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Screening of chickpea varieties against collar rot disease caused by *S. rolf sii*

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Abstract

Collar rot of chickpea caused by *Sclerotium rolf sii* has a major constraint and potential threat to successful chickpea cultivation. Therefore, efforts were made to screen the different varieties in pot condition against *Sclerotium rolf sii*. In order to find out the sources of resistance in chickpea for *Sclerotium* rot disease, 20 chickpea cultivars which were collected from Agricultural Research Station, Badnapur and screened under artificial condition in pots at College of Agriculture, Latur during Rabi 2018- 19. Results revealed that, under pot culture, all the 20 chickpea cultivars exhibited different reactions against *S. rolf sii*. However, seven cultivars viz., PG-8108, BCP-60, BCP-10, Vishal, Digvijay, Vijay and Saki-9516 were found resistant, four cultivars viz., Jaki-9218, Pkv-Kabuli-2, BDNG-200-31 and BDNG-2010-1 were found moderately resistant, two cultivars BDNG-797 and Virat, were found moderately susceptible, Three cultivars BDNG-798, BDNG-799 and BDNG-2015-2 were found susceptible, whereas, four cultivars viz., H-208, BDNG-804, BDN-9-3 and BDNGK-807 were found highly susceptible to collar rot disease.

Keywords: Chickpea, *Sclerotium rolf sii*, resistent cultivars and screening

1. Introduction

Chickpea (*Cicer arietinum* L.) is the world's third most important pulse crop after dry beans (*Phaseolus vulgaris* L.) and dry peas (*Pisum sativum* L.) (Dhar and Gurha, 1998) [2]. Chickpea is a vital source of plant derived edible protein in many countries. Chickpea also has advantages in the management of soil fertility, particularly in dry lands and the semiarid tropics. Among the pulse crops, chickpea occupies a prominent place and popular due to high nutritional value, high yield potential and low cost of cultivation. It is rich source of proteins (21.1%), carbohydrates (61.5%) and fats (4.5%). There are many reasons for low yield of chickpea such as lack of appropriate technology, use of local varieties, absence of irrigation facilities, growing of chickpea crop on marginal lands and pests and disease problems. Amongst them, collar rot (*Sclerotium rolf sii*) disease of chickpea play an important role in reducing the yield potential of chickpea. Yield losses caused by collar rot of chickpea is 14-74% (Muthusamy and Mariappan, 1991) [3]. Considering the importance of disease in the state efforts were made to screen the different varieties in pot condition against *Sclerotium rolf sii*.

2. Material and Methods

Screening of available chickpea cultivars was conducted in pot containing *S. rolf sii* inoculum developed by the mass multiplication (sick soil) in non-replicated manner.

Observation on disease severity of the variteies was recorded as per rating scale given by Nene *et al.*, 1981 [5] and the variteies were categorised as resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S) and highly susceptible (HS) as described by Nene *et al.*, 1981 [5].

Table 1: Disease rating Scale

SC Scale ALE	Per cent Mortality SCRIPTON	Disease reaction
0	0 to 10% mortality	Resistant (R)
1	10.1 to 20% mortality	Moderately resistant (MR)
3	20.1 to 30% mortality	Moderately susceptible (MS)
5	30.1 to 50% mortality	Susceptible (S)
7	Above 50% mortality	Highly susceptible (HS)

Based on numerical rating observed, per cent disease intensity was calculated by applying the formula as given below.

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$$\text{Per cent Disease Intensity (PDI)} = \frac{\text{Summation of numerical rating}}{\text{No. of plants observed} \times \text{maximum rating}} \times 100$$

Further, per cent disease control (PDC) will be worked out by applying the formula.

$$\text{Per cent Disease Control} = \frac{\text{PDI in control plot} - \text{PDI in treatment plot}}{\text{PDI in control plot}} \times 100$$

3. Results and Discussion

3.1 Screening of chickpea cultivars against *S. rolfisii* (pot culture)

A total of 20 cultivars/germplasm lines of chickpea were collected from Agricultural Research Station, Badnapur and screened under artificial inoculation conditions in pots at College of Agriculture, Latur during *Rabi* 2018-19 against *S. rolfisii*.

Results (Plate, Table 2) revealed that, under pot culture, all the 20 chickpea entries exhibited different reactions against *S. rolfisii*. However, seven cultivars *viz.*, PG-8108, BCP-60, BCP-10, Vishal, Digvijay, Vijay and Saki-9516 were found resistant with 0.00%, 0.00%, 04.00%, 04.50%, 5.92%, 07.14% and 05.82% disease intensity, respectively in the range of 0 to 10% mortality (Resistant category).

Four cultivars *viz.*, Jaki-9218, Pkv-Kabuli-2, BDNG-200-31 and BDNG-2010-1 were found moderately resistant with mean disease intensity in the range of 11.69% (Pkv-Kabuli-2) to 16.34% (BDNG-2010-1), Two varieties BDNG-797 and Virat, were found moderately susceptible with disease intensity of 26.54% and 29.16%, respectively, Three varieties BDNG-798, BDNG-799 and BDNG-2015-2 found susceptible with disease intensity of 40.42%, 36.33% and 35.15%, respectively, whereas, H-208 (55.23%), BDNG-804 (54.10%), BDN-9-3 (80.13%) and BDNGK-807 (95.00%), were found highly susceptible to collar rot (Plate).

3.2 Categorization of chickpea cultivars against *S. rolfisii* (pot culture)

The observations on per cent collar rot incidence were recorded at 15 days before harvesting of the crop and test entries of chickpea were graded and categorized as Resistant (R) (0 to 10% mortality), Moderately resistant (MR) (10.1% to 20% mortality), Moderately susceptible (MS), (20.1% to 30% mortality), Susceptible (S) (30.1% to 50% mortality) and

Highly Susceptible (HS) (above 50% mortality) are presented in Table 3.

The data revealed that the seven cultivars *viz.* PG-8108, BCP-60, BCP-10, Vishal, Digvijay, Vijay and Saki-9516 recorded resistant reaction, four cultivars namely Jaki-9218, Pkv-Kabuli-2, BDNG-200-31 and BDNG-2010-1 recorded as moderately resistant reaction, two cultivars *viz.* BDNG-797 and Virat recorded moderately susceptible reaction, three cultivars like BDNG-798, BDNG-799 and BDNG-2015-2 recorded susceptible reaction and four cultivars like H-208, BDNG-804, BDN-9-3 and BDNGK-807 recorded highly susceptible under artificial inoculation in pot culture which needs to be confirmed under sick pot condition rigorously for two or more years before utilizing it in breeding programme. Similar results were earlier reported by Amule *et al.*, 2014; Nagraja and Saifulla, 2014; Shirsole *et al.*, 2018.



Plate 1: Screening of chickpea cultivars against *S. rolfisii* (pot culture)

Table 2: Reaction of chickpea cultivars to collar rot (pot culture)

Sr. No	Chickpea lines	Average per cent disease intensity	Disease reaction
1	BCP-60	0.00	Resistant
2	BCP-10	04.00	Resistant
3	H-208	55.23	Highly Susceptible
4	Saki-9516	05.82	Resistant
5	BDNG-804	54.10	Highly Susceptible
6	BDN-9-3	80.13	Highly Susceptible
7	BDNG-797	26.54	Moderately susceptible
8	BDNG-798	40.52	Susceptible
9	BDNG-799	36.33	Susceptible
10	BDNG-200-31	15.50	Moderately resistant
11	BDNG-2015-2	35.15	Susceptible
12	BDNG-2010-1	16.34	Moderately resistant
13	BDNGK-807	95.00	Highly Susceptible
14	Virat	29.16	Moderately susceptible
15	Vijay	07.14	Resistant
16	Digvijay	05.92	Resistant
17	Vishal	04.50	Resistant

18	Jaki-9218	15.04	Moderately resistant
19	Pkv-Kabuli-2	11.69	Moderately resistant
20	PG-8108	0.00	Resistant

Table 3: Categorization of chickpea cultivars according to collar rot incidence against *S. rolfisii* under pot culture

Reaction / Category	Average per cent disease intensity	Varieties/Cultivars/Germplasm line
Resistant (R)	0 to 10% mortality	PG-8108, BCP-60, BCP-10, Vishal, Digvijay, Vijay, Saki-9516
Moderately resistant (MR)	10.1 to 20% mortality	Jaki-9218, Pkv-Kabuli-2, BDNG-200-31, BDNG-2010-1
Moderately susceptible (MS)	20.1 to 30% mortality	BDNG-797, Virat
Susceptible (S)	30.1 to 50% mortality	BDNG-798, BDNG-799, BDNG-2015-2
Highly Susceptible (HS)	Above 50% mortality	H-208, BDNG-804, BDN-9-3, BDNGK-807

4. Conclusion

Among 20 cultivars PG-8108, BCP-60, BCP-10, Vishal, Digvijay, Vijay, Saki-9516 found resistant, Jaki-9218, Pkv-Kabuli-2, BDNG-200-31, BDNG-2010-1 found moderately resistant, BDNG-797, Virat found moderately susceptible, BDNG-798, BDNG-799, BDNG-2015-2 found susceptible and H-208, BDNG-804, BDN-9-3, BDNGK-807 found highly susceptible.

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