NDB1490	26/12/2015	26/01/2017	23	23	37	37	57	68
83.	NDB1492	08/12/2015	08/01/2017	01	02	34	34	67	69
84.	NDB149	01/12/2015	01/01/2017	02	12	36	36	67	69
85.	NDB1571	08/12/2015	08/01/2017	13	12	35	35	67	68
86.	NDB1585	01/12/2015	01/01/2017	13	12	46	46	57	67
C	Susceptibe								
1.	RD 2632	04/12/2015	04/12/2016	13	13	58	56	79	89
2.	RD2637	01/12/2015	04/12/2016	13	14	47	47	79	89
3.	RD2640	02/12/2015	28/12/2016	12	24	56	45	78	78
4.	RD2657	05/12/2015	02/12/2016	14	13	46	46	78	78
5.	RD2661	01/12/2015	25/12/2016	02	25	48	48	79	89
6.	RD2640	01/12/2015	01/12/2016	13	24	46	57	89	78
7.	RD2657	20/12/2015	01/12/2016	12	12	67	58	89	89
8.	RD2661	21/12/2015	20/12/2016	13	12	57	59	78	89
9.	RD2665	30/11/2015	26/12/2016	12	13	58	56	79	89
10.	K675	01/12/2015	06/12/2016	14	24	59	67	79	78
11.	RD 2508	12/12/2015	01/12/2016	13	24	45	58	78	79
12.	RD2666	18/12/2015	22/12/2016	12	25	45	48	78	78
13.	RD2669	08/12/2015	28/12/2016	14	13	46	67	89	79
14.	RD2673	08/12/2015	28/12/2016	12	12	47	68	78	79
15.	RD 2674	08/12/2015	18/12/2016	14	12	58	68	79	89
16.	RD2676	05/12/2015	15/12/2016	12	13	57	67	78	79
17.	RD2655	28/11/2015	28/12/2016	13	24	56	56	89	79
18.	RD2658	28/11/2015	28/12/2016	12	13	67	46	78	78
19.	RD2660	20/11/2015	20/12/2016	13	12	68	67	79	78
20.	RD2675	18/11/2015	18/12/2016	14	24	67	56	89	79
21.	K824	26/11/2015	26/12/2016	25	25	56	58	78	78
22.	K603	25/11/2015	25/12/2016	24	23	56	57	78	79
23.	K782	25/12/2015	25/12/2016	12	23	57	56	89	79
24.	RD2685	25/12/2015	25/12/2016	12	12	67	58	78	78

25.	RD2687	28/12/2015	28/12/2016	13	13	68	67	78	78
26.	RD2692	01/11/2015	01/12/2016	14	12	56	68	89	89
27.	RD2693	24/11/2015	24/12/2016	24	24	47	67	89	89
28.	K829	27/12/2015	27/12/2016	13	25	45	67	78	89
29.	K832	25/12/2015	25/12/2016	25	12	46	68	78	89
30.	K835	24/12/2015	02/12/2016	24	13	48	58	89	79
31.	K836	01/12/2015	01/12/2016	12	13	57	47	78	79
32.	K837	25/12/2015	05/12/2016	12	13	58	56	89	78
33.	NDB1401	28/12/2015	28/12/2016	13	12	59	46	89	78
34.	NDB1403	28/12/2015	28/11/2016	24	14	56	48	89	79
35.	NDB1404	26/12/2015	26/12/2016	24	02	67	46	78	89
36.	RD2686	27/11/2015	28/12/2016	25	13	58	67	79	89
37.	RD2700	27/11/2015	22/12/2016	13	12	48	57	78	78
38.	RD2702	21/11/2015	21/12/2016	12	13	67	58	79	79
39.	RD2703	18/11/2015	18/12/2016	12	12	68	59	79	79
40.	RD2705	13/11/2015	13/12/2016	13	14	68	45	89	78
41.	RD2706	18/11/2015	08/12/2016	24	13	67	45	79	78
42.	RD2707	22/11/2015	22/12/2016	13	12	56	46	79	89
43.	RD2709	23/11/2015	03/12/2016	12	14	46	47	78	78
44.	RD2710	23/12/2015	03/12/2016	24	12	67	58	78	79
45.	RD2712	22/12/2015	22/12/2016	25	14	56	57	79	78
46.	RD2713	25/12/2015	25/12/2016	23	12	58	56	78	89
47.	RD2715	20/12/2015	25/12/2016	23	13	57	67	79	78
48.	RD2716	08/12/2015	28/12/2016	12	12	56	68	79	79
49.	RD2718	08/12/2015	28/12/2016	13	13	58	67	78	89
50.	RD2721	12/12/2015	22/12/2016	12	14	67	56	78	78
51.	UPB2	02/12/2015	22/12/2016	24	25	68	56	89	78
52.	K826	12/12/2015	08/12/2016	25	24	67	57	89	89
53.	K827	20/12/2015	08/12/2016	12	12	67	67	89	78
D.	Highly Susceptible								
1.	JB 122	16/11/2015	25/12/2016	35	35	68	67	89	89
2.	Jyoti	25/11/1015	25/12/2016	35	35	68	67	89	89

Table.3 Disease scores of Barley genotypes against *Bipolaris sorokiniana* during 2015-16 and 2016-17

Sl. No.	Disease response	Double digit scale	Germplasm	No. of germplasm
1.	Immune (I)	00-01	Nil	
2.	Resistant(R)	12-24	Nil	
3.	Moderately resistant (MR)	34-46	DWR46, DWR47 DWR 49, K861, K863, K878, K846, K868, NDB1413.	9
4.	Moderately Susceptible (MS)	56-68	RD2676, RD2670, BH648, BH657, HUB173, RD2035, RD2634, K729, RD2552, RD2668, NDB1245, K551, Lakhan, RD2624, K791, NDB1276, RD2696, UB181, HUB182, HUB182, HUB186, HUB106, K822, K823, K825, K830, NDB1319, NDB1402, NDB1405, PL801, PL802, RD2701, RD2704, RD2708, RD2711, RD2714, RD2717, RD2719, RD2720, RD2722, UPB1, UPB4, JB123, JB126, JB127, JB129, JB134, K839, K853, K856, K857, K858, K859, K860, K862, K864, K865, K866, NDB1411, NDB1412, NDB1414, NDB1417, NDB1418, NDB1419, NDB1420, NDB1173, NDB142, NDB1445, NDB1448, NDB1452, NDB1456, NDB1459, NDB1461, NDB1465, NDB1467, NDB1473, NDB1474, NDB1477, NDB1486, NDB1487, NDB, 1488, NDB1490, NDB1492, NDB1495, NDB1571, NDB1585	86
5.	Susceptible (S)	78-89	RD2632, RD2637, RD2640, RD2657, RD2661, RD2640, RD2657, RD2661, RD2665, K675, RD2508, RD2666, RD2669, RD2673, RD2674, RD2676, RD2655, RD2658, RD2660, RD2675, K603, K782, RD2685, RD2687, RD2692, RD2693, K824, K826, K827, K829, K832, K835, K836, K837, NDB1401, NDB1403, NDB1404, RD2686, RD2700, RD2702, RD2703, RD2705, RD2706, RD2707, RD2709, RD2710, RD2712, RD2713, RD2715, RD2716, RD2718, RD2721, UPB2	53
6.	Highly Susceptible (HS)	99	Jyoti, JB122	2

Some of these were RD2676, RD2670, BH648, BH657, HUB173, RD2035, RD2634, K729, RD2552, RD2668, NDB1245, K551, Lakhan, RD2624, K791, NDB1276, RD2696, HUB181, HUB182, HUB182, HUB186, HUB106, K822, K823, K825, K830, NDB1319, NDB1402, NDB1405, PL801, PL802, RD2701, RD2704, RD2708, RD2711, RD2714, RD2717, RD2719, RD2720, RD2722, UPB1, UPB4, JB123, JB126, JB127, JB129, JB134, K839, K853, K856, K857, K858, K859, K860, K862, K864, K865, K866, NDB1411, NDB1412, NDB1414, NDB1417, NDB1418, NDB1419, DB1420, NDB1173, NDB142, NDB1445, NDB1448, NDB1452, NDB1456, NDB1459, NDB1461, NDB1465, NDB1467, NDB1473, NDB1474, NDB1477, NDB1486, NDB1487, NDB1488, NDB1490, NDB1492, NDB1495, NDB157, NDB1585. (score 56-68) (Table 3). While fifty-three genotypes were RD 2632, RD2637, RD2640, RD2657, RD2661, RD 2640, RD2657, RD2661, RD2665, K675, RD250 8, RD2666, RD2669, RD2673, RD2674, RD267 6, RD2655, RD2658, RD2660, RD2675, K603, K 782, RD2685, RD2687, RD2692, RD2693, K824 , K826, K827, K829, K832, K835, K836, K837, N DB1401, NDB1403, NDB1404, RD2686, RD27 00, RD2702, RD2703, RD2705, RD2706, RD27 07, RD2709, RD2710, RD2712, RD2713, RD27 15, RD2716, RD2718, RD2721, UPB2 susceptible (score 56-68) (Table -3) Two genotypes JB 122, Jyoti were highly susceptible (score -99).

Among one hundred fifty genotypes none was found free from the disease. Nine genotypes were moderately resistant, eighty-six moderately susceptible, fifty-five susceptible and two highly susceptible. Some workers have screened the barley genotypes/ lines against *Bipolaris sorokiniana* and reported variable level of resistance Murti *et al.*, (2014) Screened 388 genotypes none was found free from the disease and resistant. One hundred fifty five genotypes were moderately

resistant, one hundred sixty nine were moderately susceptible, sixty two were susceptible and rests two were found highly susceptible during the crop season. Misra (1973) tested 391 barley varieties; fifty of these proved very resistant, 97 very susceptible.

Thus screening of genotypes/ varieties/ lines conducted under natural field condition for their response towards spot blotch disease caused by *Bipolaris sorokiniana* is the best methodology to identify the resistant genotypes / lines, selected for the commercial production of barley crop to protect the crop from diseases and subsequently increase the production.

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