International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 2 Issue 8
August 2015

Species dynamics of Rhizospheremycoflora of *Solanum Melongena* L. in Response to Fertilizer Application

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ABSTRACT

The current investigation was undertaken with an objective to compare the effect of different organic and inorganic fertilizers on the rhizospheremycoflora and yield of *Solanummelongena* L (Brinjal) in field and pot cultivations. Three organic fertilizers *viz*. vermicompost, kalpamealplusand vegetable meal and chemical fertilizers such as mixed fertilizer and garden fertilizer were selected for nutrient supply. The plant treated with potting mixture alone was kept as control both in field and pot conditions. Number of flowers and fruits per plant and species diversity of rhizospheremycoflora were observed for each treatment. The results have shown that organic amendments of soil induced early flowering and fruiting in the Brinjal plant and increased the fungal diversity in the rhizosphere. Inorganic fertilizers reduced the diversity and population of fungi found in the rhizosphere and caused delayed fruiting and flowering compared to the organic fertilizers applied. *Pythium and Aspergillusniger* were found to be the predominant species in the rhizosphere of *S. melongena*L. as they made their appearance in the maximum number of treatments and dilutions. Maximum number of fungal species and fruit yield were obtained in the rhizosphere supplied with vermicompost. Of the two cultivation methods adopted different fertilizers treated plants showed better performance regarding the productivity and fungal diversity when grown in field. Decreased micro floral diversity in the rhizosphere may be contributing to the reduced productivity of the plant in pot cultivation.

***Key words*:*Solanummelongena* L., rhizosphere, mycoflora, fertilizers**

1.INTRODUCTION

The rhizosphere, a narrow zone of soil adjacent to and influenced by living plant roots is a site of high microbial activity that harbors a great diversity of microorganisms affecting plant growth and health [5,4].As the interface between growing roots and the mineral world, rhizospheres are remarkable environments, and have ecological feedbacks, chemical interactions, and inter-organism communication as complex as any in the above ground world. The microorganisms present in the vicinity of rhizosphereinclude bacteria, fungi, actinomycetes, protozoa and algae.

The diversity and composition of microbial taxa in the rhizosphere can be affected by several factors including plant species [8], soil type, soil management practices [11], microbial interactions [6] and other environmental variables.Not much literature is available regarding the response of these rhizosphere microorganisms to various fertilizers.The present work has been undertaken to investigate the impact of various organic and inorganic fertilizers on the mycofloral diversity in the rhizosphereof *Solanummelongena L.* (Brinjal), one of the commonly cultivated vegetables in India.

2. MATERIALS AND METHODS

Good quality seeds of Brinjal were procured from the Kerala Agricultural University Mannuthi, Thrissur. Seeds were sown in ploughed field mixed with pot soil. After 20 days of germination, 2-3 leaved seedlings were transplanted to polythene cover filled with potting mixture. After two weeks of growth in the polythene covers plants were transplanted to well ploughed field and earthen pots mixed with sand, soil and cow dung. Three organic fertilizers like vermicompost, vegetable meal and kalpameal plus and chemical fertilizers such as mixed fertilizer and garden fertilizer were selected for nutrient supply.

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The plants were treated with adequate amount of the concerned fertilizer at a regular 10 days interval. The plant treated with potting mixture alone was kept as control both in field and pot condition. All the treatments were done in duplicate. The parameters selected for the study were:

- Number of flowers and fruits per plant
- Species composition of Rhizospheremycoflora

2.1 Isolation of Fungi from Soil Samples

Soil samples were collected directly beneath the plant crown of the experimental plants.1g of soil sample collected were serially diluted in sterile distilled water and plated on sterile Streptomycin sulphate (Hi Media) added Saboraud's Dextrose Agar (SDA) medium and incubated at room temperature for 48 hours. Each dilution has 2 replica plates. After 48 hrs. of incubation the fungal colonies were isolated into another Saboraud's Dextrose Agar plates for further use. Culturing and isolation was done under fully aseptic condition in a laminar air flow chamber.

Photographs of the experimental plant under cultivation were taken on 95th day of the treatment in field condition and on 180th day of the treatment in pot cultivation after the plants attained their fruiting stage. Photomicrographs of the fungal species were taken with trinocular microscope attached with Nikon D60 digital camera.

3. RESULTS AND DISCUSSION

In the present investigation, the effect of organic and inorganic fertilizers on the dynamics of soil fungi in the rhizosphere and the productivity of *Solanummelongena* L. was studied in both field and pot experiment. Five different fungal species were noted in the rhizosphere of *S.melongena*L. grown in potting mixture alone in field condition. These were *Aspergillusniger, Aspergillusfumigatus*, *Penicillium, Mucor*and *Pythium*. In pot cultivation only two species were noticed *viz.Pythium* and *Aspergillusniger*.

Organic amendments of soil increased fungal population and inorganic fertilizer reduced the diversity and population of fungi found in the rhizosphere. Inorganic treatment also reduced the fruiting and flowering of Brinjal compared to the organic fertilizers applied. Of different cultivation methods, field cultivation yielded better results in terms of fungal diversity and productivity than pot cultivated plants. Vermicompost treated plants showed eight different fungal species in the rhizosphere in field cultivation, while kalpameal plus and vegetable meal treated plants revealed the presence of six different fungal species each. In pot cultivation the plant supplied with vermicompost registered the presence of six fungal species. The number was reduced to two in kalpamealplus exposed plants and to one in vegetable meal treated plants.The species obtained in each treatment is given in tables 1&2. On treatment with inorganic fertilizers like garden meal and mixed fertilizer, five different fungal species each were obtained in field condition. In pot cultivation the number of rhizosphere fungi was much lower as compared to that in field cultivation (Table 3).

Regarding the productivity, first flowering was noticed in 3rd month of cultivation in vermicompost treated plants in field cultivation. Maximum number of flowers and fruits were also observed in vermicompost supplied plants in field and pot cultivation. No flowering and fruiting was observed in inorganic fertilizers treated plants in pot cultivation (Table 4). Decreased mycofloral diversity and productivity in pot cultivated plants may be due to the restriction of the available space for the root system to grow naturally. Increased microbial diversity and activity in the vermicompost treated plants indicate that vermicompost could be a definitive source of plant growth regulators produced by interactions between microorganisms and earthworms, which could contribute significantly to enhancement of plant growth, flowering and yield. Vermicompost (VC) is a rich source of macro and micro nutrients, vitamins, enzymes, antibiotics, growth hormones and immobilized microflora[1].

Pythium and *Aspergillusniger* were found to be the predominant species in the rhizophere of Brinjal as they made their appearance in the maximum number of treatments and dilutions. Reports are available in the literature regarding the rhizospheremycoflora of various plant species. Species diversity of mycoflora in the rhizosphere region of different mangroves was investigated by Mariu*met al.* [7]. Rama and Kaveriappa[10] studied the rhizospheremycoflora of some species of Myristicaceae of the Western Ghats, India. Oyeyiola[9]

studied the species composition of mycoflora in the rhizosphere region of Okra and reported*Rhizopusstolonifer*, *Aspergillusniger* and *Aspergillusclavatus* as the predominant species in both rhizosphere and rhizoplane soil.

Earlier studies by Bopaiah and Bhat[2] have shown that the potential of organic fertilizers to increase the crop production and microbial population is greater than that of the inorganic fertilizers containing equal amount of N, P, and K. Similar results were also obtained by the studies of Bibhuti and Dkhar[3] and these findings are in corroboration with those obtained in the current investigation.

4. REFERENCES

[1] Bhawalkar, U. S. 1991.Vermiculture biotechnology for LEISA. Seminar on lowexternal input sustainable Agriculture. *Amsterdam*, Netherlands, pp. 1-6.

[2] Bhopai B.M. and BhatN.T. 1981. Effect of continuous application of manures and fertilizers onrhizospheremycoflora in arecanut palm.*Plant and Soil*, 63(3): 497-499.

[3] Bibhuti B. Das and DkharM.S. 2011. Rhizosphere microbial population and physicochemical properties as affected by organic and inorganic farming practices.

[4] Boehm M. J. 1993. Effect of organic matter decomposition level on bacterial species diversity and composition in relationship to *Pythium* damping off severity. *Appl.Environ. Microbiology*, 59: 4171-4179.

[5] Campbell R. B and GreavesM. P. 1990. Anatomy and commonly structure of rhizosphere. *The rhizosphere*, John Wiley and sons, NewYork.

[6] Hedges.R.W. andMessensE.1990. Genetic aspects of rhizosphere interactions. *The rhizosphere*, Johnwileyand ,NewYork, 59-95.

[7] Marium Tariq, ShohanazDawar and Fatima S.Mehdi. 2008. Studies on the rhizospheremycoflora of mangroves, *Turk.J.bot*., 32, 97-101.

[8] Miller H.J., Henken G., Van Veen J.A. 1989. Variation and composition of bacterial populations in the rhizospheres of maize, wheat, and grass cultivars. *Can.J. Microbiol*. 35:656–660.

[9] Oyeyiola G.P. 2009.Rhizospheremycoflora of okra (*Hibiscus esculentus*). *Research Journal of Soil Biology*,1(1),31-36.

[10] Rama Bhat P. and KaveriappaK.M. 2009.Rhizospheremycoflora of some species Myristicaceae of the Western Ghats, India. *Asian Journal of Microbiology, Biotechnology& Environmental Science Paper*, 11(3): 543-557.

[11] Rovira, A. D., Elliott, L. F. and CookR. J. 1990. The impact of cropping systems on rhizosphere organisms affecting plant health. *The rhizosphere*. John Wiley and Sons, Chichester, UK.

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Table 1: Impact of organic fertilizers on the rhizosphere fungal diversity of *Solanummelongena*.L in field cultivation

Treatment	Species	Total number of species
Control	*Aspergillusniger* *Aspergillusfumigatus* *Penicillium sp.* *Mucor* *Pythium*	5
Vermicompost	*Aspergillusniger* *A. fumigatus* *A.nidulans* *A.flavus* *Penicillium* *Pythium* *Trichoderma* *Mucor*	8
Kalpamealplus	*Aspergillusniger* *A.flavus* *A.fumigatus* *A.nidulans* *Penicillium* *Pythium*	66 6
Vegetable meal	*A.niger* *A.fumigatus* *A.flavus* *A.nidulans* *Trichoderma* *Penicillium*	6

Table 2: Impact of organic fertilizers on the rhizosphere fungal diversity of *Solanummelongena*L. in pot cultivation

Treatment	Species	Total no.of species
Control	*Pythium* *Aspergillusniger*	2
Vermicompost	*Aspergillusniger* *A.fumigatus* *A. nidulans* *A. flavus* *Trichoderma* *Penicillium*	6
Kalpamealplus	*Aspergillusfumigatus* *Aspergillusniger*	2
Vegetable meal	*Pythium*	1

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Table 3: Impact of inorganic fertilizers on the rhizosphere fungal diversity of *Solanummelongena*.L in field and pot cultivation

Mode of Cultivation	**Treatment**	**Species**	**Total no. of species**
Field	Control	*Aspergillusniger* *Aspergillusfumigatus* *Penicillium sp.* *Mucor* *Pythium*	**5**
	Mixed fertilizer	*Pythium* *Aspergillusnidulans* *A. fumigatus* *A.niger* *Penicillium*	5
	Garden meal	*Aspergillusniger* *A.flavus* *A.fumigatus* *Pythium* *Mucor*	5
Pot	Control	*Aspergillusniger* *Pythium*	2
	Mixed fertilizer	*Pythium* *Aspergillusnidulans*	2
	Garden meal	*Aspergillusfumigatus* *Pythium*	2

Table 4: Impact of organic and inorganic fertilizers on the productivity of *Solanummelongena*.L in field (after four months) and pot (after six months) cultivation

Mode of cultivation	Treatment	No. of flowers flowers	No. of fruits
Field	Standard condition	-	-
	Vermicompost	3	2
	Vegetable meal	2	1
	Kalpa meal	2	1
	Mixed fertilizer	1	1
	Garden meal	1	1
Pot	Standard condition	1	1
	Vermicompost	3	2
	Vegetable meal	1	1
	Kalpa meal	1	1
	Mixed fertilizer	-	-