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Screening of Chickpea Genotypes Against Chickpea Wilt Complex Fungi Under Sick Field Condition

A.V. Zope, O.S. Rakhonde and G.K. Awadhiya
Department of Plant Pathology, Indira Gandhi Agricultural University, Raipur 492 006, Chhattisgarh, India.

Abstract **– To examine the sources of resistance against *Sclerotium rolfsii*, *Rhizoctonia solani* and *Fusarium oxyspo--rum* f.sp. *ciceri*, 32 chickpea genotypes were screened separately in artificially sick plot under field condition. It was revealed that, under artificially inoculated field condition 32 genotypes were screened against collar rot caused by *S. rolfsii*, root rot caused by *R. solani* and wilt caused by *F. oxysporum* f.sp. *ciceri*. No any entry was found to be free from collar rot. Two genotypes (JG 74 and JG 315) showed resistant and 6 genotypes showed moderately resistant reaction to collar rot disease. Among these 32 genotypes, only one genotype (JG 315) showed highly resistant, two (Vaibhav and JG 74) resistant and one (ICC-2242) showed moderately resistant reaction to root rot disease. Two genotypes (ICC-14669 and JG 315) were showed highly resistant, 3 (JG 74, Vaibhav and ICC-440) resistant and 6 showed moderately resistant reaction to wilt disease.**

Keywords **– Varietal Screening, Resistant Donor, Wilt, Chickpea, Root Rot, Collar Rot.**

I. Introduction

Resistance in many plant-pathogen interactions is associated with multifaceted defense systems. The individual components of such systems include hypersensitive responses, chemical weapons like phytoalexins and hydrolytic enzymes and structural barriers like lignin and hydroxyproline rich cell wall proteins (Dixon *et al*., 1994). Proper recognition and judicious regulation of defense responses is essential for host plants, as these responses often have small (but measurable) deleterious effects on plant growth and metabolism (Glazebrook, 2005).

Chickpea (*Cicer arietinum* L.) is most important pulse crop in India, grown for dal making, culinary and for table purposes. It constitutes the main source of protein and several amino acids. It is a very cheap pulse and hence it is also referred as 'Poor man's meat'. The yield of chickpea can be reduced considerably due to many diseases. Seedling mortality in chickpea due to *S. rolfsii* is the main problem in most of the tropical regions. Similarly *R. bataticola, R. solani* and *F. oxysporum* f.sp. *ciceri* also affects at different stages causing range losses in the standing crop. Prolonged saprophytic survival ability of the pathogen in soil makes chemical control and crop rotation ineffective. Resistant cultivars is the most practicable, feasible, and economical approach for the management of chickpea wilt complex fungi, but only a few sources with low level of genetic resistance are available, so there is a need to identify the resistant sources in chickpea.

II. Materials and Methods

Resistance Evaluation in Genotypes under Wilt Sick Field Condition

To examine the sources of resistance against *S. rolfsii, R. solani* and *F. oxysporum* f.sp. *ciceri*, 32 chickpea genotypes were screened separately in artificially sick plot under field condition. The soil maize inoculum of respective fungus was inoculated in the root zone of 30 days old plants, which was then covered with the soil and sprinkled water to provide moisture for optimum growth of fungus.

The observations on collar rot, root rot and wilt incidence were recorded at vegetative stage. The per cent mortality was converted into 0-5 scale (IIPR, 1999) as under

Score	Per cent mortality	Reaction
0	0	Highly resistant
1	1 - 10	Resistant
2	11 - 25	Moderately resistant
3	26 - 50	Moderately susceptible
4	51 - 75	Susceptible
5	76 - 100	Highly susceptible

The location severity index (LSI) was calculated by using the formula given below.

$$\text{LSI} = \frac{\sum (\text{Scores X number of genotypes under different scores})}{\text{Total number of genotypes observed}}$$

The soil maize medium with the 40:40:20 ratio of sand, soil and maize, were thoroughly mixed with 50 ml of water for every 200 g and used for mass multiplication of the fungal pathogens.

III. Results and Discussion

Screening of chickpea genotypes against wilt complex in search of genetic donors

Thirty two genotypes of chickpea were evaluated against collar rot caused by *Sclerotium rolfsii*, root rot caused by *Rhizoctonia solani* and wilt caused by *Fusarium oxysporum* f.sp. *ciceri* separately in artificially sick plot under field condition in search of genetic donors and data presented in Table 1.

Against Collar Rot Caused by Sclerotium rolfsii:

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The data recorded in Table 1 showed none of the entry to be free form collar rot. Two genotypes were resistant (JG 74 and JG 315), 6 genotypes were moderately resistant (Vaibhav, ICC-3325, ICC-6816, ICC-440, A_2K_2 and ADG-1), 2 moderately susceptible, 6 susceptible and 16 showed highly susceptible reaction to collar rot disease under location severity index of 3.875.

Against Root Rot Caused by Rhizoctonia solani:

Among 32 genotypes screened, only one genotype (JG 315) was highly resistant, two genotypes (Vaibhav and JG 74) resistant, one (ICC-2242) moderately resistant, 5 moderately susceptible, 6 susceptible and 17 showed highly susceptible reaction to root rot disease under location severity index of 4.00 (Table 1).

Against Wilt Caused by Fusarium Oxysporum f. sp. ciceri:

Out of the 32 chickpea genotypes, two genotypes (ICC-1469 and JG 315) were showed highly resistant, 3 genotypes (JG 74, Vaibhav and ICC-440) were resistant, 6 (ICC-2720, ICC-637, ICC-1923, A_2LG_4, ADG-1 and A_2K_4) were moderately resistant, 7 were moderately susceptible, 7 were susceptible and 7 were highly susceptible reaction to wilt disease under location severity index of 3.09 (Table 1).

Varietal evaluation were also done by several workers against the wilt complex. Of which Giza 88, L-606 and L-1164 were resistant to wilt complex. In general, a number of entries and varieties of chickpea were reported to be resistance to collar rot, root rot and wilt diseases by various workers from different part of the world (Bekele *et al.*, 1992; Dahiya, *et al.*, 1995; Oad *et al.*, 1995; Tadesse *et al.*, 1995; Deshmukh *et al.*, 1996; Patil *et al.*, 1997; Pithia *et al.*, 2003a; Pithia *et al.*, 2003b).

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Table 1. Screening of chickpea germplasm for resistance of chickpea wilt complex diseases in field condition.

Score	Mortality (%)	Reaction	Genotypes screen for		
			Collar rot	**Root rot**	**Wilt**
0	0	Highly resistant	- Number of genotypes = 0	**JG 315** Number of genotypes = **1**	**ICC-14669, JG 315** Number of genotypes = **2**
1	1-10	Resistant	**JG 74, JG315** Number of genotypes = **2**	**Vaibhav, JG 74** Number of genotypes = **2**	**JG 74, Vaibhav, ICC-440** Number of genotypes = **3**
2	11-25	Moderately resistant	Vaibhav, ICC-3325, ICC-6816, ICC-440, A_2K_2, ADG-1 Number of genotypes = **6**	ICC-2242 Number of genotypes = **1**	ICC-2720, ICC-637, ICC-1923, A_2LG_4, ADG-1, A_2K_4 Number of genotypes = 6
3	26-50	Moderately susceptible	ICC-14669, ICC-9643 Number of genotypes = **2**	ICC-6537, ICC-637, ICC-6816, ICC-3946, ADG-1 Number of genotypes = **5**	ICC-6537, ICC-762, ICC-1205, ICC-95, ICC-9643, ADG-2, ICC-3946 Number of genotypes = **7**
4	51-75	Susceptible	ICC-6579, ICC-9002, ALG-1, ADG-2, ICC-3946, HIG-4 Number of genotypes = **6**	ICC-14669, ICC-6579, ICC-1205, ICC-12307, A_2K_1, HIG-4 Number of genotypes = **6**	IUCC-2242, ICC-9002, ICC 6816, ICC-12307, A2K5, ALG-1, ICCV 2 Number of genotypes = **7**
5	76-100	Highly susceptible	ICC-6537, ICC-2242, ICC-2720, ICC-637, ICC-762, ICC-1205, ICC-95, ICC-12307, ICC-1923, A_2K_1, IDG-6, A_2LG_4, A_2K_4, JG 62, L 550, ICCV 2, Number of genotypes = **16**	ICC-2720, ICC-762, ICC-3325, ICC-9002, ICC-440, ICC-95, ICC-1923, ICC-9643, A_2K_5, IDG-6, A_2LG_4, ALG-1, ADG-2, A_2K_4, JG 62, L 550, ICCV 2 Number of genotypes = **17**	ICC-6579, ICC-3325, A_2K_1, IDG-6, HIG-4, JG 62, L 550 Number of genotypes = **7**
Location severity index (LSI)			**3.875**	**4.00**	**3.09**