

SCREENING OF SOME VARIETIES OF *VIGNA UNGUICULATA* (L.) WALP AGAINST CYST NEMATODE, *HETERODERA CAJANI*

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Ten commonly grown varieties of cowpea were screened under pot trials for their susceptibility of pigeon pea cyst nematode, *Heterodera cajani*. None of them was found to be immune. Out of ten, four varieties showed resistant reaction, two were moderately resistant and rest four showed susceptibility of varying degree. The cyst number and cyst content was maximum (1048 cysts, 183 eggs/cyst) in highly susceptible variety C-152, whereas minimum number of cysts (84) was observed in resistant variety FTC-27. Plant growth parameters also support the above findings.

Keywords : *Heterodera cajani*; Pigeon pea cyst nematode; Varieties.

Introduction

Potentially, resistant variety is considered as the cheapest, easy to be recommended and most practical, least expensive and environmentally safe method of nematode management. It not only reduced the cost of cultivation but also protect plant health and environment. Keeping this view in mind, now breeding work to transfer resistance in commercially suitable cultivars is being done globally. In India major emphasis has been on screening of available germ plasm for resistance against a number of nematodes, besides adopting some exotic cultivars. Considering the importance of cowpea in the economy in Rajasthan, 10 commonly grown varieties of cowpea were tested against *Heterodera cajani* in the present study to locate the source of resistance that could be used by breeders for developing nematode resistant cultivars. Resistance to nematode has been known for many years. Cowpea (*Vigna unguiculata*(L) Walp.) is primarily valued and cultivated for seeds. Pods are generally used as food and plants left after pod harvesting are used as feed for livestock and also valued as cover or green manure crops. The leaves are consumed as green vegetables or for pasturage, hay, ensilage and green manure. The relatively high lysine content (407-497 mg/gN) makes cowpea an excellent improver of protein quality over cereal grains¹. Along with food and feed value it also helps in improving soil fertility by fixing atmospheric nitrogen in the soil by the help of root nodules inhabiting nitrogen fixing *Rhizobium* spp². It is also grown as intercrop with sorghum, castor millet, pigeonpea, maize and ground nut³. Cowpea has genetic variability for susceptibility to root knot nematode⁴. A total of 36 available varieties and lines of cowpea were tested against *Meloidogyne incognita* and *Heterodera cajani* and found none of the variety to be resistant against the nematode⁵. However, cowpea variety C-152 was found least effected against *Rotylenchulus reniformis* infection

while pusa-falguni showed highest resistance⁶.

Materials and Methods

Seeds of ten varieties/accessions of cowpea were screened to locate the source of resistance against the cyst nematode *H. cajani*. The seeds were surface sterilized with 0.1% mercuric chloride solution before sowing. The experiment was conducted in pot trials containing autoclaved soil. Five replicates were made for each variety and each pot was watered daily and supplied with Hoagland's nutrient solution weekly. After germination of seeds only one plant was allowed to grow / pot. One week old seedling were inoculated with 1000 freshly hatched juveniles of *Heterodera cajani*. For raising the inoculum, healthy, equal sized cyst were extracted from inoculum which was maintained on cowpea plant roots. These cysts were extracted by simple visual screening process. Individual cysts were crushed to get eggs. These eggs were incubated at 29±1 °C for hatching. Sixty days after inoculation, plants were uprooted carefully and observations on the weight of root and shoot, number of cyst present/ root system + per pot. Number of nodules were also taken and these findings were compared with uninoculated healthy plants of each variety / accessions. The nematode complete its life cycle in eighteen days on cowpea but the plant matures in sixty days. for this reason, observations were taken sixty days of inoculation. The resistance rating was done on rating scale as given below :

Number of cyst per plant +per kg soil	Resistance rating
0	Immune (I)
1-50	Highly Resistant (HR)
51-200	Resistant (R)
201-400	Moderately Resistant (MR)
401-600	Moderately Susceptible (MS)
601-above	Susceptible

Table 1. Screening of cowpea varieties / accessions against *Heterodera cajani*.

(Observations are mean of five replicates)

S. No.	Variety	Fresh Weight (g)		Dry Weight (g)		No. of nodules	No. of cyst	No. of egg/cyst	No of cyst/100 gm soil	Screening reaction
		Shoot	Root	Shoot	Root					
1.	Ajmer Local (H)	56.4	12.38	7.48	1.46	41	-	-	-	-
2.	Ajmer Local (In)	34.2	4.1	5.48	1.10	24	764	160	51	(S)
3.	RC-19 (H)	37.48	11.08	6.08	1.92	31	-	-	-	-
4.	RC-19 (In)	19.7	7.52	3.16	1.04	14	690	156	45	(S)
5.	FS-68 (H)	27.94	3.04	4.12	0.92	45	-	-	-	-
6.	FS-68 (In)	19.60	2.42	2.80	0.72	34	356	121	37	(MS)
7.	FTC-27 (H)	64.84	6.64	11.94	1.56	39	-	-	-	-
8.	FTC-27 (In)	59.70	5.48	9.13	1.38	31	84	72	11	(R)
9.	GC-3 (H)	27.98	8.44	5.78	1.36	45	-	-	-	-
10.	GC-3 (In)	18.94	6.82	4.42	1.06	37	145	87	12	(R)
11.	Pusa dosfasali (H)	23.78	5.44	2.92	1.52	40	-	-	-	-
12.	Pusa dosfasali (In)	18.94	6.82	4.42	1.06	37	145	87	12	(R)
13.	Pusa falguni (H)	12.78	4.92	4.66	1.88	49	-	-	-	-
14.	Pusa falguni (In)	10.52	3.78	3.78	1.86	41	110	69	11	(R)
15.	C-152 (H)	78.20	10.18	15.64	3.94	56	-	-	-	-
16.	C-152 (In)	28.82	7.32	4.52	1.42	17	1048	183	49	(S)
17.	Pusa Komal (H)	37.56	6.68	5.98	2.52	35	-	-	-	-
18.	Pusa Komal (In)	26.78	4.82	3.72	0.48	27	361	123	39	(MR)
19.	Pusa Barsati (H)	44.42	9.82	9.60	3.30	43	-	-	-	-
20.	Pusa Barsati (In)	38.47	8.76	6.08	2.63	32	187	99	15	(R)

In = Infected; H= Healthy; S= Susceptible; MS= Moderately susceptible; R= Resistant; MR = Moderately Resistant.

Results and Discussion

In the present study regarding varietal screening, out of ten varieties evaluated none was found to be immune to the *Heterodera cajani*. However resistant reaction was shown by four varieties viz. FTC-27, GC-3, Pusa falguni, Pusa barsati. These was gradual decrease of size and number of eggs in the cyst in resistant variety. In present study susceptibility rating was mainly based on cyst number, cyst content and number of cysts per plant. Besides this plant growth characters like fresh and dry root and shoot weight were considered better parameter for comparing the pathogenic effects. Compared with susceptible ones similar findings were supported against *Heterodera avenae*⁷. Rest six varieties showed varying degree of cyst number / root system. FS-68 and Pusa Komal was reported moderately resistant while Ajmer local, RC-19, Pusa dofasali & C-152 was found susceptible to varying degree. Dry weight of shoot and root was remarkably reduced in susceptible varieties. Better growth was observed in FTC-27 which was resistant to *Heterodera cajani*. In C-152 there was a maximum number of cysts (1048 cysts / plant) followed by Pusa dofasali (749 cysts / plant) (Table 1). Least cyst number was 84 and 110 in FTC-27 and Pusa Falguni varieties, respectively. Greater deformed root system was noted in susceptible varieties. Many healthy cysts full of mature eggs was a common feature on susceptible roots. Cysts developed on resistant varieties were deformed having few eggs inside them.

A possible mechanism of disease resistance of cowpea to *H. cajani* may be due to hypersensitivity reaction where a rapid and localized necrosis of plant cell at the site of infection is believed to limit the multiplication and spread of invading organisms. This reaction can be induced by

nematodes or resistant cultivars of host plant or non-host species and this reaction have been reported during the expression of resistance in the different plant nematode combinations⁸.

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