

REGULAR ARTICLE

Effect of *Parthenium* weed manures on rhizosphere mycoflora of maize

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KEYWORDS

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ABSTRACT

The aim of the present investigation was to study the rhizosphere mycoflora of maize under the influence of *Parthenium hysterophorus* L. weed manures has been investigated. A total of 11 fungal species were isolated viz., *Aspergillus niger*, *A. flavus*, *A. terreus*, *Aspergillus* sp., *Cladosporium fulvum*, *Fusarium oxysporum*, *Mucor* sp., *Penicillium notatum*, *Phytophthora infestans*, *Rhizopus stolonifer* and *Trichoderma viride*. Among these, the genus *Aspergillus* was most predominant. The analysis of soil samples from treated plots showed that more frequent mycoflora due to the application of weed manures. The mycopopulation were greater in the CM amendment followed by VM, DM, GM and NPK as compared to CO treatment.

Introduction

The term rhizosphere was first introduced by a German microbiologist, L. Hiltner (1904) to describe the zone of soil that surrounds and is influenced by the roots of plants. One of the most important factors responsible for the growth of microorganisms is organic substances exuded by roots i.e. root exudates (Liljeroth and Baath, 1988). The exudates include simple sugars, amino acids, organic acids, vitamins and many other compounds (Singleton and Sainsbury, 1991; Klein, 1992). The organisms inhabiting soil are microalgae, fungi, bacteria, actinomycetes, protozoa etc (Garrett, 1981). They carry out numerous transformations as a part of their normal activities like addition of organic matter, nitrogen fixation, solubilization and immobilization of several nutrients (Katayama *et al.*, 1998; Lal *et al.*, 1998; Muller *et al.*, 1998; Brady and Weil, 1999). In this respect, the soil microflora can be manipulated and protected to improve the bio-physico-chemical characteristics and regulates decomposition process in the soil (Rezacova *et al.*, 2007).

Moreover, one more important factor which influences soil microflora is the organic manures. Organic fertilizers like plant residues, manures and composts play a vital role in changing the soil ecosystem, physico-chemical properties and soil mycoflora are of great importance in soil microbiology (Anastasi *et al.*, 2005). Microbial community composition can be more sensitive to soil amendment with plant residues than microbial biomass. The different kinds of soil amendments are compost, vermicompost, farm yard manure (FYM) etc., stimulate soil microbial growth and activity with successive mineralization of soil nutrients (Randhawa *et al.*, 2005). In the previous studies have noted that the application of FYM (Toyota *et al.*, 1999) and spent mushroom compost (Piqueres *et al.*, 2006) significantly affected soil microflora. However, the effects of compost were found to vary depending on both the type of soil and compost

(Piqueres *et al.*, 2006). In this investigation attempts has been made to see the effect of *Parthenium* weed manures on rhizosphere mycoflora of maize crop.

Materials and Methods

A field experiment was conducted in the Botanical Garden, of Dr. Babasaheb Ambedkar Marathwada University's Research farm during Oct. 2003 to Mar. 2004. The experimental design was a randomized block (RBD) with four replicates and six treatments. The fresh vegetation of *Parthenium* was collected from University campus, brought to laboratory and chopped into small pieces (2-3 cm). Equal amount of fresh plant material (48 kg) was used for the preparation of green manure (GM), compost (CM), vermicompost (VM) and dry leaf manure (DM). These treatments were applied to appropriate plots (3 m x 3 m) including fertilizers (NPK) and control (CO) plots. The maize (*Zea mays*) variety 'African Tall' was planted at a seed rate of 100 kg ha⁻¹.

The soil samples were collected (10 - 20 cm depth) in sterile polythene bags with the help of soil corer from untreated and treated maize plots. The rhizosphere mycoflora was studied by dilution plate technique as described by Johnson *et al.*, (1959).

For the determination of mycoflora, 1 gm of soil sample was dissolved in 100 ml sterile distilled water. One ml of soil suspension (0.01 g) was dispersed in sterilized petridish and then approximately 10 ml of cooled sterile rose Bengal agar medium was poured. The soil particles were mixed throughout the medium by gradually rotating the petridish. These plates were incubated at 25 ± 2 °C for 5 - 7 days. Identification of fungi was done as per Gilman (1945) and Mukadam (1997).

Results and Discussion

In this study of rhizosphere mycoflora of maize plant 11 species of fungi viz., *Aspergillus niger*, *A. flavus*, *A. terreus*,

Aspergillus sp., *Cladosporium fulvum*, *Fusarium oxysporum*, *Mucor* sp., *Penicillium notatum*, *Phytophthora infestans*, *Rhizopus stolonifer* and *Trichoderma viride* were recorded (Tables 1 and 2). Among these, only the genus *Aspergillus* had four species and suggests that it is a common component of the soil mycoflora.

The results summarized in tables shows that the population of *A. niger* was increased twice in GM, VM and NPK treatments and also uncountable colonies were found in the CM plots only. Population of *A. flavus* was greater in the plots amended with VM than all the other treatments. Uncountable colonies of *Aspergillus* sp. were found in GM and CM plots and also increased twice in the VM and DM treatments over the CO plots. The population of *T. viride* was more in all the manures applied plots than fertilized and absolute CO. *P. notatum* showed high density population in the plots based with VM followed by CM, DM and GM than that of CO plots. Population of *F.*

oxysporum was more frequent in all the amendments except NPK treatment only.

It is clear from the observations that the population of *F. oxysporum* was found to be increased in the CO plots. This may be due to the root exudates of maize, which might have enhanced the inhabitants of fungi. There was very little change in the population of *A. terrus*, *R. stolonifer*, *Mucor* sp. etc., in the plots supplemented with CM and VM, but due to application of manures microbial community is increased (Tables 1 & 2).

From the above results, it can be concluded that organic manuring affects qualitative and quantitative inhabitants of microorganisms in the rhizosphere of maize crop. Application of manures, not only increased microbial population, but also improved fertility of the soil due to the nitrification process brought about by some of the *Aspergillus* species (Schmidt 1954). These results are in close conformity with the earlier findings of Bopaiah and Bhat, (1981); Malwar *et al.*, (1999); Mogle *et al.*, (2005).

Table 1: Rhizosphere mycoflora from untreated plots of maize crop

Fungi	Treatments (Total number of colonies)					
	GM	CM	VM	DM	NPK	CO
<i>A. niger</i>	05	06	07	05	03	04
<i>A. flavus</i>	05	05	03	02	06	03
<i>A. terrus</i>	02	--	01	--	02	01
<i>A. species</i>	10	08	07	10	03	06
<i>T. viride</i>	04	08	10	05	03	02
<i>P. notatum</i>	07	03	07	05	06	02
<i>C. fulvum</i>	01	--	03	--	02	01
<i>R. stolonifer</i>	06	07	03	04	02	--
<i>M. species</i>	02	--	--	02	--	01
<i>P. infestans</i>	--	01	01	--	02	--
<i>F. oxysporum</i>	06	03	08	01	01	02

GM = Green manure; CM = Compost; VM = Vermicompost; DM = Dry manure; NPK = Fertilizer; CO = Control

Table 2: Rhizosphere mycoflora from treated plots of maize crop

Fungi	Treatments (Total number of colonies)					
	GM	CM	VM	DM	NPK	CO
<i>A. niger</i>	09	++	16	22	06	03
<i>A. flavus</i>	10	08	12	07	04	06
<i>A. terrus</i>	02	03	05	02	--	02
<i>A. species</i>	++	++	18	23	14	08
<i>T. viride</i>	11	18	16	14	05	03
<i>P. notatum</i>	13	16	24	14	09	07
<i>C. fulvum</i>	02	--	03	01	01	02
<i>R. stolonifer</i>	07	10	06	08	03	06
<i>M. species</i>	02	04	04	--	03	--
<i>P. infestans</i>	--	03	02	--	01	02
<i>F. oxysporum</i>	++	++	++	++	18	++

-- = No growth; ++ = Uncountable

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