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Screening of Chickpea Genotypes Against Collar Rot of Chickpea Caused by *Sclerotium rolfsii* Sacc. Under Field Conditions

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ABSTRACT

Collar rot of chickpea (*Cicer arietinum*) is caused by the ubiquitous soil-borne pathogen *Sclerotium rolfsii*. Collar rot is one of the fast spreading fungal disease of chickpea and at seedling stage it causes heavy losses. Present study was carried out to find the resistant sources from 112 chickpea entries comprising of desi and kabuli types. The fungus was isolated from diseased chickpea plants collected from research farm at seedling and vegetative stage of the crop, purified and maintained on PDA for further screening process. Mass culture of the pathogen was prepared on wheat grains media and inoculated in collar zone of chickpea plant, 15 days after sowing. All the chickpea entries were susceptible to highly susceptible to collar rot disease.

Key words *Screening, chickpea genotypes, collar rot, Sclerotium rolfsii.*

Chickpea (*Cicer arietinum* L.) is the world's third most important food legume after drybean and pea. India is the largest producer of chickpea, contributing more than 70 per cent of the total world production. Among the soil borne diseases of chickpea, collar rot is important disease causing seed rot and seeding mortality in the initial stage of crop growth up to 45 days. The mortality ranges from 54.7-95% in India (Kotasthane *et.al.*, 1976) causing significant reduction in plant population. Collar rot caused by *Sclerotium rolfsii* Sacc., is one of the several fungal diseases affecting this crop and is reported almost all over the world whereever chickpea is grown (Nene *et al*., 1984). Collar rot is a fast spreading and destructive disease of chickpea. It has wide host range (Aycock, 1966 and Punja, 1988) and an omnivorous soil borne fungus, parasitizing root and collar region of the plant thus, producing wilt like symptoms. Generally, the disease is severe in loamy soil regions and more prevalent in soybean- paddy based cropping system, when soil moisture is high and temperature is warm at the seedling stage. Affected seedlings turn yellow and die. The seedlings generally collapse and show rotting at the collar region and below. As the genetical resistance is not available in chickpea crop till now, the only practicable and cost-effective control for such a devastating soil-borne pathogen is selection of cultivars. Therefore, the present study was conducted to screen the chickpea entries against *S. rolfsii* for the identification of resistant sources in available genotypes.

MATERIAL AND MATHODS

Isolation of pathogen *Sclerotium rolfsii* from diseased samples

Isolation was made from the fresh diseased plant samples collected from research farm at seedling and vegetative stage of the crop. The roots of diseased plant showing symptoms were washed thoroughly with water, small pieces of infected roots were cut with the help of sterilized blade. These pieces were surface sterilized with 1:1000 mercuric chloride ($HgCl_2$) solution for one minute followed by three washings with sterilized distilled water to remove traces of $HgCl_2$. The pieces were then transferred aseptically to Petri plates containing sterilized PDA and incubated at 25± 2^0C for three to five days and examined at frequent intervals to see the growth of the fungus developing from different pieces. As and when fungal colony appears they were transferred to PDA slant for purification of culture.

Mass multiplication of *Sclerotium rolfsii*

The *S. rolfsii* was mass multiplied in wheat grain media. Wheat grains were soaked in water for 6 hrs then little boiled, drained excess water, air dried and supplemented with 50 g calcium carbonate in 1 kg wheat grains. Two hundred gram wheat grains were filled in 6 x 11 inches polythene bags and plugged with non absorbent cotton with the support of one inch diameter PVC ring (length 1.5 inch). These bags were sterilized in autoclave with 1.02 kg/cm^2 pressure for 25-30 minutes. The sterilized bags were inoculated with 2-3 mycelial discs (5 mm) taken from the periphery of the with 5 days old culture of *S. rolfsii* previously grown on PDA. The inoculated bags were incubated in BOD incubator at 25± 2^0C for 15 days. Multiplied culture of *S. rolfsii* inoculated in collar zone of chickpea plant, 15 days after sowing**.**

Screening of chickpea entries

Seeds were procured from AICRP (All India Coordinated Research Project) on Chickpea, Raipur. The field experiment was laid out during *rabi* season 2015-16 and 2016-2017 at the research farm, IGKV Raipur. One hundred twelve entries were screened against *S. rolfsii*. Each test entry was sown in a plot of two rows of 5 meter length 30 cm apart alternating with one row of susceptible check variety L 550 after every two test entry and replicated

Table 1. IIPR rating scale

S. No.	Reaction	Per cent mortality	Score
1	R- Resistant	< 10	1
2	MR- Moderately Resistant	10 – 20	2
3	T- Tolerant	21 – 30	3
4	S- Susceptible	31 – 40	4
5	HS- Highly Susceptible	> 40	5

twice. Observations on emergence were recorded at ten and twenty DAS. Culture of *S. rolfsii* was artificially inoculated in collar zone 15 days after sowing**.** Light irrigation was given just to activate the growth of fungus. Observations on per cent mortality were started from ten days after inoculation and recorded at five day intervals upto marurity, finally computed as follows.

$$\text{Per cent incidence} = \frac{\text{Total infected plant}}{\text{Total emergence of plant}} \times 100$$

RESULTS AND DISCUSSION

In present study, 112 chickpea entries were screened against collar rot pathogen under field conditions. All the entries were susceptible to highly susceptible to collar rot**.** None entry was resistant or moderately resistant lines to collar rot. This shows a high level of aggressiveness of the pathogen or relatively narrow diversification of genetic material under study. Gaurkhede *et al.* (2015) reported that in a field screening of 284 chickpea germplasm accessions against collar rot, 9 were found free from disease and 29 exhibited < 10 per cent mortality due to collar rot. Gupta and

Table 2. Reaction of chickpea entries against collar rot of chickpea

Sr. No.	Per cent mortality	Score/ reaction	Name of entries	Total entries
1	Less than10	1 (R)	Nil	Nil
2	10 – 20	2 (MR)	Nil	Nil
3	21 – 30	3 (T)	Nil	Nil
4	31 – 40	4 (S)	**AVT-1 (RF)**: RSG 888 (ch), CSJ 515 (ch), RSG 931 (ch), GNG 2263 **IVT (RF)**:IPC 2010-142, RG 2009-01, GNG 2307, GJG 1316, BG 3066, NBeG 740, RSG 888 (ch), H 12-80, GJG 1307, GNG 2294, DBGV 104, BG 3065, CSJ 515 (ch), CSJ 872, Phule G 13107, DIBG 202, RSG 931(ch), Phule G 12113, RSG 931(ch), BGD 111-1, CSJ 870, NBeG 738, IPC 2012-31.	27
5	Above 40%	5 (HS)	**AVT-1 (DESI)**: GNG 2207, NBeG 471, PG 170, Phule G 12110, GNG 2264, Phule G 12107, **AVT-2 (DESI)**: NBeG 4G2 Phule G 0405, BG 3043, JG 16 (ch) GAG 1107, JG 36. **IVT (DESI):** GL 29095, H12-26, GNG 2302, GNG 1958(ch), BG3063, AKG 1201, DIBG 201, NBeG 806, JG 74315-2, GNG 2300, CSJ 859, IPC 2011-85, PG 160, IPC 2011-141, NDG 14-11, GJG 1320, NBeG 807,Phule G 0616, Phule G 13103, AKG 1109, H12-01, CSJ 855, GNG 1581(ch), GJG 1318, PG 172, GL 12021, BG 3064. **AVT-1 (LS)**: GNG 2261, GNG 2215, IPC 2010-134, BG 3054, RSG 963(ch), IPC 2007-28, PG 0104, **AVT-2(LS):** PG0109, RSG 963(ch), IPC 2010-62 **IVT(LS):** CSJ 887, RSG963(ch), GL 12003, IPC 2012-49, H 12-62, BG 3068, H 12-55, JG 74315, IPC 2012-98, BG 3067, NBeG 507, GJG 1319, GNG 2299, PG 158, JG 24, Phule G 0719-10, NDG 14-24, CSJ 884, GL 29098, NBeG 511, GNG 2304, Phule G 13110 **Mechanical Harvesting:** DBGV 3205, Phule G 08108, BG 3069, CSJ 1002, BG 3061, DBGV 3104, BG 3070, IPC 2012-30, CSJ 1001, PG 173, Phule G 0805-5, CSJ 515 (ch), BG 3062	85
Total entries			112	
L.S.I.			4.75	

Mishra, (2009) screened among 120 lines of chickpea in disease sick fields for 3 consecutive years and 32 entries performed consistent resistant reaction to collar rot. Twelve accessions were found free from collar rot during the testing years under high disease pressure. Hussain *et al*., (2005), screened 57 cultivars and found only one genotype highly resistant. Sugha *et al*., (1991) evaluated 210 chickpea lines/ cultivars from different sources. None of these were resistant or even moderately resistant.

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