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Preliminary Investigation of a 'Peg Drying' Problem of Groundnut

S B Sharma[1], **V K Mehan**[1], **V M Ramraj**[1], and **D D R Reddy**[2] (1. ICRISAT Asia Center, Patancheru 502 324, Andhra Pradesh, India. 2. Andhra Pradesh Agricultural University, Rajendranagar 500 030, Andhra Pradesh, India)

A new 'peg drying' problem of groundnut has recently been observed in about 6000 ha of the crop grown on sandy soil in the Chirala, Vetapalem, and Bapatla regions of southern coastal Andhra Pradesh, India. The affected plants were slightly stunted, and had mottled leaves and blackened pegs and pods. Some pegs were free from lesions but were flaccid. The roots of the affected plants appeared bushy. In the Vetapalem area, seeds were generally not well-formed and often showed hollow heart symptoms. Yield loss due to this problem was estimated at about 30%.

Soil samples collected from fields with the 'peg drying' problem and from fields with apparently healthy crops were analyzed for pH, nutrient status, fungal pathogens, and nematodes. Density of the ring nematode *Criconemella ornata* ranged between 56 and 472 per 100 cm^3 in the 'peg dried' fields, and between 2 and 22 per 100 cm^3 in fields without the problem. The fungi *Fusarium moniliforme*, *F. solani*, *F. semitectum*, *Rhizoctonia solani*, and *Macrophomina phaseolina* were commonly isolated from the affected pegs.

A pot experiment was set up in the greenhouse at ICRISAT Asia Center to study the problem. Soil collected from the top 20 cm profile of affected fields was placed in 15 cm diameter pots. Main treatments were application of 15 L ha^{-1} dibromochloropropane, Vitavax®, and control (no chemical). Subtreatments were—addition of boric acid (1.43 mg kg^{-1} soil), addition of calcium sulphate (0.5 g kg^{-1} soil), and addition of both boric acid and calcium sulphate to the soil. A week after imposing the treatments, two seeds of the groundnut cv TMV 2 were sown in each pot. There were two pots for each subtreatment and six pots for each main treatment. The pots were irrigated regularly with deionized water, and plant growth was visually assessed before harvesting the plants 102 days after sowing.

Blackening of peg tips was noticed to varying degrees in all the treatments. Plant growth in the nematicide-

Table 1. Soil pH and nutrient status of fields with and without the groundnut 'peg drying' problem, southern coastal Andhra Pradesh.

Soil	pH	Na[2]	Fe	Zn	Ca	Mn	Cu
From apparently healthy fields	7.0 (6.6-7.3)[1]	52 (46-57)	45 (25-65)	0.61 (0.48-0.74)	97 (57-137)	11 (8-13)	0.38 (0.36-0.40)
From fields with 'peg drying' problem	5.4 (5.3-5.5)	21 (16-26)	61 (38-90)	0.28 (0.16-0.36)	40 (15-72)	14 (13-16)	0.27 (0.16-0.36)

1. Figures in parentheses show range.
2. Na, Fe, etc. expressed as mg kg^{-1} soil.

treated soils showed a slight improvement over the control. No improvement in plant growth resulted from the fungicide treatment, and some phytotoxic effect was noticed. Plant growth, root mass, peg number, and pod number and filling were improved by the calcium+boron treatment. All plants in the calcium+boron treatment, and 25–50% plants in soils treated with either calcium or boron, produced pods. Plants in the control treatment generally did not set pods. Low pH, calcium, and zinc concentrations in problem soils (Table 1) and improved response of the plants to calcium+boron indicated the possible involvement of these abiotic factors in the 'peg drying' problem.

Bioefficacy of *Paecilomyces lilacinus* in Controlling *Meloidogyne javanica* (Pathotype 2) on Groundnut

D J Patel, R V Vyas, B A Patel, and **R S Patel** (Department of Nematology, B A College of Agriculture, Gujarat Agricultural University, Anand 388 110, Gujarat, India)

Plant parasitic nematodes, especially the root-knot nematode *Meloidogyne javanica*, are a major constraint to groundnut production and productivity in India and elsewhere. Sharma and McDonald (1990) have reported *M. javanica* infestation on groundnut in light soils of the semi-arid tropics. Several chemicals and bioagents are being used for the management of phyto-nematodes. One bioagent, *Paecilomyces lilacinus*, is an effective microbial tool in controlling root-knot nematodes (Jatala 1986). The present study was undertaken during 1990–92 to test the bioefficacy of *P. lilacinus* against *M. javanica* (Pathotype 2) on groundnut. It was tested in pots in two ways—as seed treatment and as a soil application.

Earthen pots (15 cm diameter) were disinfected with 4% formalin and filled with soil infested with microplot-maintained *M. javanica* (Pathotype 2) (430 second stage juveniles per 100 g soil). In the *P. lilacinus* seed treatment, seeds of groundnut cv GG 2 were coated uniformly with 0.05, 0.1, and 0.2% fungal spore powder containing 10^8 conidia g^{-1}. Soil application of *P. lilacinus* was done @ 1, 2, 3, 4, and 5% (w/w), using 15-day old fungus grown on sterilized neem cake. A treatment of 5% neem cake without fungus was used for comparison. In addition, two controls were maintained, one each for seed treatment and soil application of fungus, thus making a total of 28 treatments in different combinations.

Neem cake and fungus were incorporated in the soil 10 days before seeding. Treatments were replicated thrice using a completely randomized design. Three seeds of groundnut cv GG 2 were sown per pot, thinned to one seed per pot after germination. Observations on fresh shoot and root mass, root-knot index, and nodulation index were recorded 90 days after germination. Data were analyzed statistically to evaluate the different treatments.

Data pooled for 3 years (1990–92) indicated that seed treatment with *P. lilacinus* had no effect on fresh shoot and root mass, or on root-knot index on groundnut plants grown in *M. javanica* infested soils; while *P. lilacinus* soil application gave significant differences for all parameters measured (Table 1). Among the various neem cake based treatments, concentration of 5% (w/w) was the most effective, followed by 4% and 3% fungus application. Concentrations of 1% and 2% fungus application and 5% neem cake (without fungus) gave similar results; these three treatments were all superior to the control in preventing root-knot nematode infestation. Nodulation on groundnut roots by nitrogen-fixing bacteria was not affected by *P. lilacinus*, whether used as seed treatment or as a soil application.

It can therefore be concluded that soil application of *P. lilacinus* @ 3 to 5% (w/w) on a neem cake base is useful for the management of *M. javanica* (Pathotype 2) on groundnut cv GG 2; seed treatment with the fungus may not be effective.

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