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## Host resistance of lentil genotypes against *Stemphylium* blight caused by *Stemphylium botryosum* Wallr. in lower gangetic alluvial zone of West Bengal, India

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Lentil (*Lens culinaris* Medik) is a valuable human food and one of the oldest known protein rich food legumes which is also known as poor men's meat. Owing to biotic and abiotic stresses, the crop yield is below attainable levels which are mainly attributed to pathological factors especially Stemphylium blight caused by *Stemphylium botryosum* Wallr. It causes severe leaf drop, resulting in defoliated plants which sometimes causes even 100 per cent crop loss. A field experiment was carried out during *rabi* season of 2016-17 at the District Seed Farm (AB Block), Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal, India to evaluate the host resistance of lentil genotypes against Stemphylium blight. Eighty six lentil genotypes were screened. Percent disease severity ranged from 0.00 % to 57.58 %. Only three entries (P3235, LL1122, ILL10832) were found Immune (Disease grade-0) and forty five entries (P2127, P3205, P3206, P3216, P8103, P8110, P8111, P8115, P13122, P13128, P13129, P13130, P13131 etc.) gave Resistant reaction (Disease grade-1). Thirty two entries (L830, L4076, L4147, L4149, L4602, L4603, L4594, L4649, L5227, L6183, P2113, P2118 etc.) showed Moderately resistant (Disease grade-3) and five entries (L4605, L5120, L7818, K-75, Asha) were found Moderately susceptible (Disease grade-5). Only one entry (IPL81) showed Susceptible (Disease grade-7) and none of the entry was found highly susceptible (Disease grade-9). These immune and resistant genotypes can be used as good donor for evolving resistant varieties against Stemphylium blight in lentil.

**Key words:** Host resistance, Lentil, genotypes, Stemphylium blight

### 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 % (Sharma, and Shukla, 2014). Among the diseases, Stemphylium blight is a major one. Stemphylium blight caused by *Stemphylium botryosum* 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 (Erskine and Sarker, 1997). Various fungicides control the blight disease with dissimilar cost-benefit ratio (Das, 2015). 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 geneti-

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cally host resistance in existing varieties and germplasms for the identification of resistant sources.

## MATERIALS AND METHODS

Investigations were carried out in December, 2016 to March, 2017 at the District Seed Farm (AB Block), Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal. Seeds were sown on 6th December, 2016 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 as the entire screening programme was done based on natural incidence of the disease. 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<sup>-1</sup>. 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 (Hashemi *et al.* 2005) 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  $PDI = [\text{Sum of numerical rating}/\text{total number of observations taken} \times \text{maximum disease score}] \times 100$ . 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.

## 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. Eighty six lentil genotypes were screened. Percent disease severity ranged from 0.00 % to 57.58 %. Only three entries (P3235,

LL1122, ILL10832) were found Immune (Disease grade-0) and forty five entries (P2127, P3205, P3206, P3216, P8103, P8110, P8111, P8115, P13122, P13128, P13129, P13130, P13131, 14103, P14109, P15104, P15111, P15121, PL02, PL05, PL06, PL07, PL08, PL24, ILL7663, L11-287, IC 129560, IC 240965, IC 248956, IC 249032, IC 267663, IC 560185, IC 560206, IG 49, IG 129185,

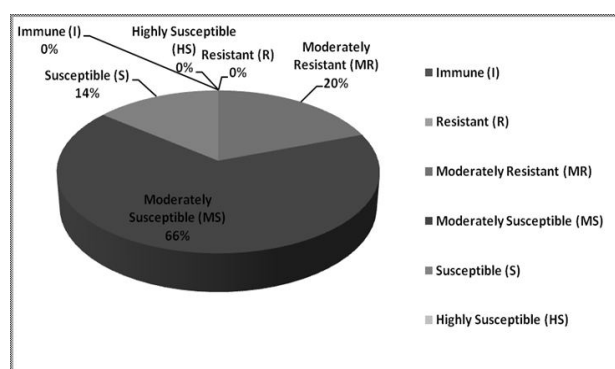


Fig. 1 : Percentage of screened genotypes on the basis of reactions to *Stemphylium* blight (Rabi, 2016-17)

IG 129302, IG 129313, BM-4, IG 134033, HM-1, Sehore 74-3, JL-3, E-153, NDL-1, LH 90-57) gave Resistant reaction (Disease grade-1). Thirty two entries (L830, L4076, L4147, L4149, L4602, L4603, L4594, L4649, L5227, L6183, P2113, P2118, P2125, P2126, P2130, P2202, P2205, P2206, P2217, P3131, P3236, P13109, P15213, P16217, L11-289, L11-291, L11-295, LC-282-1444, LC300-17, IC 112078, IC 560172, PRECOZ.) showed Moderately resistant (Disease grade-3) and five entries (L4605, L5120, L7818, K-75, Asha) were found Moderately susceptible (Disease grade-5). Only one entry (IPL81) showed Susceptible (Disease grade-7) and none of the entry was found highly susceptible (Disease grade-9). 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. 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. Growth chamber, greenhouse and field trials in Saskatoon and Bangladesh were conducted. Seventy acces-

**Table 1 :** Disease scale and Grouping of lentil genotypes against *Stemphylium* blight on the basis of Disease severity scale at Mondouri Farm, Bidhan Chandra Krishi Viswavidyalaya, West Bengal

Scale	Disease Severity percent	Disease Reaction	Number	Name
0	No infection.	Immune	3	P3235, LL1122, ILL10832
1	Below 10% of foliage affected	Resistant	45	P2127, P3205, P3206, P3216, P8103, P8110, P8111, P8115, P13122, P13128, P13129, P13130, P13131, P14103, P14109, P15104, P15111, P15121, PL02, PL05, PL06, PL07, PL08, PL24, ILL7663, L11-287, IC 129560, IC 240965, IC 248956, IC 249032, IC 267663, IC 560185, IC 560206, IG 49, IG 129185, IG 129302, IG 129313, BM4, IG 134033, HM-1, Sehore 74-3, JL-3, E-153, NDL-1, LH 90-57
3	30% of foliage affected	Moderately resistant	32	L830, L4076, L4147, L4149, L4602, L4603, L4594, L4649, L5227, L6183, P2113, P2118, P2125, P2126, P2130, P2202, P2205, P2206, P2217, P3131, P3236, P13109, P15213, P16217, L11-289, L11-291, L11-295, LC-282-1444, LC300-17, IC 112078, IC 560172, PRECOZ
5	50% of foliage affected	Moderately susceptible	5	L4605, L5120, L7818, K-75, Asha
7	70% of foliage affected	Susceptible	1	IPL81
9	Above 70% of foliage affected	Highly susceptible	0	--

**Table 2:** Percent disease index (PDI) and disease reaction of *Stemphylium* blight in lentil under natural condition during *Rabi*, 2016-17

Genotype	Average Percent Disease Index (%)	Disease Grade	Disease Reaction	Genotype	Average Percent Disease Index (%)	Disease Grade	Disease Reaction
L830	17.38 (24.64)	1.56	MR	P15121	2.02 (8.17)	0.18	R
L4076	10.10 (18.53)	0.91	MR	P15213	10.10 (18.53)	0.91	MR
L4147	12.37 (20.60)	1.11	MR	P16217	13.64 (21.67)	1.23	MR
L4149	23.74 (29.16)	2.14	MR	PL02	7.58 (15.98)	0.68	R
L4602	20.20 (26.71)	1.82	MR	PL05	4.55 (12.31)	0.41	R
L4603	18.18 (25.24)	1.64	MR	PL06	8.08 (16.52)	0.73	R
L4605	33.13 (35.14)	2.98	MS	PL07	9.09 (17.55)	0.82	R
L4594	14.14 (22.09)	1.27	MR	PL08	5.05 (12.99)	0.45	R
L4649	29.29 (32.77)	2.64	MR	PL24	0.51 (4.08)	0.05	R
L5120	36.36 (37.09)	3.27	MS	LL1122	0.00 (0.00)	0.00	I
L5227	22.22 (28.13)	2.00	MR	ILL7663	3.03 (10.02)	0.27	R
L6183	22.93 (28.61)	2.06	MR	ILL10832	0.00 (0.00)	0.00	I
L7818	30.30 (33.40)	2.73	MS	L11-287	9.60 (18.05)	0.86	R
P2113	22.22 (28.13)	2.00	MR	L11-289	10.61 (19.01)	0.95	MR
P2118	25.25 (30.17)	2.27	MR	L11-291	31.31 (34.03)	2.82	MR
P2125	28.28 (32.13)	2.55	MR	L11-295	11.11 (19.47)	1.00	MR
P2126	16.16 (23.70)	1.45	MR	LC-282-1444	10.61 (19.01)	0.95	MR
P2127	7.58 (15.98)	0.68	R	LC300-17	23.23 (28.82)	2.09	MR
P2130	10.14 (18.57)	0.91	MR	IPL81	57.58 (49.36)	5.18	S
P2202	12.12 (20.37)	1.09	MR	IC 112078	13.13 (21.25)	1.18	MR
P2205	11.11 (19.47)	1.00	MR	IC 129560	5.56 (13.63)	0.50	R
P2206	14.14 (22.09)	1.27	MR	IC 240965	1.01 (5.77)	0.09	R
P2217	21.21 (27.42)	1.91	MR	IC 248956	2.02 (8.17)	0.18	R
P3131	10.61 (19.01)	0.95	MR	IC 249032	8.08 (16.52)	0.73	R
P3205	9.09 (17.55)	0.82	R	IC 267663	7.07 (15.42)	0.64	R
P3206	5.56 (13.63)	0.50	R	IC 560185	8.59 (17.04)	0.77	R
P3216	4.04 (11.60)	0.36	R	IC 560172	17.17 (24.48)	1.55	MR
P3235	0.00 (0.00)	0.00	I	IC 560206	3.54 (10.84)	0.32	R
P3236	12.63 (20.81)	1.14	MR	IG 49	3.54 (10.84)	0.32	R

(Cont. Part of Table 2)

P8103	4.55	(12.31)	0.41	R	IG 129185	0.51	(4.08)	0.05	R
P8110	0.51	(4.08)	0.05	R	IG 129302	0.51	(4.08)	0.05	R
P8111	8.08	(16.52)	0.73	R	IG 129313	1.85	(7.82)	0.17	R
P8115	8.59	(17.04)	0.77	R	BM-4	2.53	(9.14)	0.23	R
P13109	12.63	(20.81)	1.14	MR	IG 134033	2.02	(8.17)	0.18	R
P13122	6.57	(14.85)	0.59	R	PRECOZ (RC)	12.58	(20.77)	1.13	MR
P13128	4.04	(11.60)	0.36	R	HM-1	0.51	(4.08)	0.05	R
P13129	8.08	(16.52)	0.73	R	Sehore 74-3	0.51	(4.08)	0.05	R
P13130	7.07	(15.42)	0.64	R	K-75 (SC)	48.64	(44.22)	4.38	MS
P13131	2.02	(8.17)	0.18	R	JL-3	0.51	(4.08)	0.05	R
P14103	0.51	(4.08)	0.05	R	E-153	8.59	(17.04)	0.77	R
P14109	1.52	(7.07)	0.14	R	Asha (LC)	34.33	(35.87)	3.09	MS
P15104	4.04	(11.60)	0.36	R	NDL-1	2.53	(9.14)	0.23	R
P15111	2.02	(8.17)	0.18	R	LH 90-57	1.01	(5.77)	0.09	R
SEm(±)	2.681				SEm(±)	2.681			
CD (0.05)	7.54				CD (0.05)	7.54			

\*Figure in parentheses are angular transformed values

sions selected from all wild species of the *Lens* genus were screened for *Stemphylium* blight (SB) resistance. From the experiment it was showed that among 86 screened entries, 52%, 37% and 6% were showed resistant, moderately resistant and moderately susceptible category respectively. It could be noticed that the resistant level was relatively quite high as compared to susceptible status (Figure 1). On the basis of disease severities index the three genotypes were found immune and forty genotypes five were showed resistant against *Stemphylium* blight. These genotypes can be used as good donor for evolving resistant varieties against *Stemphylium* blight in lentil.

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