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EFFECT OF POULTRY MANURE AND SAWDUST ON SURVIVAL OF SCLEROTIA OF *MACROPHOMINA PHASEOLINA* IN SOIL

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Abstract

Using wet sieving and dilution technique, the sclerotial population of *Macrophomina phaseolina* in soil amended with poultry manure and sawdust was studied. Sclerotial population of *M. phaseolina* declined after 15-day period where poultry manure @ 1, 3 and 5%w/w was used. No significant change in sclerotial population was observed where sawdust was used.

Introduction

Macrophomina phaseolina (Tassi) Goid., causes seedling blight, charcoal rot on over 500 species of plants in tropical and subtropical countries of the world (Sinclair, 1982) of which at least 66 different hosts have been recorded from Pakistan (Mirza & Qureshi, 1978; Shahzad *et al*., 1979). The fungus produces small black sclerotia on infected host tissue that are subsequently dispersed in soil during tillage operation (Cook *et al*., 1973; Ghaffar & Akhtar, 1968). Population as high as 1000 sclerotial propagules g^{-1} have been reported (Papavizas & Klag, 1975) whereas in Pakistan up to 29 sclerotial propagules g^{-1} of soil have been recorded (Sheikh & Ghaffar, 1975). Sclerotial inoculum of *M. phaseolina* are reported to produce greater mortality of pine seedlings than mycelial inoculum (Smith, 1969). Similarly Sheikh & Ghaffar (1979) observed that infection of *M. phaseolina* on different crops was related to the inoculum densities of sclerotia in soil. Composted organic material such as plant debris and animal manure add nutrient to the soil thereby increasing the soil fertility. This improves plant growth and makes the plant less prone to infection by pathogens (Muhammad *et al*., 2001). The efficacy of various organic amendments to control diseases caused by *M. phaseolina* has been reported (Sheikh & Ghaffar, 1977; 1980). In view of the increasing cost of chemical pesticides and the hazards involved in their use, biological control has been suggested as an alternate method of control (Mulder, 1979). Since composted agricultural wastes has been reported to suppress different types of soil borne plant diseases (Janisiewicz & Roitman, 1988; Muhammad, 1998; Muhammed *et al*., 2001), these could be used in the biological control of plant disease (Garrett, 1975). The present report described the effect of poultry manure and sawdust on the reduction in survivability of sclerotia of *M. phaseolina* in soil.

Material and Methods

M. phaseolina, isolated from roots of cotton was used. One month old sclerotia, multiplied on 5% w/w cornmeal soil medium was separated after passing through 150 µm

sieve. Sandy loam soil pH 7.8, with 40% maximum water holding capacity was air dried at room temperature and passed through 2mm sieve before use. Soil was artificially infested with sclerotia of *M. phaseolina* @ of 44-48 sclerotia g^{-1} soil. Infested soil was amended with i) poultry manure consisting of bird faeces obtained from poultry farm Malir, Karachi, ii) saw dust obtained from saw mill. The amendments were used @ 0, 1, 3 and 5% w/w and transferred into 9cm plastic pots @ 300g per pot. Soil was adjusted at 40-50% MHC by addition of water twice a week. There were three replicates of each treatment which were kept on laboratory bench at 28^0C, ± 5^0C and covered with polyethylene sheet in which holes were made to allow exchange of air and reduction of moisture loss. Sclerotial population of *M. phaseolina* was determined at 0, 15 and 30 days period using wet seiving and dilution technique (Sheikh & Ghaffar, 1975).

Results and Discussion

Fig. 1 shows the effect of poultry manure and saw dust on the sclerotial population of *M. phaseolina* in soil. Poultry manure @ 1, 3, and 5% w/w significantly reduced the sclerotial population of *M. phaseolina* by 33-64% after 15 days period ($p<0.05$). Reduction in survivability of sclerotia correlated well with levels of concentrations of poultry manure. The effect was more pronounced at 3, and 5% levels (52-64%; $p<0.05$). In non amended control soils no significant differences in population of sclerotia was noticed during the experimental period. Similarly sawdust had no effect on the reduction of sclerotia of *M. phaseolina*. This finding was in agreement with Khan & Shaukat (1998), who observed that sawdust was least effective against the nematode populations.

Our results showed that survival of sclerotia of *M. phaseolina* can be considerably reduced by soil amendment with poultry manure. This finding corroborates the observations of Khan & Shaukat (2000), who found that population density of *Tylenchorhynchus annulatus* was significantly reduced by soil amendment with poultry manure, mustard oil cake, castor oil cake and farmyard manure. Abdulhadi *et al*., (1997) have also observed that soil amendment with poultry manure significantly reduced densities of second stage juveniles of *Meloidogyne javanica*, reduced root galling and increased yield of cucumber.

The means by which sclerotial populations are reduced through poultry manure needs investigation. Papavizas (1976) reported that soil amended with alfalfa liberated volatiles fungistatic to sclerotia where ammonia has been implicated as one of the components for this inhibition. On the other hand other researchers have proposed that composted organic material such as plant debris and animal manure add nutrient to the soil thereby increasing the soil fertility which improves plant growth and makes the plant less prone to infection by pathogens (Muhammad *et al*., 2001). Since microorganisms are more competitive than plants for nutrients, they will tie up nitrogen in high C:N substrates as they decompose the material. Soil amended with poultry manure probably supress growth of *M. phaseolina* by increasing C:N ratio. Schueter (1989) found that various types of agricultural/municipal wastes suppress different types of soil-borne plant diseases by making plants more vigorous and better able to withstand attack.

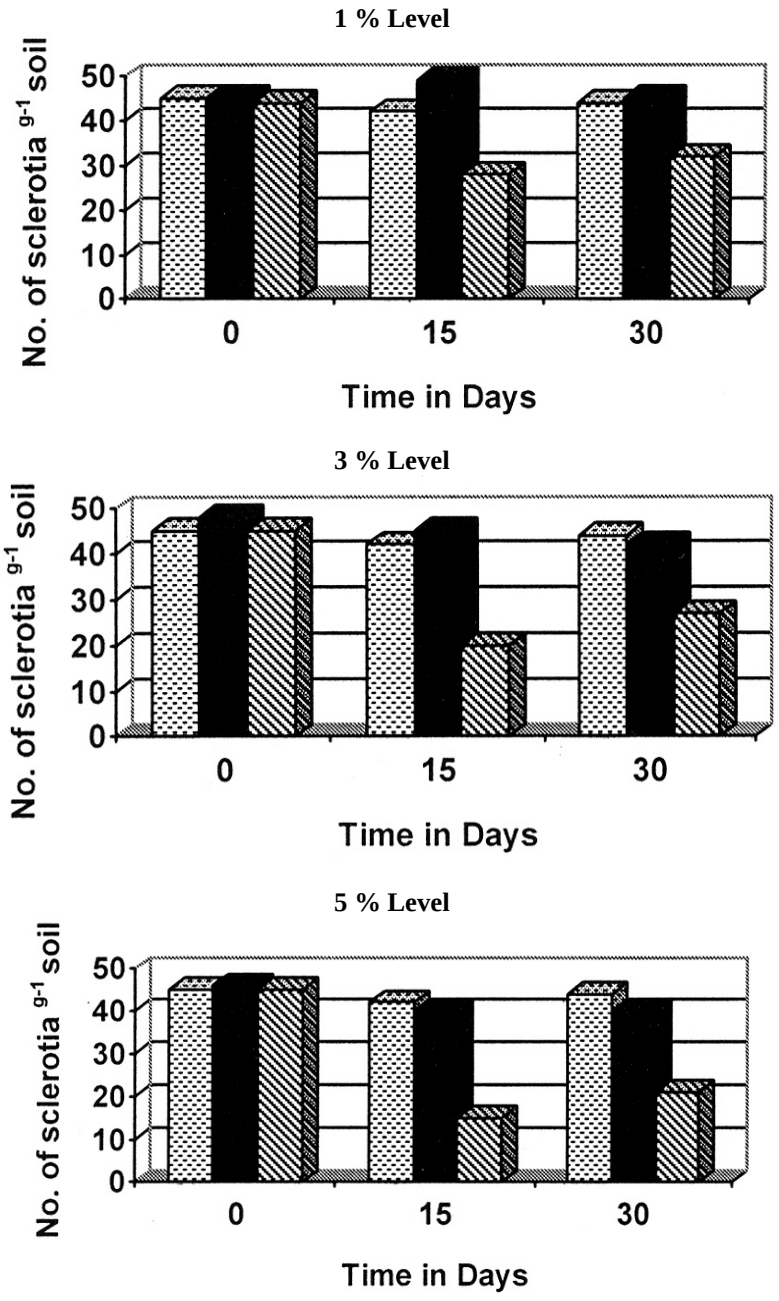

Fig. 1. Effect of poultry manure and sawdust used @ 1, 3 and 5% level on the reduction in number of sclerotia of *Macrophomina phaseolina* in soil at 40-50% MHC.

⚄ Infested soil only, ■ Infested soil + sawdust, □ Infested soil + poultry manure

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