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Screening and identification of sources of resistance against root-knot nematode (*Meloidogyne javanica*) in chilli (*Capsicum annuum*) germplasm*

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India with an area of 5.0 lakh ha and production of 7, 53, 000 tonnes accounting for 32.1% of the world acreage and production was the largest in area and production of chillies during 2007 in the world (FAO Stat database 2007).

One of the main constraints to increase productivity in the country is high susceptibility of chilli crop to pests and diseases which include nematodes. Several species of root-knot nematodes *(Meloidogyne arenaria, M. hapla, M. incognita* and *M. javanica*) are pests of peppers *(Capsicum* spp) worldwide also (Thies and Fery 2002), the most important being *M. javanica* (Treub) Chitwood in India causing severe economic losses (Saxena 1986). Crop losses due to root-knot nematode in tropical countries are estimated to be around 15% (Sasser 1979). The test material consists of 172 chilli germplasm accessions originated/sourced from AVRDC, Taiwan (49 accessions), China (6 accessions), Hungary (8 accessions), Israel (1 accession), Italy (1 accession), Jamaica (1 accession), Mexico (2 accessions), Surinam (1 accession), USA (3 accessions), USDA, USA (46 accessions) and India (54 accessions) including susceptible checks, viz 'California Wonder' and 'Yolo Wonder' were screened for their reaction to root knot nematode *(M. javanica*) in greenhouse pot experiment.

After 45 days of inoculation, the plants were uprooted and roots were gently washed. The reaction of the genotypes based on the severity of gall formation on each plant was assessed by a rating on 0–4 scale with nil galls as – 0; 1–25 galls as – 1; 26–50 galls as – 2; 51–75 galls as – 3 and 76 and above galls as – 4 (Taylor and Sasser 1978). The replicated data was pooled based on the gall index scores and the per cent gall index (PGI) was calculated for each accession as per the following formula.

$$\text{Per cent gall index (PGI)} = \frac{\text{Sum of gall index score values}}{\text{No. of plants observed} \times \text{Max. gall index score}} \times 100$$

The chilli germplasm was grouped into different categories, viz highly resistant (0); resistant (1–10); moderately resistant (11–20); moderately susceptible (21–30); susceptible (31–50) and highly susceptible (51–100) based on the pooled mean PGI as per the methodology of Raghupathi and Narayanaswamy (2001). The summary reaction of germplasm and check varieties against root-knot nematode (*M. javanica*) in terms of per cent gall index (PGI) is given in Table 1.

Out of 172 accessions screened, root-knot nematode infestation was observed in 161 accessions including the check varieties with the remaining 11 accessions being free from the symptoms. The reaction of the germplasm varied from highly resistant to highly susceptible categories with the per cent gall index (PGI) ranging from 0 to 100. Under the highly resistant category, a total of 11 entries, 7 from exotic and 4 from indigenous sources were recorded.

In this experiment, conspicuously, there had been no entries under the resistant and moderately resistant categories indicating that, resistance to root-knot nematode (*M. javanica*) is governed by dominant gene. Out of 11 genotypes which were highly resistant to root-knot nematode, 2 accessions originated from Taiwan ('EC 378632' and 'EC 402113') and found to be highly resistant to 'dieback' and 'sunscald' (Pandravada *et al.* 2007) and also having significant yield potential (2.99 and 1.81 tonnes/ha, respectively) as well (Pandravada 2007) are the most promising accessions for immediate utilization in resistance breeding programmes. This will enable to incorporate the genes to bring in resistance to root-knot nematode *(M. javanica*) into the backgrounds of existing promising varieties or elite material.

*Short note

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Table 1 Reaction of chilli germplasm against root-knot nematode *(Meloidogyne javanica)* based on PGI

PGI (range)	Reaction category	Accession identity
Germplasm		
0	Highly resistant	EC 402105, EC 402113, EC 405253, NIC 19969, IC 214965, IC 214985, IC–215012, EC 391083, EC 391087, EC 378632, EC 378688
Nil	Resistant	Nil
Nil	Moderately resistant	Nil
24 – 28	Moderately susceptible	SR 6462, SD 6149, EC 402109
32 – 50	Susceptible	EC 405257, SD 6190, SD 6218, EC 391082, SD 6125, SR 6509, EC 399543, AAT 7, SR 6482, SR 6485, SR 6514, NIC 23897, EC 378630, EC 378634, EC 405254, EC 405260, SD 6146, SR 6467, SR 6483, SR 6484, SR 6541, EC 391088, PSR 7072, SR 6486, SD 5335, SD 6120, EC 405247, SD 6113, AAT 22, SD 6173, EC 402115, SDS 4512, EC 399567, EC 405259, SD 6222, SDS 3574
51.4 – 100	Highly susceptible	PBC 474, SDS 4517, AAT 2, EC 399574, EC 399550, SD 6160, EC 378631, EC 382175, EC 399572, EC 399575, SR 6428, SR 3429, EC 399556, EC 399535, EC 399539, EC 399565, EC 399570, EC 402101, AAT 16, EC 399546, EC 399563, EC 399574 1, PBC 376, SD 5322, AAT 18, PBC 75/X, EC 399579, EC 399551, EC 321467, EC 388993, EC 399545, EC 399552, SR 6461, EC 402104, EC 402111, Kt-Pl 19, AAT 12, EC 399541, EC 399564, SD 3575, Arka Lohit, SDS 4493, EC 246019, Kt-Pl 28, EC 382017, PBC 535, SR 6515, Pusa Jwala, EC 321433 1, EC 399580, EC 388994, Arka Abhir, EC 402107, SDS 4495, EC 405251, EC 399560, EC 399562, EC 399564 1, EC 339049, EC 382015, EC 382187, EC 388996, EC 421305, EC 402114, Kt-Pl 22, PBC 75/Y, PBC 157, SD 6227, EC 339051, SD 6111, EC 345674, EC 378635, EC 389238, EC 399540, EC 399544, EC 399547, EC 399555, EC 399558, EC 399569, EC 399577, EC 405252, AAT 21, PBC 613, EC 399571, SDS 5251, SR 6456, Kt-Pl 29, EC 378684, Kt-Pl 27, AAT 9, EC 391094, EC 399538, EC 378627, Kt-Pl 24, PBC 204, EC 391086, Kt-Pl 26, EC 339050, EC 399549, EC 399557, AAT 11, PBC 371, Warangal Local, EC 399561, EC 382110, EC 339047, EC 388995, EC 388997, SR 6464, EC 339043, AAT 24, EC 399581, EC 339048, EC 391095, EC 399532, EC 399533, EC 399534, EC 399534 1, EC 345674 1, EC 402117
Check varieties		
96	Highly susceptible	'California Wonder '
96.7	Highly susceptible	'Yelo Wonder'
		CV (%) 42.9

SUMMARY

Out of 172 accessions of chilli germplasm artificially screened against *Meloidogyne javanica* in the glass house conditions, the root-knot nematode infestation was observed in 161 accs. including the check varieties. The reaction of the germplasm varied from highly resistant to highly susceptible with the per cent gall index (PGI) ranging from 0 to 100. A total of 11 entries were found to be highly resistant, 3 entries as moderately susceptible, 36 entries as susceptible and 122 entries as highly susceptible. Conspicuously, there were no entries that reacted under moderately resistant or resistant categories in the germplasm. In the present investigation, a total of 11 accessions found free from the incidence of root-knot originated from India, Taiwan and Hungary were identified as promising. Out of these, 'EC 378632' and 'EC 402113' which were also found to be highly resistant to dieback and sunscald and having significant yield potential are sources for multiple resistance in chilli improvement programmes.

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