e- ISSN: 2394-5532
p- ISSN: 2394-823X

Scientific Journal Impact Factor: 3.762

International Journal of Applied And Pure Science and Agriculture

www.ijapsa.com

Effect of Organic and Inorganic Inputs on Soil Mycoflora Population and Species Diversity in Wheat.

Gurbax Singh and Ramandeep Kaur

Department of Agriculture, Khalsa College Amritsar, Punjab, India.

Abstract

Fungal communities associated with soil play an important role in nutrient cycle, supporting plant growth and the biocontrol of plant diseases. This paper has analysed the effect of organic and inorganic inputs on soil mycoflora population and species diversity in Wheat of student's farm of Khalsa College, Amritsar and a comparative study between these locations. Identification and characterization was done by the help of standard protocols. All total 26 numbers of fungal species have observed during the studies. The Aspergillus shows as the dominant mycoflora in both the location. Six species have found in Aspergillus group i.e. A. niger, A. fumigatus, A. japonicus and A. clavatus. In all locations almost same fungal species were found, but vary in their percentage of occurrence.

Keywords: Fungus, Organic, Inorganic, Species, Mycoflora.

I. Introduction

The soil is highly complex and a favourable habitat for microorganisms and it is a suitable environment that supports extremely diverse communities of micro and macro organisms. It is a natural culture media for growth of microorganisms. Soil is an important panorama for wide range of microflora which includes fungi, bacteria and actinomycetes. Microflora increases nutrient content of soil via decomposition of crop residues, mineralization and immobilization of nutrients, biological nitrogen fixation and bioturbation. Rhizosphere is a zone of soil which directly influenced by root secretions and associated soil microorganisms. It is observed that rhizosphere having greater microbial activity. The changes in rhizosphere microbes depends on type of plant, age of plant, soil physico-chemical parameters, nature of root exudation, type of agricultural inputs mainly fertilizers and different environmental conditions.

In modern agriculture there is indiscriminate use of inorganic fertilizer to increase the production. But various results revealed that over use of chemical fertilizers has been shown to have a direct effect on the composition of the soil microbial community (Katayama *et al.,* 1998; Doran *et al.,* 1996). The lower fungal diversity may be due to number of reasons such as irrigation, fertilizer and agricultural practices (Yadav, 2014). The application of commonly used herbicides on non-target soil of maize field resulted in decreases in microbial counts (Ayansina and Oso, 2006). Inorganic treatment lowers the microbial population (Kapoor *et al.,* 2015). It is found that 1% of the pesticides applied may contact the target organisms and remainder moves into the soil, thereby soil flora and fauna may be adversely affected (Misra and Mani, 1994).

To minimize the adverse impact of chemical fertilizer now a day's farmers using various organic inputs for sustainable and eco-friendly development. Various comparative research on soil microflora population under different organic and inorganic inputs applied field revealed that addition of organic manure as an organic fertilizer rich in bacterial diversity, fungal diversity and other number of microorganisms compared to inorganic field (Ishaq and Khan, 2011). It is recorded that highest fungal population in treatment of FYM 40.6X 10 4 g-1 compared to urea treatment 38.8X10 4 g -1 (Raindra *et al.,* 2010). Organic fertilizers to soybean variety increases the microbial population compared to NPK and

control (Das and Dkhar, 2010). 10-26% increase in microbial biomass under organic management was reported (Fraser *et al.,* 1994).

The present investigation was carried out to study the effect of organic and inorganic inputs on soil mycoflora population and species diversity in Wheat.

II. Materials and Methods

The soil samples assayed in this investigation were obtained from two plots located on the Student's Research Farm, Khalsa College, Amritsar. These two plots had been continuously cropped since 1915 to either corn, oats, rice or wheat. The soil was a silty loam. Each of these plots received equal amounts of fertilizer each year. One plot received organic bio booster and other inorganic inputs from three years in a row. The soil samples collected from these plots were assayed for numbers and kinds of fungi by a standardized soil dilution-plate technique.

2.1. Collection of samples*:* Composite samples of soil from the four sites were collected during the study period, from a depth of 5 inches. Samples were collected in sterile polythene bags and carried to laboratory for microflora analysis.

2.2. Enumeration of Soil Fungal Population: The rhizosphere fungi were enumerated by Serial dilution method (Waksman, 1992).The collected rhizosphere soil samples from both the organic and inorganic inputs applied field were used for preparation of different serial Dilutions. An accurately weighed aliquot of approximately 0.100 g. of each soil sample was added aseptically to 10 ml. of sterile distilled water contained in a 125 ml. Erlenmeyer flask. The flasks were placed on a platform shaker (60 oscillations per minute) for 15 minutes to break up the soil particles. They were then shaken manually for approximately 20 seconds and 1 ml. of the suspension was immediately withdrawn with a sterile pipette and transferred to 50 ml. of sterile distilled water contained in a 250 ml. Erlenmeyer flask. The dilution was 1:5000. The resulting suspension was shaken thoroughly and 1 ml aliquots were transferred onto the surface of each of 5 agar plates for each individual soil sample. One percent streptomycin solution was added to the medium before pouring into Petri plates for preventing bacterial growth and plates were kept for incubation at 28 ºC for 4-7 days for fungi. After 6 days of incubation the different colonies were counted from different organic and inorganic soil plates.

2.3 Statistical Analysis: The quantitative analysis of fungal population was studied at 10^{-3} dilution. The percentage contribution of each colony forming units (CFU) of different fungal isolate was calculated by using the formula.
Mean plate count X dilution factor CFU/ g dry soil = dry weight of soil
Total no. of CFU of an individual species X 100 Percentage contribution = Total no. of CFU of all species. Rhizosphere mycoflora population (x 10^{-3} CFU/g soil) in organic and Inorganic field of wheat was 39.1 and 32.4 respectively.

2.4 Observation and Identification: The individual colonies of fungi were selected based on morphology and purified by inoculation on PDA plates which were incubated for 7–14 days at 28ºC. Further slants were prepared and incubated at 28^{o}C for 7 to 10 days. Seven to 10 days after preparing the plates, the fungi reached a stage of growth at which they could be identified. All colonies not having a corresponding number

on the bottom of the plates were assumed to be secondary. Some slow-growing fungi may have been excluded because of this assumption. The presence of secondary colonies obviously derived from sporulating original colonies made counts beyond the 3-day incubation period highly unreliable.

III. Results and Discussion

The results on rhizosphere mycoflora population and species diversity in organic and inorganic wheat fields showed there is increase in rhizosphere mycoflora population and species diversity in organic inputs applied field compared to inorganic inputs applied. The results on soil rhizosphere mycoflora species colonies and species number are presented in table 1 and 2. Results revealed in 2015 the total 243 mycoflora colonies of different 26 members of fungi isolated from rhizosphere. Overall diversity indicate that rhizosphere of organic field shows more species diversity i.e. 26 mycoflora species in organic field and 23 species in inorganic field. The identified rhizosphere mycoflora species belongs to genera *Aspergillus, Rhizopus, Trichoderma, Fusarium, Curvularia* etc in organic and inorganic field.

It is observed that changes in frequency of mycoflora in agricultural fields are due to several factors like temperature, humidity, vegetation, organic and inorganic materials, soil type and texture (Gaddeyya *et al.,* 2012). The different fertilization changes the soil microfungal communities and fungal activities in agricultural soils (Rezacova *et al.,* 2007). It is observed that long-term effects of organic matter inputs on different cropping systems in a 10-year-old experiment enhances microbial activity (Chirinda *et al.,* 2008). Overall results revealed that there is monthly and yearly variation in rhizosphere total colonies and species diversity in organic and inorganic field of wheat. The organic field shows more rhizosphere population and species diversity compared to inorganic field.

Table no 1: Rhizosphere soil mycoflora colonies & percentage contribution in Organic field of Wheat.

S.No	Name of identified Fungus	Number of Colonies per Serial Dilution					
		Stock 1g/100ml	1:10	1:100	1:1000	1:10000	1:100000
1.	*Alternaria alternata*	-	-	-	-	1	1
2.	*Aspergillus flavus*	9	4	3	2	1	1
3.	*Aspergillus fumigatus*	3	2	-	1	-	-
4.	*Aspergillus japonicus*	-	-	-	3	1	-
5.	*Aspergillus niger*	47	40	14	3	3	-
6.	*Aspergillus candidus*	1	-	1	-	2	-
7.	*Aspergillus sydowii*	3	2	-	1	-	-
8.	*Botrytis ceneria*	4	5	-	3	-	-
9.	*Cladosporium sp.*	-	-	-	-	1	1

10.	*Curvularia longifolia*	1	-	-	1	-	-
11.	*Curvularia lunata*	1	-	3	4	1	2
12.	*Drechslera sp.*	-	-	1	2	-	-
13.	*Fusarium solani*	-	-	1	-	2	-
14.	*Fusarium sp.*	-	-	-	2	2	-
15.	*Humicola grisea*						
16.	*Mycelia sterilia*	-	-	4	1	-	-
17.	*Paecilomyces sp.*	1	-	2	2	1	1
18.	*Paecilomyces variotii*	-	-	3	-	1	-
19.	*Penicilium chrysogenum*	-	3	-	-	1	2
20.	*Penicillium sp.*	-	-	1	1	1	-
21.	*Phoma sp.*	1	-	-	-	1	-
22.	*Rhizopus oryzae*	1					
23.	*Rhizopus stolonifer*	4	2	1	-	1	1
24.	*Trichoderma sp.*	1	-	4	2	6	1
25.	*Verticillium sp.*	-	2	-	1	1	1
26.	*Yeast sp.*	3	5	1	-	-	1
Total number of isolated fungal colonies:243		80	65	39	20	27	12

Table no 2:Rhizosphere soil mycoflora colonies & percentage contribution in inorganic field of Wheat

S.No	Name of identified Fungus	Number of Colonies per Serial Dilution					
		Stock 1g/100ml	1:10	1:100	1:1000	1:10000	1:100000
1.	*Alternaria alternata*	-	-	-	-	1	1
2.	*Aspergillus flavus*	9	4	3	2	1	1
3.	*Aspergillus fumigatus*	3	2	-	1	-	-
4.	*Aspergillus japonicus*	-	-	-	3	1	-

5.	*Aspergillus niger*	47	40	14	3	3	-
6.	*Aspergillus candidus*	1	-	1	-	2	-
7.	*Aspergillus sydowii*	3	2	-	1	-	-
8.	*Cladosporium sp.*	-	-	-	-	1	1
9.	*Curvularia longifolia*	1	-	-	1	-	-
10.	*Curvularia lunata*	1	-	3	4	1	2
11.	*Drechslera sp.*	-	-	1	2	-	-
12.	*Fusarium solani*	-	-	1	-	2	-
13.	*Fusarium sp.*	-	-	-	2	2	-
14.	*Paecilomyces sp.*	1	-	2	2	1	1
15.	*Paecilomyces variotii*	-	-	3	-	1	-
16.	*Penicilium chrysogenum*	-	3	-	-	1	2
17.	*Penicillium sp.*	-	-	1	1	-	-
18	*Phoma sp.*	1	-	-	-	1	-
19	*Rhizopus stolonifer*	4	2	1	-	-	-
20.	*Sterile mycelium*	-	-	4	1	-	-
21.	*Trichoderma sp.*	-	-	3	2	1	-
22.	*Verticillium sp.*	-	2	-	1	-	-
23.	*Yeast sp.*	3	5	1	-	-	1
Total number of isolated fungal colonies:226		74	60	38	26	19	9

IV. Conclusion

The organic bio-booster contains microbial load and soil nutrient which results increase in microbial population. The organic inputs like farm yard manure increases the soil beneficial mycoflora population and species diversity compared to inorganic inputs applied field which adversely affect mycoflora diversity. The increase in soil mycoflora diversity enhances nutrient availability to crop ultimately increases growth and yield of crop plants. From this result we can conclude that organic manure can be used as a bio-booster for increase in microbial population and species diversity for sustainable eco-friendly development. This study

showed that the majority of *Aspergillus* species were found in both the locations and % of occurrence is also varying in site wise. We have taken only four groups of rhizospheric soil sample and from this a little amount of fungal sp. were identified. The relationship between biodiversity of soil fungi and ecosystem function is an issue of paramount importance, particularly in the face of global climate change and human alteration of ecosystem processes. The periodicity occurrence of different fungal species fluctuated due to ecological and biological factors of the soil.

V. Acknowledgement

The authors are grateful to the Department of Agriculture, Khalsa College,Amritsar, for providing necessary laboratory facilities.

Bibliography

[1] Ayansina A. D. V. and Oso, B. A. (2006). Effect of two commonly used herbicides on soil microflora at two different concentrations. *African Journal of Biotechnology,* 5 (2):129-132.
[2] Chirinda, N., Olesen, J.E. and Porter, J.R. (2008). Effects of organic matter input on soil microbial properties and crop yields in conventional and organic cropping systems. *16th IFOAM Organic World Congress,* Modena, Italy, June 16-20, 2008.
[3] Das, B.B. and Dkhar, M.S. (2010). Rhizosphere Microflora of Soybean as affected by organic amendments in Meghalaya. *NeBIO,* 1(4):1-7.
[4] Doran, J.W., Sarrantonio, M. and Liebieg, M.A. (1996). Soil health and sustainability. *Advance in Agronomy*. 56:1-54.
[5] Gaddeyya, G., Shiny, P., Niharika, B.P. and Ratna, K. P. K. (2012). Isolation and identification of soil mycoflora in different crop fields at Salur Mandal. *Advances in Applied Science Research*, 3 (4):2020- 2026.
[6] Ishaq Fouzia and Khan Amir. (2011). Isolation, Identification and Comparative Study of Fungal and Bacterial Strains Found in Organic and Inorganic Soils of Different Agricultural Fields. *Recent Research in Science and Technology*, 3(11): 30-36.
[7] Kapoor, T., Ramesh, C., Chauhan, S., Sambyal M., Raashee, A. and Natasha, S.(2015). Impact of Different Farming Systems on the Soil Quality under Sub Humid Agroecosystem of Zone-II of Himachal Pradesh. *The 2nd Int Conf on Bio-resource and Stress Management* during 7-10th Jan 2015 at PJTSAU, Rajendranagar, Hyderabad, India.
[8] Katayama, A., Hu, H.Y., Nozawa, M., Yamakawa, H. and Fujie, K. (1998). Long-term changes in microbial community structure in soils subjected to different fertilizing practices revealed by quinone profile analysis. *Soil Sci. Plant Nutr*. 44:559–570.
[9] Misra, S. G. and Mani, D. (1994). Agricultural Pollution, Vol. I. Asish Publishing House, 8/81, Punjabi Bagh, New Delhi-110026.
[10] Raindra, K., Seweta, S., Manisha, S. and Asha, S. (2010). Effect of organic amendments on soil mycoflora. *Asian Journal of Plant Pathology*, 4(2):73- 81.
[11] Rezacova, V., Baldrian P., Hrselova H., Larsen, J. and Gryndler, M. (2007). Influence of mineral and organic fertilization on soil fungi, enzyme activities and humic substances in long term field experiment. *Folia Microbiol,* 52 (4):415-422.
[12] Waksman, S. A. (1992). A method for counting the numbers of fungi in the soil. *J. Bot.*7:339-341.
[13] Yadav, A.M. (2014).Comparative study of Mycoflora of Paddy field soil in Bhandara District. *Int. J. of Life Sciences*, Special Issue A2:59-61.

