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USE OF *PROSOPIS* SPP., IN THE CONTROL OF ROOT INFECTING FUNGI ON OKRA

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Abstract

Soil amendment with *Prosopis juliflora, P.glandulosa, P.cinererea* and neem cake significantly ($p < 0.05$) controlled the infection of *Macrophomina phaseolina, Rhizoctonia solani* and *Fusarium solani* on okra roots. Combined use of *Prosopis* spp., with *Verticillium chlamydosporium* and *Paecilomyces lilacinus* showed better control of root infecting fungi than their separate use. Greater plant height and fresh weight of shoot was produced by *V.chlamydosporium* used with neem cake. *P.cinererea* used alone also significantly ($p < 0.05$) increased plant height and fresh weight of shoot. *Prosopis* spp., can therefore, be exploited for the control of root infecting fungi.

Introduction

Okra (*Abelmoschus esculentus*) an important vegetable crop is known to suffer from root rot diseases caused by *Macrophomina phaseolina, Rhizoctonia solani, Fusarium solani* and *F.oxysporum* (Ehteshamul - Haque & Ghaffar, 1994). Where chemical pesticides are costly and provide short term control (Easton *et al.*, 1975), organic amendment with botanical toxicants have shown promising results in the control of soilborne root infecting fungi (Ghaffar, 1995). Of the various wild trees, *Prosopis juliflora* has shown antimicrobial activity *in vitro* where active compound was identified as juliflorine (Ahmad *et al.*, 1986). An experiment was therefore carried out to see the effect of soil amendment with leaves of *Prosopis* spp., viz., *P.juliflora, P.glandulosa* and *P.cinererea* in the control of root rot disease of okra and its efficacy was also compared with neem cake, *Verticillium chlamydosporium, Paecilomyces lilacinus* and *Bacillus subtilis*.

Materials and Methods

Air dried leaves of *P.juliflora, P.glandulosa, P.cinerarea* and neem cake were powdered and mixed in sandy loam soil, pH. 8.05 @ 1.0% w/w. Amended soil was transferred in 8 cm diam., plastic pots each containing 250 g soil. The soil had a natural infestation of 3-11 sclerotia g^{-1} of soil of *Macrophomina phaseolina* as found by wet sieving and dilution technique (Sheikh & Ghaffar, 1975), 5-10% colonization of *Rhizoctonia solani* on sorghum seeds used as baits (Wilhelm, 1955) and 3500 cfu g^{-1} of

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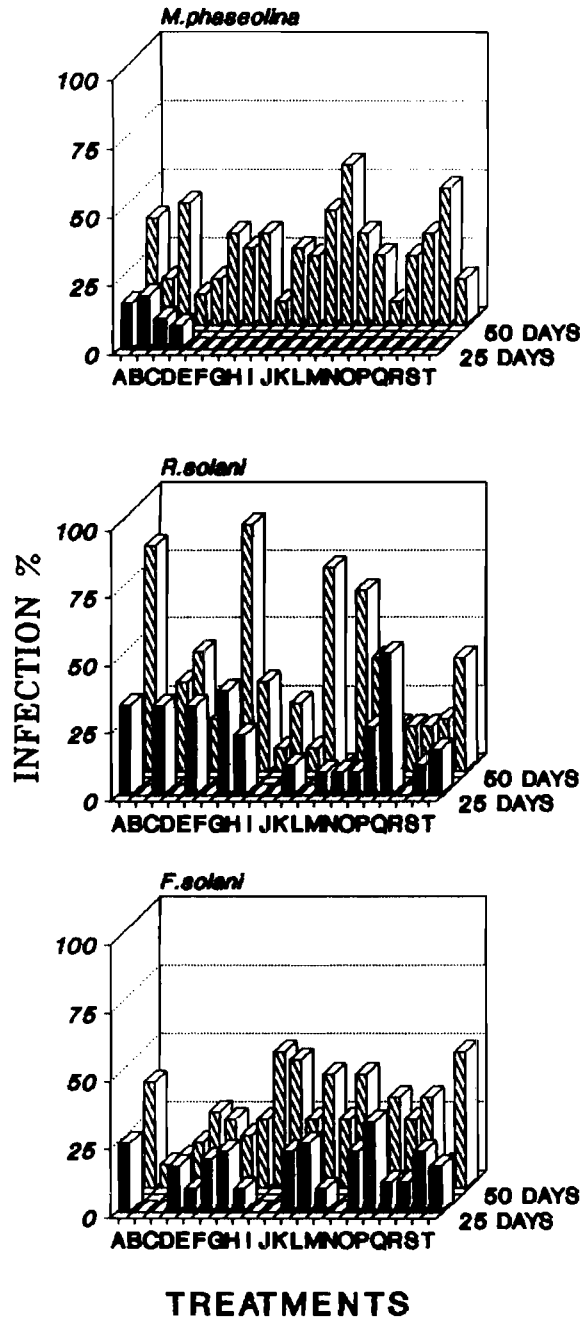

Fig.1. Effect of *Prosopis* spp., neem cake and microbial antagonists on *Macrophomina phaseolina, Rhizoctonia solani* and *Fusarium solani* infection on okra roots:

A = Control, B = *P.juliflora*, C = *P.glandulosa*, D = *P.cinererea*, E = Neem cake, F = *Verticillium chlamydosporium*, G = *Paecilomyces lilacinus*, H = *Bacillus subtilis*, I = B+F, J = B+G, K = B+H, L = C+F, M = C+G, N = C+H, O = D+F, P = D+G, Q = D+H, R = E+F, S = E+G, T = E+H

$LSD_{0.05}$ (Treatments) = 13.9, $LSD_{0.05}$ (Pathogen) = 5.3, $LSD_{0.05}$ (Time) = 4.4.

soil of mixed population of *F.solani* and *F.oxysporum* as assessed by soil dilution technique (Nash & Snyder, 1962). Pots were kept at 50% W.H.C. by watering daily (Keen & Raczkowski, 1921). In another set after 3 weeks of amendments, an aqueous suspension of *V.chlamydosporium*, *P.lilacinus* (10^7 cfu ml^{-1}) multiplied on Potato Dextrose Agar and *B.subtilis* (10^8 cfu ml^{-1}) multiplied on Nutrient Agar, were drenched in each pot @ 25 ml/pot. Five seeds of okra (*Abelmoschus esculentus*) were sown in each pot. Pots without amendment served as control. Each treatment was replicated three times and the pots were randomized on a screen house bench.

Plants were uprooted after 25 and 50 days growth. After washing the roots in tap water, 5 cm long root pieces from each plant were cut, surface sterilized with 1% $Ca(OCl)_2$ for 3 minutes and transferred on to PDA plates containing penicillin (100000 units/litre) and streptomycin (0.2 gm/litre). Plates were incubated for 5 days at 28°C and incidence of root infecting fungi viz., *M. phaseolina*, *R. solani*, and *F. solani* were recorded. Data on plant height and fresh weight of shoots were also recorded. Data were analysed and subjected to factorial ANOVA followed by Least Significant Difference (LSD) according to Gomez & Gomez (1994).

Results

Complete control of *M.phaseolina* infection was found in 25 day old seedling where neem cake, *V.chlamydosporium*, *P.lilacinus* and *B.subtilis* were used alone, or where *V.chlamydosporium*, *P.lilacinus* or *B.subtilis* were used in soil amended with *P.juliflora*, *P.glandulosa*, *P.cinerarea* and neem cake. In 50 day old plants, soil amendment with *P.juliflora*, *P.cinerarea* or neem cake also significantly ($p<0.05$) controlled *M.phaseolina* infection. Greater reduction in *M.phaseolina* infection was found where *V.chlamydosporium* and *P.lilacinus* were used with *P.juliflora* and *P.cinererea* followed by use of *B.subtilis* with neem cake. Soil amendment with *P.juliflora* and use of *V.chlamydosporium* showed complete control of *R.solani* infection in both 25 and 50 day old plants. Soil amendment with *P.cinererea* or use of *V.chlamydosporium* with *P.juliflora*, *P.glandulosa* or neem cake and *P.lilacinus* with *P.juliflora* also showed complete reduction in *R.solani* infection in 25 day old okra seedlings. Similarly in 25 day old seedlings soil amendment with *P.juliflora* or *P.glandulosa* alone or *P.juliflora* with *V.chlamydosporium*, *P.lilacinus* or *P.glandulosa* with *B.subtilis* completely reduced *F.solani* infection. In 50 day old plants *P.juliflora*, *P.glandulosa*, *P.cinererea*, *V.chlamydosporium* or *P.lilacinus* significantly ($p<0.05$) reduced *F.solani* infection. Use of *B.subtilis* with *P.juliflora*, *P.cinererea* and *V.chlamydosporium* with *P.cinererea* and *P.lilacinus* with neem cake also significantly ($p<0.05$) controlled *F.solani* infection on 50 day old okra seedlings (Fig. 1). Greater plant height and fresh weight of shoot was produced where neem cake was used with *V.chlamydosporium* followed by *P.cinererea* used alone (Fig. 2).

Discussion

In the present study, use of soil amendment with *Prosopis* spp., viz., *P.juliflora*, *P.glandulosa*, *P.cinererea* and neem cake significantly ($p<0.05$) reduced the infection

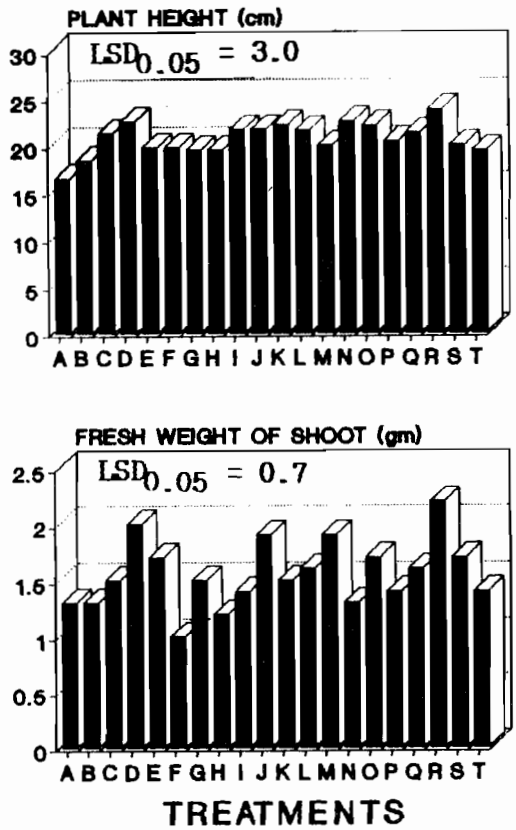

Fig. 2. Effect of *Prosopis* spp., neem cake and microbial antagonists on growth of okra plant:
A = Control, B = *P.juliflora*, C = *P.glandulosa*, D = *P.cinererea*, E = Neem cake, F = *Verticillium chlamydosporium*, G = *Paecilomyces lilacinus* H = *Bacillus subtilis*, I = B+F, J = B+G, K = B+H, L = C+F, M = C+G, N = C+H, O = D+F, P = D+G, Q = D+H, R = E+F, S = E+G, T = E+H

of *M.phaseolina*, *R.solani* and *F.solani* on okra roots. Soil amendment with neem cake has been reported to control infection of *M.phaseolina*, *R.solani* and *Fusarium* spp., on mungbean (Ehteshamul - Haque *et al.*, 1995) and also reduced pre-emergence and post-emergence mortality of cotton caused by *M.phaseolina* and *R.solani* (Jeyarajan *et al.*, 1987). *P.juliflora* has been reported to contain alkaloids (Ahmad *et al.*, 1989), terpenoid diketone (Ahmad & Sultana, 1989) where juliflorine was found as an antimicrobial compound (Ahmad *et al.*, 1986). In the present study microbial antagonists viz., *Verticillium chlamydosporium* and *Paecilomyces lilacinus* and *Bacillus subtilis* showed significant results in the control of root infecting fungi. *V.chlamydosporium* and *P.lilacinus* (Ehteshamul - Haque *et al.*, 1994) and *B.subtilis* (Ehteshmaul - Haque *et al.*, 1990) has been reported to reduce infection of root infecting fungi. Combined use of *Prosopis* spp., with *V.chlamydosporium* and

P.lilacinus also showed better control of root infecting fungi than their separate use. *Prosopis* spp., which grow wild in the sandy desert with high salinity can therefore be exploited to provide organic substrates in the biocontrol of soilborne root infecting fungi for a disease free crop.

Acknowledgements

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