Pak.J.Bot., 30(2): 287-290, 1998.

# EFFECT OF SCLEROTIAL INOCULUM DENSITY OF *MACROPHOMINA PHASEOLINA* ON CHARCOAL ROT OF SUNFLOWER

SHAHNAZ DAWAR AND ABDUL GHAFFAR

*Department of Botany,*
*University of Karachi, Karachi-75270, Pakistan.*

**Abstract**

Infection and colonization of *Macrophomina phaseolina* increased significantly ($p<0.05$) with the increase in sclerotial population in soil. No significant difference in shoot length was observed in different treatments. In seed inoculation experiment, size of inoculated plants was significantly smaller than the uninoculated plants ($p<0.001$). Infection of root by *M. phaseolina* was significantly greater in treated plants as compared to control ($p<0.05$) which showed significant increase with the increase in time ($p<0.001$).

## Introduction

*Macrophomina phaseolina* (Tassi) Goid., causes seedling blight, root rot, stem and pod rot on more than 500 species of plants (Sinclair, 1982) where atleast 67 hosts have been recorded from Pakistan (Mirza & Qureshi, 1978; Shahzad *et al.*, 1988). The fungus which is reported from seeds of sunflower (Dawar & Ghaffar, 1991; Fakir *et al.*, 1974; Raut, 1985) has been isolated from different parts of seed viz., pericarp, seed coat, cotyledon and axis (Dawar & Ghaffar, 1990) Infection of sunflower seeds by *M. phaseolina* is known to reduce the germination and vigour of sunflower seed beside producing pre- and post-emergence seedling blight and charcoal rot disease (Sadashivaiah *et al.*, 1986). The present work determines the relation of sclerotial inoculum of *M. phaseolina* with pre-and post-emergence damping off and root infection of sunflower.

## Materials and Methods

*M. phaseolina* isolated from sunflower seeds was grown on cornmeal sand medium (5% w/w) for 4 weeks at 30°C. The sclerotia were separated after passing through 150 μm sieve. Pathogenicity of *M. phaseolina* on sunflower was tested by artificial inoculation of seeds where seeds were coated with *M. phaseolina* @ 10 scl./seed using 1% gum arabic solution as a sticker. Seeds were sown at the experimental field of the Department of Botany, University of Karachi in complete randomized block design with 3 replicates of each treatment. The soil used in this study was sandy loam, pH, 8.0 with moisture holding capacity of 40% (Keen & Reczkowski, 1921). Shoot length, infection and colonization of sunflower roots by *M. phaseolina* was recorded at 20, 40, 60 and 80 days intervals. Plants were uprooted and roots were washed in running tap water, surface disinfected with 1% $Ca(OCl)_2$ and 1 cm root pieces transferred on PDA plates

containing penicillin (@ 100,000 units/litre) and streptomycin (@ 0.2g/litre). Dishes were incubated for 5 days at 28°C to confirm infection and colonization of roots by *M. phaseolina*.

In another experiment, soil obtained from the experimental field of the Department of Botany, University of Karachi was artificially infested with sclerotia of *M. phaseolina* @ 3, 14 and 30 scl./g soil. Untreated soil with natural population of 0-3 scl./g served as control. The soil was kept in 8 cm diam., plastic pots and 10 sunflower seeds were sown in each pot. Soil moisture was adjusted and maintained at 50% MHC. Infection and colonization of sunflower roots was determined at 20, 40, and 60 days interval by the method described above. Data were subjected to Analysis of Variance (ANOVA) following Gomez & Gomez (1984).

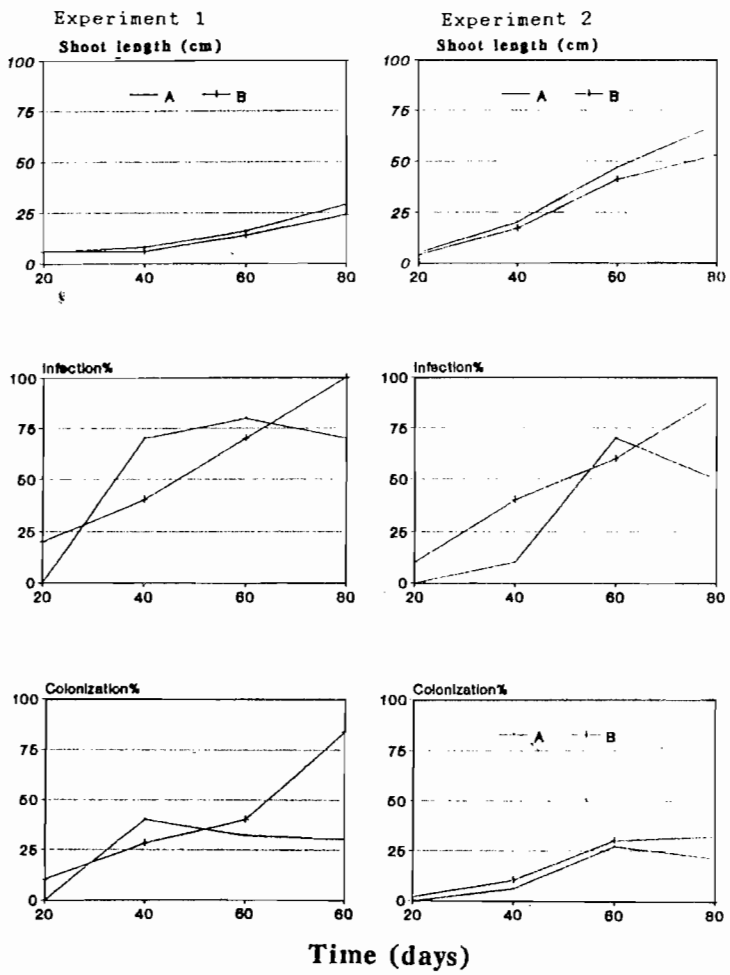


Fig.1. Effect of seed inoculation with sclerotia of *Macrophomina phaseolina* on infection and colonization of sunflower roots.

A = Control, B = Seed inoculated with *M. phaseolina*.

## Results and Discussion

In seed inoculation experiment, *M. phaseolina* caused pre-emergence death of sunflower seeds. The size of plant reduced in inoculated plants as compared to control (Fig.1). Infection and colonization of root by *M. phaseolina* was significantly greater in treated plants as compared to control ($p<0.05$) which showed significant increase with the increase in time ($p<0.001$) and after 60 days sampling 70 and 100% infection of *M. phaseolina* was also observed in uninoculated and inoculated plants, respectively. Similar results were observed when experiment was repeated (Fig.1).

Soil infestation by *M. phaseolina* @ 3, 14 and 30 scl./$g^{-1}$ soil reduced the germination of seed by 28, 30 and 32% respectively ($p<0.01$). No significant difference in shoot length was observed in different treatments (Fig.2). After 60 days interval, infecton and colonization of roots by *M. phaseolina* increased significantly ($p<0.05$) with the increase in sclerotial population in soil (Fig.3). Colonization of *M. phaseolina* also increased with the increase in time period ($p<0.01$). Such similar observations have been made on soybean (Meyer *et al.*, 1974) and mungbean (Shahzad & Ghaffar, 1992) where root infection by *M. phaseolina* increased with an increase in inoculum level.

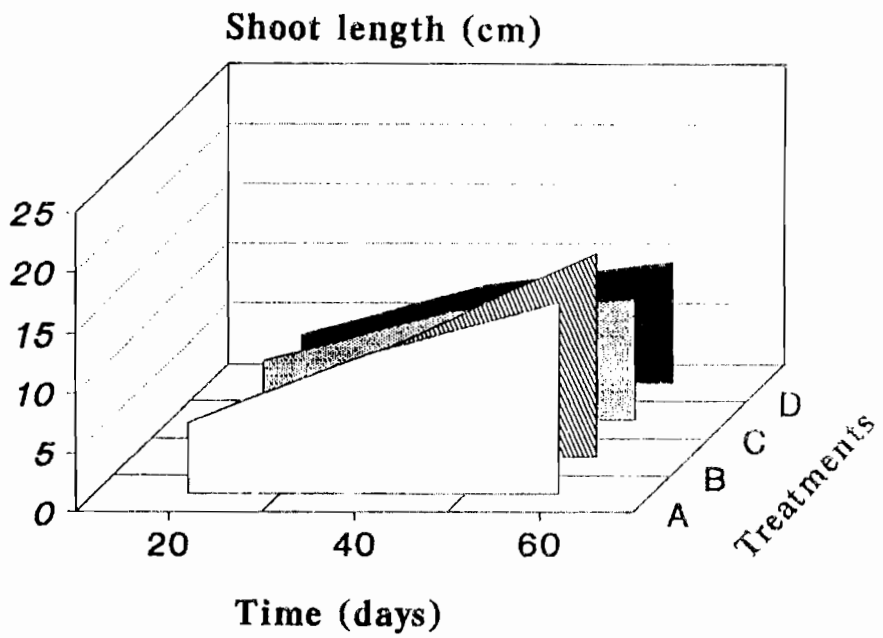


Fig.2. Effect of soil infestation with different population of *Macrophomina phaseolina* on shoot length of sunflower.

A = Control; B = 3 sclerotia/g soil; C = 14 sclerotia/g soil;

D = 30 sclerotia/g soil.

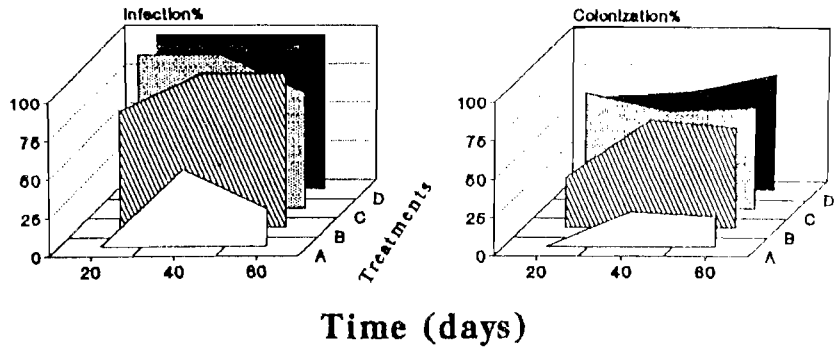


Fig.3. Effect of soil infestation with different population of *Macrophomina phaseolina* on infection and colonization of sunflower roots.

A = Control; B = 3 sclerotia/g soil; C = 14 sclerotia/g soil;

D = 30 sclerotia/g soil.

## References

Dawar, S. and A. Ghaffar. 1990. Location of fungi in sunflower seed. *Pak. J. Bot.*, 22: 117-120.

Dawar, S. and A. Ghaffar. 1991. Detection of seedborne fungi of sunflower. *Pak. J. Bot.*, 23: 173-178.

Fakir, G.A., M.H. Rao and M.T. Thirumalachar. 1976. Seed transmission of *Macrophomina phaseolina* in sunflower. *Plant Dis. Rep.*, 60: 736-737.

Gomez, K.A. and A.A. Gomez. 1984. *Statistical procedures for agricultural research*. 2nd ed. Wiley, New York. 680 pp.

Keen, B.A. and H. Raczkowski. 1921. The relationship between clay content and certain physical properties of soil. *J. Agric. Sci.*, 11: 441-448.

Meyer, W.A., J.B. Sinclair and M.N. Khare. 1974. Factors affecting charcoal rot of soybean seedlings. *Phytopath.*, 64: 845-849.

Mirza, J.H. and M.S.A. Qureshi. 1978. *Fungi of Pakistan*. Dept. of Plant Pathology, Univ. of Agric., Faisalabad, Pakistan, 311 pp.

Raut, J.G. 1985. Effect of charcoal rot caused by *Macrophomina phaseolina* on sunflower plant. *Ind. Phytopath.*, 8: 345-348.

Sadashivaiah, A.S., K.G. Ranganthaiah and D.N. Gowada. 1986. Seed health testing of *Helianthus annuus* with special reference to *Macrophomina phaseolina*. *Ind. Phytopath.*, 39: 445-447.

Shahzad, S., A. Sattar and A. Ghaffar. 1988. Additions to the hosts of *Macrophomina phaseolina*. *Pak. J. Bot.*, 20: 151-152.

Shahzad, S. and A. Ghaffar. 1992. Effect of different populations of *Paecilomyces lilacinus* on the biological control of *Macrophomina phaseolina* and *Meloidogyne incognita* infection on mungbean. Expert consultation on plant Nematode problems and their control in the Near East Region, IInd. International Meeting on plant Nematology, Karachi. p.77.

Sinclair, J.B. 1982. *Compendium of Soybean Diseases*. 2nd ed. American Phytopathological Soc., St. Paul, MN. 104 pp.

(Received for publication 21 December 1997)