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SCREENING OF LENTIL GENOTYPES AGAINST COLLAR ROT UNDER CONTROLLED CONDITIONS

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ABSTRACT

Lentil is an important pulse crop, contributes about 8-9% of the total pulse production in India and is also a major source of protein, minerals and vitamins. Collar rot of lentil is an important seedling disease caused by *Sclerotium rolfsii* Sacc. In this study, twenty-one lentil genotypes were evaluated for their resistance to collar rot, caused by *S. rolfsii*, under controlled pot conditions with artificial inoculation. Result revealed that RKL 603 11-1 and RKL 20-26 found resistance to collar rot in lentil. Additionally, nine genotypes, namely RKL 16-332, RKL 603 11-6, RKL 14-270, RKL 3-91, RKL 14-49, RKL 14-20, RKL 16-401, RKL 14-175, and RKL 14-101, exhibited a moderately resistant response. Eight genotypes, including RKL 58F 3715, RKL 14-29, RKL 14-35, L 4727, RKL 27C 12106, L 4076, RKL 16-324 and Kota masoor 1, were identified as susceptible. Furthermore, two genotypes, JL-3 and IPL 316, displayed a highly susceptible reaction to collar rot disease.

Key words : Lentil, Genotypes, *Sclerotium rolfsii* and Collar rot.

Introduction

Lentil is attacked by fungal, viral and bacterial pathogens. *Sclerotium rolfsii* is one of the important soils borne fungal pathogens having a wide host range and world-wide distribution (Punja, 1988), causing collar rot, root rot, stem rot and wilt on more than 500 plant species including almost all the agricultural and horticultural crops. The fungus is a soil borne pathogen of very aggressive nature and causes considerable damage to young seedlings causing collar rot resulting in substantial yield losses. It survives in the soil for years by producing sclerotia. Infected seedlings exhibit damping-off symptoms, while mature plants turn pale, droop, and dry out (Njambere and Chen, 2011). The disease severely impacts on yield, leading to reduced cultivation areas. To restore lentil production, it is essential to manage collar rot effectively. This disease is particularly problematic for farmers in South-Eastern Rajasthan. The fungus infects lentil crops from the seedling stage to flowering, with seedlings being particularly vulnerable. The present study aims to determine which genotypes of lentil are resistant to *Sclerotium rolfsii*. Application of fungicides is one option to address this problem, however due to the technical difficulties of applying chemicals in the soil, field application is not viable. The development of resistant cultivars is the best long-lasting, efficient, and ecofriendly substitute of chemical fungicides to solve this problem. Identification of resistant sources against this disease has been reported but stable resistance could not be achieved due to the prevalence of aggressive isolates of *S. rolfsii* (Sharma and Jodha, 1984). Moreover, these diseases are very difficult to control using chemicals or cultural practices. There are only few reports available on sources of resistance against lentil collar rot. The present study was conducted with the aim of evaluating lentil genotypes resistant to collar rot under arterially inoculated pot and field conditions, keeping in mind the aforementioned facts.

Material and Methods

Isolation and purification of *Sclerotium rolfsii* from infected plants

Infected lentil plants were collected from AICRP on MULLaRP at Agricultural Research Station, Ummedganj-Kota. Sections of 1-2 mm diameter were cut from infected collar region and washed with distilled water. It was then surface sterilized by dipping in mercuric chloride solution (0.1%) for 30 seconds followed by washing in sterile distilled water for 2-3 times. The sections were then placed in sterilized potato dextrose agar (PDA) media and incubated at 28±1°C in incubator for 7 days for the pathogen growth. The culture was maintained on PDA slants at 5±1°C and preserved for further studies.

Mass multiplication

For mass multiplication of *S. rolfsii* was multiplied in sand maize medium and then incubated for 7 days at a temperature of 28±1^{0}C. The sand maize medium was prepared by mixing 90 g of river bed sand, 10g of maize meal and 20 ml of distilled water in a 250 ml conical flask. The sterilized medium in the flask was inoculated with a bit of actively growing fungal culture and then incubated at 28±1°C for 15 days. Once fully grown, the fungal inoculum was thoroughly mixed with sterilized soil and filled into pots. The soil was moistened for one week before sowing the seeds.

Screening of lentil genotype against collar rot disease

Lentil genotypes were procured from AICRP on MULLaRP, ARS, Kota. To find out the sources of resistance, lentil entries were evaluated for their reaction against *Sclerotium rolfsii* under pot condition as per standard evaluation system. Prepare a sand-maize meal medium by placing 90 g of riverbed sand, 10 g of maize meal and 20 ml of distilled water in each 250 ml Erlenmeyer flask. Autoclave medium in flasks at 121.6^{o}C and 15lb for 15 minutes. Inoculate each flask with a bit of actively growing fungal culture and incubate at 25°C for 15 days. The different varieties were seeded in 12-inch size of pots. Each pot was filed with sterilized soil with compost. Each pot was inoculated with mass culture of pathogen @ 10gm per pot (12inch) two days prior to seeding. Approximately 10 seeds were seeded in each pot. The pots were irrigated frequently and maintained the soil humidity. Observations on per cent mortality was started from ten days and recorded at five-day intervals up-to maturity and statistical analyzed. Percent Disease Incidence will be calculated as per below formula.

Table 1 : IIPR rating scale.

S. no.	Reaction	Per cent Mortality
1	R- Resistant	0-10
2	MR- Moderately Resistant	11-20
3	MS- Moderately Susceptible	21-30
4	S- Susceptible	31-50
5	HS- Highly Susceptible	51-100

$$\text{Percent Disease Incidence (PDI)} = \frac{\text{Total infected plant}}{\text{Total emergence of plant}} \times 100$$

Results and Discussion

The present investigations on various aspects of collar rot of lentil caused by *Sclerotium rolfsii* including screening of lentil cultivars, against *S. rolfsii*. The results obtained on these aspects are presented here under.

Evaluation of lentil cultivars against collar rot disease in controlled conditions

In present study, 21 genotypes of varieties lentil were screened against collar rot caused by *Sclerotiun rolfsii* in artificial inoculation in pot conditions. The result revealed RKL 603 11-1 and RKL 20-26 were found resistant against collar rot of lentil. However, nine genotype *viz.*, RKL 16-332, RKL 603 11-6, RKL 14-270, RKL 3-91, RKL 14-49, RKL 14-20, RKL 16-401, RKL 14-175, RKL

Plate 1 : Mass multiplication of *S. rolfsii* in sand maize medium.

Plate 2 : Resistant RKL 603-11-1.

Table 2 : Screening of lentil genotype against the collar rot under pot condition.

S. no.	Name of genotype	Diseases incidence (%)	Reaction
1.	RKL 58 F 3715	33.83 (35.55)	Susceptible
2.	JL 3	54.83 (47.77)	Highly Susceptible
3.	RKL 16 332	14.17 (22.09)	Moderately Resistant
4.	RKL 14-29	35.67 (36.66)	Susceptible
5.	RKL 14-35	33.50 (35.33)	Susceptible
6.	RKL 603-11-6	14.50 (22.25)	Moderately Resistant
7.	RKL 603-11-1	8.50 (16.93)	Resistant
8.	IPL 316	55.83 (48.07)	Highly Susceptible
9.	RKL 14-270	13.50 (21.55)	Moderately Resistant
10.	L 4727	35.83 (36.74)	Susceptible
11.	RKL 3-91	12.17 (20.28)	Moderately Resistant
12.	RKL 27C 12106	34.33 (35.86)	Susceptible
13.	RKL 14-49	17.33 (24.56)	Moderately Resistant
14.	RKL 14-20	14.17 (22.09)	Moderately Resistant
15.	RKL 16-401	12.50 (20.69)	Moderately Resistant
16.	RKL 14-175	15.83 (20.38)	Moderately Resistant
17.	RKL 14-101	12.50 (20.69)	Moderately Resistant
18.	L 4076	41.50 (40.10)	Susceptible
19.	RKL 16-324	40.50 (39.52)	Susceptible
20.	Kota Masoor-1	33.17 (35.15)	Susceptible
21.	RKL 20-26	8.33 (16.75)	Resistant
	SEm ±	1.34 (1.16)	
	CD (p=0.05)	3.85 (3.32)	

Plate 3 : Moderate resistant RKL 14-20.

14-101 exhibited moderately resistant reaction. None of the genotype found moderately susceptible. Eight

Plate 4 : Susceptible RKL 16-324.

Plate 5 : Highly Susceptible IPL 316.

genotypes *viz*., RKL 58F 3715, RKL 14-29, RKL 14-35, L 4727, RKL 27C 12106, L 4076, RKL 16-324, Kota masoor 1 were found as susceptible. While, two genotype *viz*., JL- 3 and IPL 316 showed highly susceptible reaction against collar rot diseases (Table 2). Result indicated with findings of Koshariya *et al.* (2020) screened total 271 lentil entries against collar rot disease of lentil, only 3 germplasm, DPL-62, VL-1 and VL-4, were found highly resistant to this disease, whereas, 10 germplasm DPL-15, ASHA, NDL1, PL-5, Ranjan, PL-406, PL-234, VL-103 Kirsey fokar and Dehati Masoor were identified as resistant. Rest of germplasm lines were found from susceptible to highly susceptible to the disease. Mondal *et al*. (2021) screened eleven lentil varieties and result found that maximum disease incidence was recorded in WBL-81 (37.89%) while minimum disease incidence was observed in LL-56 (3.33%) against collar rot of lentil. Chopra *et al*. (2023) tested 20 genotypes of lentil against collar rot caused by *S. rolfsii*. Out of twenty genotypes, none of the genotype found highly resistant and resistant against collar rot. Three genotypes of lentil *viz.*, JL 3, PLL 1802 and RVL17-11 has been found moderately resistant reaction against the collar rot. While, eleven genotypes viz., L 4076, RKL 605-3, L 4729, IPL344, IPL 341, RKL 58 F 3715, L 4727, PLL1801, TCA-DL-18-1, VL 531and RKL 61 F-215 exhibited susceptible reaction. However, five genotypes

viz., JL-3, RVL 18-4, SJL 6-3, RL 10, IPL 316 showed highly susceptible reaction against collar rot.

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