BREAKING RESISTANCE IN CHILLI TO ROOT-KNOT NEMATODE BY FUNGAL PATHOGENS*)

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Thirty one cultivars or lines of chilli were screened in the glasshouse against Meloidogyne incognita (Kofoid & White) Chitwood. Cultivars or lines which showed resistance were retested in a field infested with this nematode. The role of Rhizoctonia solani and Pythium aphanidermatum, fungi causing collar rot and damping off, was investigated in the breakdown of resistance in Jowala and Longthin Faizabadi, respectively resistant and moderately resistant to this nematode. Some of the cultivars or lines which showed some resistance in the glasshouse were found to lose it under field conditions. R. solani and P. aphanidermatum were implicated in the breakdown of resistance of Jowala and Longthin Faizabadi to this nematode.

Keywords: Meloidogyne incognita, fungal interaction, plant breeding, disease control, Rhizoctonia, Pythium.

Chilli (Capsicum annuum L) is an important cash crop in India, grown for its pungent fruits which are used as a condiment. It suffers heavy losses wherever fields are infested with root-knot nematode, Meloidogyne incognita (Kofoid & White) Chitwood, a widespread pest in vegetable fields (Swarup, 1962; Sethi et al., 1964; Khan, 1969). Because of the high cost and environmental hazards of chemicals used to control this nematode, sources of resistance to the nematode were sought (Di Vito & Saccordo, 1978; Hare, 1954; Langford et al., 1968).

In this paper I report the role of soil-borne fungal pathogens under laboratory conditions in apparently breaking resistance of two cultivars ‘Jowala’ and ‘Longthin Faizabadi’ to this nematode.

MATERIALS AND METHODS

Glasshouse trial: Surface sterilized seeds of each cultivar/line were sown separately in small wooden trays filled with autoclaved soil. At the three leaf stage, individual seedlings of each cultivar/line were transplanted into 10 cm earthenware pots filled with approximately 1 kg autoclaved soil. One week later, when seedlings were established, 500 freshly hatched juveniles of M. incognita, raised from a single egg-mass on tomato were pipetted into 3-4 holes

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in the soil around each seedling and the holes filled with soil after inoculation. Each treatment was replicated 5 times. Forty days after inoculation, the plants were uprooted, washed thoroughly in running water and the number of galls and egg-masses produced counted. Two methods of assessment of nematode infestation were adopted: (1) quantitative analysis—estimating the number of eggs/root system by treating the entire root system of each plant with 4% sodium hypochlorite, macerating it in a Waring blender, filtering through 25 mesh sieve, adjusting the volume of filtrate to 150 ml and then counting the number of eggs in a 10 ml aliquot under a stereo-microscope; and (2) non-quantitative analysis—assessing the development stages of the nematode by observing macerated pieces of roots stained in cottonblue-lactophenol under the stereo-microscope.

Host reactions were recorded on a 1-5 scale; 1 = no galls, no nematode development in the roots (highly resistant); 2 = few galls (1-25), without egg-masses (resistant); 3 = few galls (1-25), with egg-masses (moderately resistant); 4 = moderate galling (26-50), with egg-masses (susceptible); 5 = severe galling (more than 50), with numerous egg-masses (highly susceptible).

Field trial: Cultivars/lines exhibiting resistance in the glasshouse were later screened in a root-knot infested field. Preplant nematode density varied from 525 to 825 (650 ± 105 S.D.) juveniles per kg soil. Seven seedlings of each cultivar/line raised in root-knot free soil were transplanted at the 3 leaf stage in each microplot (1 x 1 m) arranged in a randomized block design. Each treatment was replicated 3 times. After forty days the plants were uprooted, washed clean and observations made as described above.

Fungus-host-nematode interaction: During the field trial it was observed that cultivars/lines which failed to maintain their resistance suffered collar rot/damping off diseases. *Rhizoctonia solani* and *Pythium aphanidermatum* were found in roots and soil samples from around diseased plants. Fifteen soil samples each weighing approximately 200 g were collected from around diseased plants and approximately 0.4 g soil was taken from each to inoculate soil plates (Warcup, 1950). Ten to fifteen plates were poured from each sample and incubated at 28 ± 1°C: fungi developing after 5-6 days were examined and identified. Fungi were isolated from diseased plants following a serial washing technique (Harley & Waid, 1955) by incubating a number of 0.2 cm washed root segments at 28 ± 1°C for a week on agar.

Fungi which developed on the plates were examined and identified. To investigate the role of these fungi, if any, in breaking the resistance of these cultivars to *M. incognita* a pathogenicity test was carried out on Jowala and Longthin Faizabadi with *R. solani* and *P. aphanidermatum*. The stock cultures of *R. solani* and *P. aphanidermatum* isolated from diseased chilli roots were maintained at room temperatures on potato dextrose broth (Riker & Riker, 1936). Seedlings of Jowala and Longthin Faizabadi were transplanted singly in 10 cm clay pots filled with autoclaved soil. Following a preliminary test to determine