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EFFECT OF MICROBIAL ANTAGONISTS IN THE CONTROL OF ROOT ROT OF TOMATO

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Abstract

Seed treatment with microbial antagonists viz., *Trichoderma harzianum, Gliocladium virens, Paecilomyces lilacinus, Rhizobium meliloti* and *Streptomyces* sp., completely controlled infection of tomato roots by *Fusarium oxysporum* in 30 and 120 day old plants. Against *Macrophomina phaseolina* the effectiveness of microbial antagonists declined with time and only *Gliocladium virens* was able to reduce *M. phaseolina* infection after 120 days of treatment. Higher germination of seeds, fresh weight, shoot length and plant length at all intervals as compared to control was observed in *Paecilomyces lilacinus* and *Rhizobioum meliloti* treatments followed by *Gliocladium virens, Trichoderma harzianum* and *Streptomyes* sp.

Introduction

Tomato (*Lycopersicon esculentum* Mill) an important vegetable crop of Pakistan is known to suffer from a number of diseases which adversely affect crop production. Of the diseases transmitted through seeds, *Fusarium oxysporum* (Huango & Sun, 1982; Ricker, 1987; Nutter *et al.,* 1978; Sonoda, 1976) produces wilting and root rot of tomato. In Pakistan, roots of tomato have been found to be infected by *Macrophomina phaseolina, Rhizoctonia solani* and *Fusarium* spp., (Ghaffar, 1988). Considering the cost of chemicals and the hazards involved in their use, biological control has been suggested as an alternative method of plant disease control (Mulder, 1975). The present report describes the effect of microbial antagonists viz., *Trichoderma harzianum, Gliocladium virens, Paecilomyces lilacinus, Rhizobium meliloti* and *Streptomyces* sp., used as seed dressing in the control of root infecting fungi of tomato.

Materials and Methods

Tomato seeds were coated with spore suspension of 7 day old culture of microbial antagonists viz., *T. harzianum, P. lilacinus, G. virens, Streptomyces* sp., and *R. meliloti* @ $6.5x10^7$ $6.0x10^7$, $1.5x10^7$, $3.7x10^7$ and $1.13x10^7$ cfu/seed, respectively, using 1% gum arabic solution as sticker. Ten seeds were sown in 8 cm diam., plastic pots, each pot contained 250 g non-sterilized sandy loam soil, pH 7.2. The soil moisture was adjusted and maintained at 50% WHC. Each treatment was replicated 3 times and pots were randomized. Plants were uprooted at 30, 60, 90 and 120 days intervals. Ten one cm long root pieces from each plant were surface sterilized for 2 minutes with 1% $Ca(OCl)_2$ before transfer on PDA containing Penicillin (100,000 units/litre) and Streptomycin (0.2 g/litre). Plates were incubated for 4 days at 28°C for determining infection of roots by root infecting fungi.

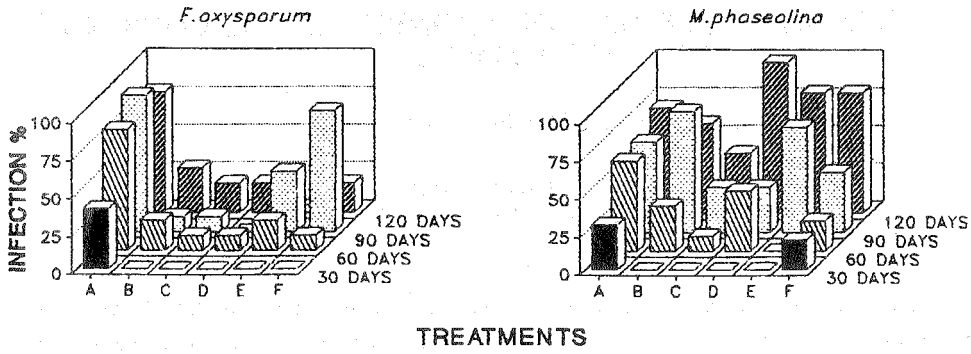

Fig.1. Effect of microbial antagonists on root infecting fungi of tomato.
A= Control, B: *Trichoderma harzianum*, C= *Gliocladium virens*, D= *Rhizobium meliloti*, E= *Streptomyces* sp., F= *Paecilomyces lilacinus*.

Results and Discussion

In 30 day old tomato seedlings, 100% reduction in infection of *F. oxysporum* was observed as compared to control where *T. harzianum, P. lilacinus, G. virens, Streptomyces* sp., and *Rhizobium meliloti* were used as seed-dressing (Fig.1). The effectiveness of these antagonists was evident even after 120 days of treatment where significant reduction in infection of *F. oxysporum* was observed. Similarly infection of *M. phaseolina* in 30 day old tomato seedlings reduced by 100% in *P. lilacinus, G. virens, T. harzianum, Streptomyces* sp., and *R. meliloti* treatments. However, the effectiveness of these microbial antagonists against *M. phaseolina* declined with time and only *G. virens* was able to reduce *M. phaseolina* infection after 120 days of treatment. Higher germination of seeds, fresh weight, shoot length and plant length at all intervals as compared to control was observed in *P. lilacinus* and *R. meliloti* treatments followed by *T. harzianum, Streptomyces* sp., and *G. virens* (Fig.2).

There are reports that use of microbial antagonists as seed treatment showed promising results in reducing the infection of *F. oxysporum* in tomato plant. *G. virens* showed strong antagonistic effect on *F. oxysporum* f. sp. *lycopersici* (Cipriano *et al.*, 1989). Seed treatment with *Trichoderma harzianum* reduced infection of *F. oxysporum* and increased crop yield in tomato (D'Ercole & Nipoti, 1986). *Streptomyces* spp., are known to produce broad spectrum antibiotic (Broadbent, *et al.*, 1971). Treatment of tomato seeds with culture filtrate of *Streptomyces* sp., before sowing reduced infection of seedlings by *F. oxysporum* (Tsintasdze & Tsilosani, 1973). Similarly *R. meliloti* inhibited radial growth of *M. phaseolina* and reduced the severity of charcoal rot of mungbean, okra and sunflower (Zaki & Ghaffar, 1987). *Paecilomyces lilacinus* reduced *Macrophomina* infection of mung and okra (Shahzad & Ghaffar, 1989). The results of the present study indicated that instead of chemical pesticides, use of microorganism as seed-dressing can minimize *F. oxysporum* and *M. phaseolina* infection of tomato.

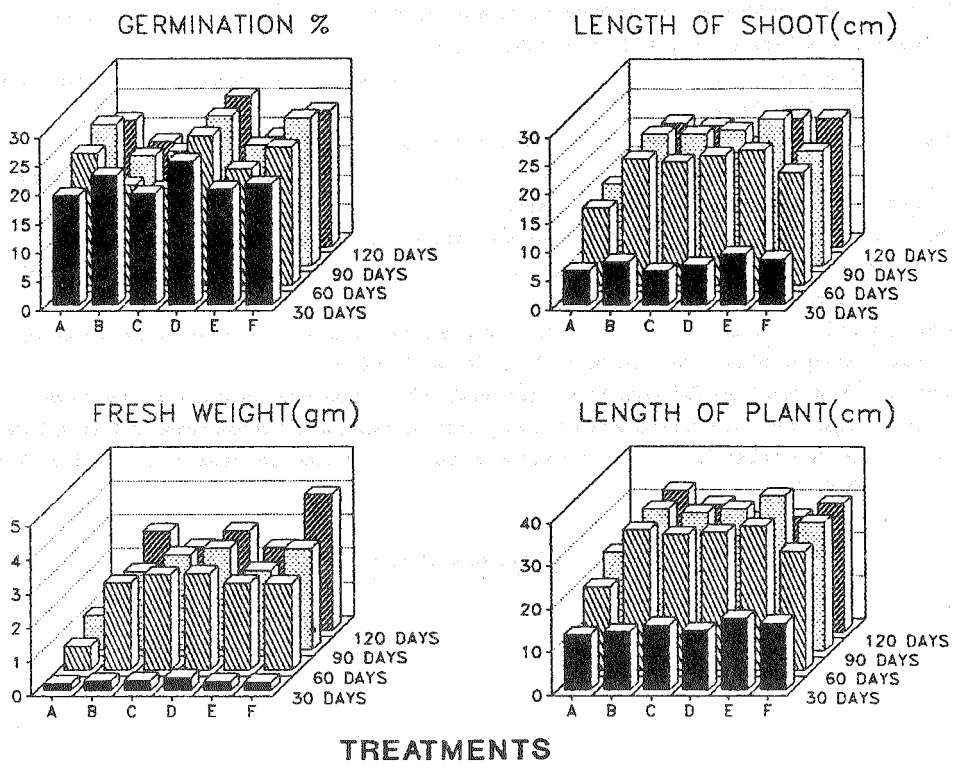

Fig.2. Effect of microbial antagonists on germination and growth of tomato plants.
A= Control, B= *T. harzianum*, C= *Gliocladium virens*, D= *R. meliloti*, E= *Streptomyces* sp., F= *P. lilacinus*.

Acknowledgement

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