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Disease Reaction of Lentil Genotypes against Stemphylium Blight caused by S*temphylium botryosum* Wallr. in West Bengal

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Abstract—*Stemphylium blight of lentil (Lens culinaris Medik.) caused by Stemphylium botryosum Wallr. is considered a potential threat in the major lentil growing areas of India, Bangladesh, Nepal, Syria, Canada, ,USA and Iran. It causes severe leaf drop, resulting in defoliated plants which sometimes causes even 100 per cent crop loss. Seventy seven lentil accessions (along with three checks) obtained from the AICRP on MULLaRP, IIPR, Kanpur were screened for resistance against infection of Stemphylium blight during Rabi, 2015-16 at 'AB' Block, District Seed Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal. To increase disease pressure artificial inoculation was also done. Significant variability in the severity of the disease was observed among genotypes. None of the germplasms were found under Immune (Disease grade-0), Resistant (Disease grade-1) and Highly susceptible (Disease grade-9) category. Fifteen entries i. e. LL 1370, VL 151, LL 1375, RLG 195, L 4727, L 4769, LL 1397, DL 14-2, VL 526, VL 126, RKL 14-20, IPL 334, L 4710, PL 210, PRECOZ (RC) showed Moderately resistant (Disease grade-3). To prevent a disease outbreak, those moderately resistant lines should be in the pipeline to release as a variety as well as can be used in the breeding program to develop Stemphylium blight resistant cultivars of lentil.*

Keyword: Disease reaction, Lentil, Stemphylium blight

1. INTRODUCTION

Lentil (*Lens culinaris* Medik) is one of the most nutritious cool season food legume and ranks next only to chickpea in India. Lentil contains about 25% protein, 0.7% fat, 2.1% minerals, 0.7% fiber and 59% carbohydrate. It is a rich source of phosphorus and carotene. It is generally grown as a rainfed crop on marginal lands under residual moisture condition. The average yield of lentil in India is lower than the world average. The crop is vulnerable to many diseases. The reasons for low yield are occurrence of various biotic and abiotic factors at different growth stages. Diseases like rust, wilt, root rot, stemphylium blight reduce the productivity of lentil by 20 – 25 % [7]. Among the diseases, Stemphylium blight is a major one. Stemphylium blight caused by *Stemphylium botrysum* Wallr. in West Bengal is of economic importance. Generally, it appears at flowering stage of the crop. Most of the research on infection by *Stemphylium* spp. of different hosts has confirmed that temperature and moisture are the most important environmental factors. In S.E. Asia and India, temperatures of 18 to 22°C and a relative humidity of over 85% have been reported to favour the development of the disease [2, 6] Various fungicides control the blight disease with dissimilar cost-benefit ratio [1]. The ideal and most economical mean of managing the Stemphylium blight disease of lentil would be the use of resistant varieties. Under these circumstances there is a need to exploit genetically host resistance in existing varieties and germplasms for the identification of resistant sources.

2. MATERIALS AND METHODS

Investigations were carried out in November, 2015 to March, 2016 at the District Seed Farm (AB Block), Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal. Seeds were sown on 21st November, 2015 and grown under prevailing epiphytotic condition for the disease. Each line was sown in three meter length in two replications with row to row spacing 25 cm and plant to plant 10 cm. K-75 and PRECOZ were used as standard susceptible check and as resistant check respectively. Susceptible check was rotated after every four tested entries row. To increase disease pressure artificial inoculation was also done. Plant to plant distance was 10 cm. Nitrogen (N), Phosphate (P_2O_5) and Potash (K_2O) fertilizers were applied at the rate of 30:40:20 kg ha^{-1}. Irrigation was given thrice whenever required. Observations were recorded on randomly selected ten plants from each genotype at 20 days after disease onset. Disease severity percent was assessed using 0-9 scale [3] where, 0= No infection, 1= below 10% of foliage affected, 3= 30% of foliage affected, 5=50% of foliage affected, 7=70% of foliage affected, 9= above 70% of foliage affected. Percentage Disease Index was worked out using the formula PDI = [Sum of numerical rating/total number of

observations taken x maximum disease score] x 100. Finally the disease severity percent was also calculated. On the basis of disease severity, genotypes were classified into different groups viz., immune, resistant, resistant, moderately resistant, moderately susceptible, susceptible and highly susceptible.

3. RESULTS AND DISCUSSION

Evaluation of resistant varieties is considered to be the most feasible and durable solution for controlling the Stemphylium blight disease in lentil. Screening of lentil genotypes against Stemphylium blight disease under natural condition is the first step to identify the resistant donors for development of lentil varieties with Stemphylium blight resistance. Seventy seven lentil genotypes were screened. Percent disease severity ranged from 18.89 % to 77.78. None of the germplasms were found under Immune (Disease grade-0), Resistant (Disease grade-1) and Highly susceptible (Disease grade-9) category. Fifteen entries i. e. LL 1370, VL 151, LL 1375, RLG 195, L 4727, L 4769, LL 1397, DL 14-2, VL 526, VL 126, RKL 14-20, IPL 334, L 4710, PL 210, PRECOZ (RC) showed Moderately resistant (Disease grade-3) and fifty one entries i. e. VL 148, IPL 333, PL 4, PL 213, L 4737, L 4147, WBL 77,LL 1320, L 4751, VL 525, LL 1374, PL 194, LL 1373, RVL 14-5, L 4717, L 4771, BPL 15, L 4076, PL 024, RLG 191, VL 150, TRCL-1, RKL 1003-24C, L 4726, PL 220, L 4764, L 4735, IPL 534, KLS 14-23, PL 406, LH 84-8, DPL 15, RVL 13-5, LL 1404, KLB 1442, PL 063, DPL 62, IPL 316, PL 175, PL 218, BPL 14, RKL 24C-59, PL 221, LL 1318, HUL 57, VL 507, NDL 14-22, IPL 225, RVL-13-7, Moitree (LC), K-75 (SC) were found Moderately susceptible (Disease grade-5). Only eleven entries (RVL 14-4, RKL 607-1, L 4755, RL 3-5, L 4762, KLS 14-1, KLS 218, JL 3, KLS 1445, IPL 406, IPL 227) showed Susceptible (Disease grade-7). Different workers evaluated the lentil genotypes and our results are in accordance with those in many cases. Rashid *et al*. (2009) screened and found that 21 entries viz. 10/P8406-122, FLIP-92-52LX, LR-9-135, LR-9-130, LR-9-179, LR-9-69, LR-9-69, LR-9-100, LR-9-118, LR-9-28, LR-9-25, ILL-4605 Procoz, LR-9-57, LR-9-107, LR-9-105, LR-9-48, LR-9-62, LR-9-25, 10/P11X955-135, 10/P2 FLIP-92-52LX955-167(4) and 10/P8405-23 were Resistant (R) to Stemphylium blight [5]. Podder (2012) reported that three experiments were conducted to evaluate disease resistance of germplasm accessions selected from seven *Lens spp.* and in intraspecific and interspecific RIL population [4]. Growth chamber, greenhouse and field trials in Saskatoon and Bangladesh were conducted. Seventy accessions selected from all wild species of the *Lens* genus were screened for Stemphylium blight (SB) resistance. From the experiment it was showed that among seventy seven screened entries, 20%, 66% and 14% were showed moderately resistant, moderately susceptible and susceptible category respectively. It could be noticed that the susceptible level was relatively quite high as compared to resistant status (Fig. 1). On the basis of disease severities index the fifteen genotypes were found moderately resistant against Stemphylium blight. These genotypes can be used as good donor for evolving resistant varieties against Stemphylium blight in lentil.

Table 1: Disease Scale and Grouping of Lentil Genotypes Against Stemphylium Blight on the basis of Disease Severity Scale at District Seed Farm (AB Block), B. C. K. V. (W. B.)

Scale	Disease Severity percent	Disease Reaction	Number	Name
0	No infection.	Immune	0	--
1	Below 10% of foliage affected	Resistant	0	--
3	30% of foliage affected	Moderately resistant	15	LL 1370, VL 151, LL 1375, RLG 195, L 4727, L 4769, LL 1397, DL 14-2, VL 526, VL 126, RKL 14-20, IPL 334, L 4710, PL 210, PRECOZ (RC)
5	50% of foliage affected	Moderately susceptible	51	VL 148, IPL 333, PL 4, PL 213, L 4737, L 4147, WBL 77,LL 1320, L 4751, VL 525, LL 1374, PL 194, LL 1373, RVL 14-5, L 4717, L 4771, BPL 15, L 4076, PL 024, RLG 191, VL 150, TRCL-1, RKL 1003-24C, L 4726, PL 220, L 4764, L 4735, IPL 534, KLS 14-23, PL 406, LH 84-8, DPL 15, RVL 13-5, LL 1404, KLB 1442, PL 063, DPL 62, IPL 316, PL 175, PL 218, BPL 14, RKL 24C-59, PL 221, LL 1318, HUL 57, VL 507, NDL 14-22, IPL 225, RVL-13-7, Moitree (LC), K-75 (SC)
7	70% of foliage affected	Susceptible	11	RVL 14-4, RKL 607-1, L 4755, RL 3-5, L 4762, KLS 14-1, KLS 218, JL 3, KLS 1445, IPL 406, IPL 227
9	Above 70% of foliage affected	Highly susceptible	0	--

Table 2: Percent Disease Index (PDI) and Disease Reaction of Stemphylium blight in Lentil under Artificial Inoculation During *Rabi*, 2015-16.

Sl. No.	Genotype	Average Percent Disease Index (%)*		Disease Grade	Disease Reaction
1	VL 148	40.74	(39.66)	3.67	MS
2	LL 1370	28.15	(32.04)	2.53	MR
3	VL 151	26.67	(31.09)	2.40	MR
4	IPL 333	37.78	(37.93)	3.40	MS
5	PL 4	35.56	(36.60)	3.20	MS
6	LL 1375	31.81	(34.33)	2.86	MR
7	RLG 195	25.93	(30.61)	2.33	MR
8	L 4727	31.85	(34.36)	2.87	MR
9	PL 213	40.74	(39.66)	3.67	MS
10	RVL 14-4	77.78	(61.87)	7.00	S
11	L 4737	53.92	(47.25)	4.85	MS
12	RKL 607-1	59.26	(50.34)	5.33	S
13	L 4769	25.19	(30.12)	2.27	MR
14	L 4147	45.19	(42.24)	4.07	MS
15	WBL 77	51.11	(45.64)	4.60	MS
16	LL 1320	42.22	(40.53)	3.80	MS
17	LL 1397	27.41	(31.57)	2.47	MR
18	L 4751	42.22	(40.53)	3.80	MS
19	VL 525	45.19	(42.24)	4.07	MS
20	LL 1374	43.70	(41.38)	3.93	MS
21	PL 194	43.53	(41.28)	3.92	MS
22	DL 14-2	20.00	(26.57)	1.80	MR
23	LL 1373	42.22	(40.53)	3.80	MS
24	VL 526	26.85	(31.21)	2.42	MR
25	RVL 14-5	35.50	(36.57)	3.20	MS
26	L 4717	46.67	(43.09)	4.20	MS
27	L 4771	48.15	(43.94)	4.33	MS
28	BPL 15	40.00	(39.23)	3.60	MS
29	VL 126	24.44	(29.63)	2.20	MR
30	L 4076	39.26	(38.80)	3.53	MS
31	PL 024	35.56	(36.60)	3.20	MS
32	RLG 191	35.74	(36.72)	3.22	MS
33	VL 150	41.11	(39.88)	3.70	MS
34	TRCL-1	43.70	(41.38)	3.93	MS
35	RKL 14-20	25.93	(30.61)	2.33	MR
36	RKL 1003-24C	42.22	(40.53)	3.80	MS
37	L 4726	48.15	(43.94)	4.33	MS
38	PL 220	38.15	(38.14)	3.43	MS
39	L 4764	49.63	(44.79)	4.47	MS
40	L 4735	43.70	(41.38)	3.93	MS
41	IPL 534	35.64	(36.66)	3.21	MS
42	KLS 14-23	39.26	(38.80)	3.53	MS
43	PL 406	48.15	(43.94)	4.33	MS
44	LH 84-8	46.67	(43.09)	4.20	MS
45	DPL 15	34.90	(36.21)	3.14	MS
46	L 4755	74.81	(59.88)	6.73	S
47	RL 3-5	72.59	(58.43)	6.53	S
48	IPL 334	27.41	(31.57)	2.47	MR
49	RVL 13-5	45.93	(42.66)	4.13	MS
50	LL 1404	35.40	(36.51)	3.19	MS
51	L 4762	71.85	(57.96)	6.47	S
52	KLB 1442	33.38	(35.29)	3.00	MS
53	KLS 14-1	68.89	(56.10)	6.20	S
54	PL 063	51.11	(45.64)	4.60	MS
55	DPL 62	41.01	(39.82)	3.69	MS
56	IPL 316	48.15	(43.94)	4.33	MS
57	PL 175	49.63	(44.79)	4.47	MS
58	PL 218	51.11	(45.64)	4.60	MS
59	BPL 14	46.67	(43.09)	4.20	MS
60	RKL 24C-59	42.18	(40.50)	3.80	MS
61	PL 221	42.22	(40.53)	3.80	MS
62	L 4710	26.67	(31.09)	2.40	MR
63	KLS 218	62.22	(52.07)	5.60	S
64	JL 3	71.85	(57.96)	6.47	S
65	PL 210	25.93	(30.61)	2.33	MR
66	LL 1318	42.22	(40.53)	3.80	MS
67	HUL 57	51.11	(45.64)	4.60	MS
68	VL 507	43.01	(40.98)	3.87	MS
69	NDL 14-22	37.04	(37.49)	3.33	MS
70	KLS 1445	56.30	(48.62)	5.07	S
71	IPL 406	61.48	(51.64)	5.53	S
72	IPL 227	57.78	(49.47)	5.20	S
73	IPL 225	39.74	(39.08)	3.58	MS
74	RVL-13-7	38.52	(38.36)	3.47	MS
75	Moitree (LC)	44.44	(41.81)	4.00	MS
76	PRECOZ (RC)	18.89	(25.76)	1.70	MR
77	K-75 (SC)	50.56	(45.32)	4.55	MS
	SEM(±)	**1.70**			
	CV (%)	**5.9**			
	CD (0.05)	**4.80**			

*Fig. in parentheses are angular transformed values

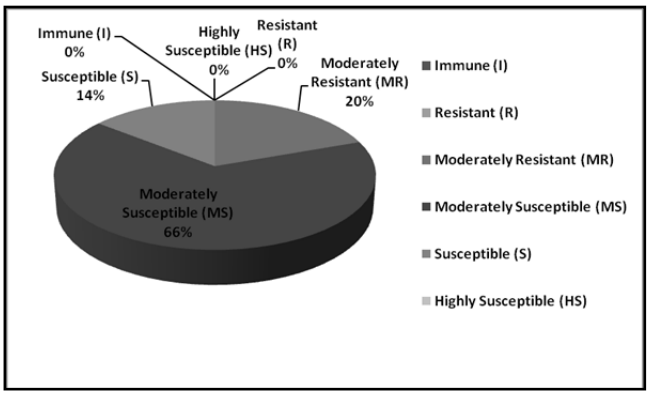

Fig. 1: Percentage of screened genotypes on the basis of reactions to Stemphylium blight (*Rabi*, 2015-16).

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