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Correlation between Soil Mycoflora and Productivity under Influence of Organic and Inorganic Inputs Applied Field of *Cajanus cajan*.

Shaikh, N. F.[1], Gachande B. D.[2]

Botany Research Laboratory and Plant Disease Clinic, N.E.S. Science College, Nanded-431605 (MS), India

Abstract: ***In present investigation a field experiment was conducted in a Cajanus cajan field during 2010-2013, to study the effect of various fermented liquid organic inputs and inorganic inputs on rhizosphere and Non-rhizosphere mycoflora population and yield. The soil rhizosphere and Non-rhizosphere mycoflora population was studied by using serial dilution technique. Result observed that application of organic inputs like Farm yard manure, Beejamruth and Jeevamruth increases rhizosphere and Non-rhizosphere fungal population in terms of colony forming unit (CFU) in organic field. The application of inorganic inputs lowers the rhizosphere and Non-rhizosphere mycoflora population (CFU) compare to organic field of Cajanus cajan. The yield obtained in organic field was higher than inorganic field and it is signifintly correlated with the mycoflora population.***

Keywords: *Cajanus cajan*, mycoflora, Yield, Organic and Inorganic inputs.

1. Introduction

Type of cultivation and crop management practices found to have greater influence on the activity of soil microflora (Mc Gill *et al.,* 1980). Dynamics of biological activity of soil and seasonal variation of soil microorganisms may be the results of the changes occurring in soil chemistry. The chemical properties of soil influence the numerical presence of microorganisms (Oneț *et al.,* 2011)

Now a day's farmers were extensively using different External agricultural inputs like inorganic fertilizers such as urea, ammonium nitrate, sulfates, and phosphates; organic fertilizers such as animal manures (FYM), vermicompost and plant composts; various other organic products such as humic acids and microbial inoculants, and pesticides including herbicides, insecticides, nematicides, fungicides, veterinary health products, and soil fumigants. All these inputs were used to maximizing crop productivity and economic returns.

The different organic and inorganic inputs present in the soil have a direct effect on the microbial population of the soil. During past decades, conventionally managed agricultural system has used inorganic fertilizer and pesticides to improve crop productivity. This intensive use of agrochemicals will definitely reduce the biodiversity, increase irreversible erosion of soil and reduce soil organic matter (Dick, 1992; Schiavon *et al.,* 1995).

To overcome the adverse effect of chemical fertilizers farmers are turning towards organic farming. Pure Organic Farming accounts complete exclusion of inorganic fertilizers and pesticides, but advocates the use of organic manures and biological pest control methods. The result of some investigation indicate that, This system can reduce some negative effects attributed to conventional agriculture and has potential benefits in enhancing soil quality (Mader *et al.,* 2002). Application of high N rates of chemical fertilization result in decline of some beneficial microorganisms (Barabasz *et al.,* 2002). While application of different organic inputs like plant compost, vermicompost, farm yard manure and integrated plant compost results in increase in rhizosphere microbial population (Das and Dkhar 2012). Addition of organic amendments increases microbial biomass and microbial activity compared to conventional agricultural system (Gelsomino *et al.,* 2004).

The application of FYM, vermicompost and GLM in organic nutrient management practices significantly increases in yield of soybean, groundnut and chilli and it is superior over inorganic nutrient management (Vidyavathi *et al.,* 2011). The combinations of Beejamruth+ Jeevamruth + Panchagavya were best treatment and resulted in significantly highest yield as compared to RDF alone in tomato (Gore and Sreenivasa, 2011).

Low organic carbon content in the soil seriously affects the growth of microbes. Therefore, addition of organic materials such as manure and crop straw is essential for improving soil fertility and increasing rice crop yield as well as increasing microbial biomass and diversity (Zhong and Cai, 2007).

The present investigation was carried out to study the Correlation between soil mycoflora and productivity under influence of organic and inorganic inputs applied field of *Cajanus cajan* during the period 2010-2013.

2. Materials and Methods

2.1. Experimental Study Site

Agricultural fields of Nanded district of Maharashtra were selected for the study of rhizosphere and Non-rhizosphere mycoflora populations and productivity (yield) under the influence of organic and inorganic inputs applied field of *Cajanus cajan* during the period 2010-2013.The selected experimental organic field was supplied with farm yard manure and organic liquid like Jeevamruth and Beejamruth

(Palekar, 2006).The Jeevamruth applied to field crop and Beejamruth applied to seed. The inorganic field supplied with regular chemical fertilizers.

2.2 Collection of soil samples

Rhizosphere soil samples were collected from organic and inorganic crop fields of *Cajanus cajan* crop by digging out soil around the rhizosphere area up to 20 cm from plant to a dimension of 15 cm height and 7 cm diameter. The five samples were collected from sampling site from each selected crop field and mixed together into a single. Similar sampling was taken from Non-rhizosphere zone (25 - 40 cm away from the plant). These soil samples were collected in sterile polythene bags and brought to the laboratory.

2.3 Enumeration of Soil Fungal Population

The rhizosphere and Nom-rhizosphere fungi were enumerated by Serial dilution method (Waksman, 1992).The collected soil samples from both the organic and inorganic inputs applied field were used for preparation of different serial Dilutions such as $10^{-2,}$ 10^{-3}, 10^{-4}, and 10^{-5}. Then transferred 1 ml aliquots from each dilution were used to count the fungal population on Martins Rose Bengal Agar Medium, potato dextrose agar and Czapek's Dox Agar. One percent streptomycin solution was added to the medium before pouring into petriplates 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.

2.4 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.

$$\text{CFU/ g dry soil} = \frac{\text{Mean plate count X dilution factor}}{\text{dry weight of soil}}$$

2.5 Collection of Yield Data

The yield data of selected crops were collected for three successive years of selected crop from both organic and inorganic field during 2010-2011, 2011-2012 and 2012-2013 in terms yield q/acre.

2.6. Correlation between Population of soil mycoflora & yield.

The collected yield data of selected different crop plants from organic and inorganic fields were correlated with mycoflora population (colony forming unit) at 10^{-3} dilution with the help of SPSS statistical software.

3. Results and Discussion

The results on rhizosphere and Non-rhizosphere mycoflora population and yield of *Cajanus cajan* in organic and inorganic field shows there is increase in rhizosphere and Non-rhizosphere mycoflora population and yield in organic inputs applied field compared to inorganic inputs applied field.

In organic field, Population of rhizosphere fungi ranged from 36.8×10^{-3} to 51.2×10^{-3}CFU/g of soil (2010-11), 38.4×10^{-3} to 52.0×10^{-3}CFU/g of soil (2011-12) and 43.6×10^{-3} to 54.3×10^{-3}CFU/g of soil (2012-13). In inorganic field, Population of rhizosphere fungi ranged from 23.2×10^{-3} to 36.0×10^{-3}CFU/g of soil (2010-11), 18.4×10^{-3} to 30.4×10^{-3}CFU/g of soil (2011-12) and 15.2×10^{-3} to 28.4×10^{-3}CFU/g of soil (2012-13). (Table.1)

In organic field, Population of Non-rhizosphere fungi ranged from 25.6×10^{-3} to 36.0×10^{-3}CFU/g of soil (2010-11), 27.2×10^{-3} to 46.3×10^{-3}CFU/g of soil (2011-12) and 32.6×10^{-3} to 52.6×10^{-3}CFU/g of soil (2012-13). In inorganic field, Population of Non-rhizosphere fungi ranged from 10.4×10^{-3} to 24.8×10^{-3}CFU/g of soil (2010-11), 11.2×10^{-3} to 20.8×10^{-3}CFU/g of soil (2011-12) and 10.3×10^{-3} to 21.3×10^{-3}CFU/g of soil (2012-13). (Table.2)

It is observed that application of FYM (5 t/ha) to soybean field had significantly increased the fungi (22.21 and 27.25 CFU x 10^3/g) in the soybean field at 30 and 60 DAS, respectively (Meena and Ghasolia (2013). Study revealed that the fungal population count was observed maximum (4.6×10^{-3} CFU ml^{-1}) in organic treatment than in inorganic (3.6×10^{-3} CFU ml^{-1}) treatment (Tanvi *et al.*, 2015).addition of various organic manures and microbial inoculants on fertility of mulberry garden enhances fungal population (37.66×10^3CFU/g soil (Shashidhar *et al*., 2009).Inorganic fertilizer to crop field significantly lowers the rhizosphere microbial population and diversity (Nelson and Mele, 2006).The organic inputs like Panchagavya and Beejamruth seed treatment increases rhizosphere microbial population (Shubha *et al.,* 2014). the application of two commonly used herbicides (atrazine and atrazine + metolachlor) on non-target soil of maize field resulted in decreases in microbial counts (Ayansina and Oso 2006).

The data presented in table shows the application of organic inputs like farm yard manure and Jeevamruth during the period 2010-13 in organic field of *Cajanus cajan* increases yield. While during 2010-13 in inorganic field there was decrease or increasing yield means there is no continuity. In organic farming of *Cajanus cajan* the recorded yield in 2010-11 was (12.2 q/acre), 2011-12 was (14.6 q/acre) and 2012-13 was (16.4 q/acre). In inorganic farming of *Cajanus cajan* the recorded yield in 2010-11 was (9.2 q/acre), 2011-12 was (8.6 q/acre) and 2012-13 was (10.3 q/acre). (Table.3)

Reported that, in organic farming there is increasing yield year by year and decrease in inorganic fields year to year. Yields in organic system increase up to 28-32% than those in the conventional plots (Padmavathy and Poyyamoli 2011). Application of organic inputs like (FYM, Poultry manure, Panchagavya, Beejamruth and Jeevamruth) with or without biofertilizers (*Azospirillum* + *Phosphorus solubilizing bacteria*) results in beneficial effect on growth and yield attributes of onion (Praveenkumar and Allolli 2010). application of organic inputs like Jeevamruth and Panchagavya were significantly increases grain yield (3387 kg ha) and Straw yield (4632 kg ha') (Divya and Babalad

2012). most European studies of organic farming found that decrease in crop yields in organic farming compare to conventional farming. While some American studies have reported similar yields in organic farming and inorganic farming of tomatoes and corn (Poudel *et al.,* 2002). The effect of farm yard manure with Jeevamruth on yield and economics result revealed that, application of farm yard manure at the rate 7.5 t ha^{-1} with Jeevamruth recorded highest (Rs.27,384 ha^{-1}) net profit compare to the treatment 100 per cent Recommended dose of fertilizer (RDF) (Rs. 25,475 ha^{-1}) in Sunflower (*Helianthus annus* L.) (Manjunathas *et al.*, 2009).

For soil mycoflora population in organic field there is a strong positive correlation between soil mycoflora and yield in an organic farm.Thus there is strong evidence from sample values to beliieve that in organic fields as soil mycoflora population increases yield also increases. For soil mycoflora population in inorganic field there is a moderate negative correlation between soil mycoflora and yield in inorganic farm. The data shows for 2010-2013. It is found that, organic inputs applied to soil gradually changes in microbial community structure which responsible for enhancing gradual improvement in soil quality finally increases yield (Visser and Parkinson 1992). Application of poultry litter (PL), as a fertilizer to cotton field, results in increase soil fungal population levels over time. It determines relationships of fungal population levels to soil nutrient contents and cotton growth and yield (Pratt and Tewolde, 2009). (Table.4)

4. Conclusion

The organic inputs like farm yard manure, Jeevamruth and Beejamruth increases the soil mycoflora population and yield compared to inorganic inputs applied field which adversely affect mycoflora population and yield it means there is positive correlation between fungal population and yield of *Cajanus cajan* in organic field compare to inorganic field.

The Increase in soil mycoflora population enhances nutrient availability to crop ultimately increases growth and yield of crop plants. From this result we can conclude that organic liquid manure can be used for increase in microbial population and yield of crops for sustainable eco-friendly development.

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Table 1: Population of Rhizosphere mycoflora (x 10^{-3} CFU/g soil) in organic and Inorganic field of *Cajanus Cajan*.

Sr.No	Months	Organic field			Inorganic field		
		2010-2011	2011-2012	2012-2013	2010-2011	2011-2012	2012-2013
1	Jun	51.2	47.2	54.3	28.8	26.8	28.4
2	July	43.2	44.8	48.2	25.2	21.6	20.4
3	Aug	36.8	38.4	43.6	28.0	28.8	27.6
4	Sep	39.2	40.8	45.3	23.2	18.4	16.8
5	Oct	45.2	48.8	50.2	30.4	25.2	23.2
6	Nov	49.6	52.0	54.3	33.6	30.4	24.0
7	Dec	40.8	46.4	49.8	36.0	23.2	19.4
8	Jan	37.6	41.6	45.4	26.4	19.2	15.2
	Average	42.95	45.00	48.88	28.95	24.20	21.87
	S.D	±5.379	±4.520	±4.046	±4.275	±4.371	±4.784

Table 2: Population of Non-Rhizosphere mycoflora (x 10^{-3}CFU/g soil) in organic and Inorganic field of *Cajanus cajan*.

S. No	Months	Organic field			Inorganic field		
		2010-2011	2011-2012	2012-2013	2010-2011	2011-2012	2012-2013
1	Jun	36.0	33.6	40.4	21.6	19.2	21.3
2	July	31.2	27.2	32.6	18.4	14.4	15.2
3	Aug	25.6	29.2	38.2	15.2	20.8	16.5
4	Sep	28.8	36.6	44.5	16.8	11.6	10.3
5	Oct	34.0	42.3	50.3	20.8	16.8	11.6
6	Nov	29.6	34.5	43.5	10.4	14.4	12.3
7	Dec	36.0	46.3	52.6	24.8	11.2	10.8
8	Jan	27.2	35.8	47.8	12.8	12.8	12.4
	Average	31.05	35.68	43.73	17.60	15.15	13.80
	S.D	±3.953	±6.291	±6.596	±4.780	±3.503	±3.699

Table 3: Comparison between crop Production in Organic and Inorganic field of *Cajanus cajan* during 2010-2013.

Sr. No	*Field*	*Organic yield Q/acre*	*Inorganic yield Q/acre*
1	2010-2011	12.2	9.2
2	2011-2012	14.6	8.6
3	2012-2013	16.4	10.3

Table 4: Correlation between population of soil mycoflora and yield in *Cajanus cajan*.

Year	Organic field		Inorganic field	
	Rhizosphere	Non-Rhizosphere	Rhizosphere	Non-Rhizosphere
Over period 2010-13 (3 years)	0.967 Sig (2 tailed) 0.165	0.972 Sig (2 tailed) 0.150	-0.476 Sig (2 tailed) 0.684	-0.502 Sig (2 tailed) 0.665

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