Int.J.Curr.Microbiol.App.Sci (2020) Special Issue-10: 11-15

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-10 pp. 11-15**
Journal homepage: http://www.ijcmas.com

Original Research Article

Integrated Nutrient Management – A remedy for enhancing the lives of Microbes in soil

Shweta Pawar, Bharat Singh*, N.S. Thakur,Ashok Sharma, and RiniShrivas

College of Agriculture, Indore (MP) – 452001, India
**Corresponding author*

A B S T R A C T

An experiment was conducted to examine the microbial populations at AICRPDA farm Indore, in kharif season 2017-18, in which 3 replications and 9 treatments were taken withorganic and inorganic farming practices in soybean crop. Soil samples collected from the surface (0-15 cm) soil depths of the treated plots by soil plate and dilution plate methods for fungi, bacteria and actinomycetes respectively. Results obtained showed that the organically treated plot recorded the maximum microbial population counts (fungal, bacterial and actinomycetes). A significant variation in microbial population was found between control and treated plots (organic and inorganic) at the surface soil depth. The application of organic fertilizers increased the nutrient content of the soil and thereby increasing the microbial counts.

Keywords

Nutrient management, microbial populations

Introduction

Soil is the habitat of a diverse array of organisms which include both micro flora and fauna. Soil micro organisms play a very important role in soil fertility not only because of their ability to carry out biochemical transformation but also due to their importance as a source and sink of mineral nutrients. Soil microbes, the living part of soil organic matter, function as a transient nutrient sink and are responsible for releasing nutrients from organic matter for use by plants (e.g., N, P and S). An understanding of microbial processes is important for the management of farming systems, particularly those that rely on organic inputs of nutrients. The soil microbial community is involved in numerous ecosystem functions, such as nutrient cycling and organic matter decomposition, and plays a crucial role in the terrestrial carbon cycle. Chemical fertilizer generally improves crop production but, due to long term use they decrease the soil quality. On the other hand, use of organic materials (e.g., animal manures, crop residues, green manures, etc.) as an alternative source holds promise, they improves the soil quality and yes, improves the microbial population soil.

Materials and Methods

A long term studies on the impact of organic, integrated and chemical nutrient management practices on soybean production at AICRPDA, Indore, during 2017-18. From sowing to harvesting 16 Standard Meteorological weeks were recorded. 34.70

C was the heighest maximum temperature, 27.360 C was highest minimum temperature, 636.50 mm were the total rainfall recorded during the SMW.

Enumeration of microbial populations

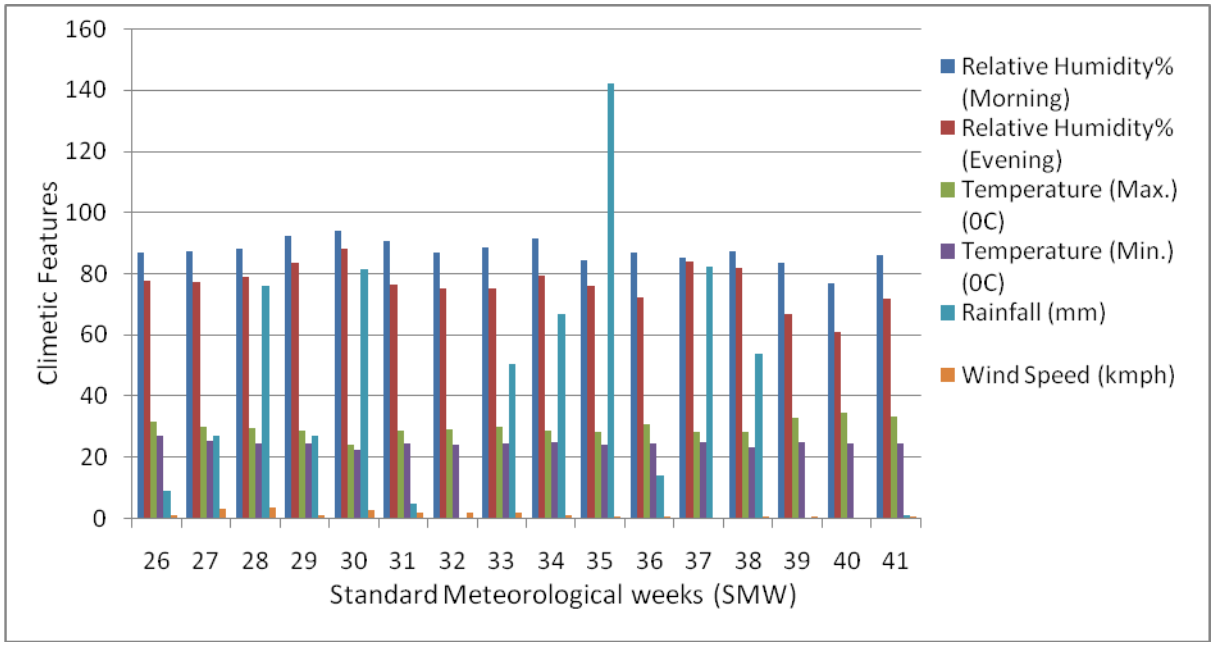
The soil microbial population was studied to know the initial microbial populations in soil using different dilution methods.

Serial dilution (Pour Plate Method)

To evaluate the effect of different treatments on microbial population in soil, serial dilutions were made. Plant root nodules and soil samples collected for microbial studies were processed for serial dilution by suspending 10 gm of soil sample in 95 ml. sterilized distilled water in flasks and was shaked on horizontal shaker for 20 min. Subsequent serial dilution were made up to1-6 dilution and was used to calculate presence of microbial population in the soil dilution (Thornton,1922 and Wollum, 1982).

Plating

Plating was done by taking 1ml each of 10-1 to 10-6 dillution depending upon the type of micro-organisms to be counted in aseptically sterilized petriplates. The petridishes containing one ml of organism suspension, each one taken sterilized, centrifused, nutrient agar is poured into than gently swirled for uniform mixing of media and cooled. Plating was done in triplicate for each dilution. The composition of standard media for Actinomycetes, Bacteria and Fungi were taken.



Treatment details

Sym	Treatment	Treatment detail
T1	N0P0	Control
T2	N20P13	Fertilizer N and P @ 20 and 13 kgha^{-1}
T3	N30P20	Fertilizer N and P@ 30 and 20 kgha^{-1}
T4	N40P26	Fertilizer N and P@ 40 and 26 kgha^{-1}
T5	N60P35	Fertilizer N and P @ 60 and 35 kgha^{-1}
T6	FYM 6t ha^{-1} + N20P13	FYM @ 6 t ha^{-1} in rainy season only plus fertilizer N and P @ 20 and 13 kgha^{-1}, respectively to each crop.
T7	Crop residues 5t ha^{-1} + N20P13	Crop residues of soybean @ 5t ha^{-1}
T8	FYM 6t ha^{-1}	FYM @ 6 t ha^{-1}
T9	Crop residues 5t ha^{-1}	Residues are applied to each crop after emergence of crop in between crop rows as surface mulch.

Results and Discussion

The data on soil microbial population are presented in Table A, results revealed that the highest soil microbial population were recorded in treatment (FYM 6t ha^{-1}+ N20 P13), and lowest in case of control treatment (N0 P0) whereas the soil samples under chemical fertilizer showed the lower level of soil microbial population as compared to amended treatments. From the results on the microbial population it is analysed that the highest microbial count was observed in the treatment where the FYM is implemented with the inorganic fertilizer. Inorganic fertilizer maintain the Nutrient availability at the initial stage (few days after sowing) but later on depending physico-chemical parameters of the soil nutrient availability declines due to formation of metal complexes, but the addition of FYM Maintains the soil organic carbon pool & which helps In maintenance of soil biological activities. Addition of inorganic fertilizer in conjunction with the organic fertilizer is the appropriate rescue system for maintenance of soil quality & productivity in long term use.

Application of organics increases the microbial activity of the soil. Different microbs improves the shows that applying organics with inorganics having a positive influence on the microbs. nhealth of soil by the means of availig the different nutrient to the soil which is beneficial to the crops.

Khaddar and Yadav (2006) evaluated that the fungal population increased in treated plot over control. Among the organics, biofertilizer increased fungal population at 25 day stage of the crop, while there was slight decrease in fungal population. Integrated use of chemical fertilizer with organics could ameliorate the soil and improve the productivity of a soybean wheat cropping sequence resulting in eco-friendly farming system.

Thakur et al. (2011) studied the status of nutrients & their depletion and build-up in

soil, and crop productivity after 36 years (1972-73 to 2008-09) of intensive cropping under continuous use of various inorganic fertilizers and organic manure in a Vertisols. Results showed that the application of RDF of N, P, and K the soil physical environment and sustain higher crop productivity under this intensive cropping system, the balanced use of fertilizers continuously either alone or in combination with organic manure is necessary for microbial population.

Kumar et al. (2017) carried out an experiment at the Experimental Farm of Department of Soil Science and Water Management, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan, (HP) during 2014-15 and 2015-16, result revealed that Conjoint use of fertilizers, manures and PGPR significantly influenced soil microbial properties of cauliflower crop. Treatment T3 resulted in significantly maximum micro-biological properties which was found statiscally at par with T5.

Nakhro and Dkhar evaluated that application of organic fertilizers increased the organic carbon content of the soil and thereby increasing the microbial counts and microbial biomass carbon. The use of inorganic fertilizers resulted in low organic carbon content, microbial counts and microbial biomass carbon of the soil, although it increased the soil's NPK level which could be explained by the rates of fertilizers being applied.

Table.1 Methods used in determinations of microbial analysis

S. No.	Determination	Method
1	Enumeration of bacteria	Thornton media for Total bacterial count (Thornton, 1922)
2	Enumeration of fungi	Rose Bengal media for fungi (Wollum, 1982)
3	Enumeration of actinomycetes	Agar Media for Actinomycetes (Wollum, 1982)

Table.A Effect of different treatments of nutrient management on soil microbial properties

Sym	Treatment	Bacteria	Fungi	Actinomycetes
T1	Control	23×10^7	7×10^4	11×10^4
T2	N20 P13	25×10^7	20×10^4	14×10^4
T3	N30 P20	35×10^7	21×10^4	19×10^4
T4	N40 P26	41×10^7	25×10^4	20×10^4
T5	N60 P35	46×10^7	28×10^4	22×10^4
T6	FYM 6 t ha^{-1}+T2	71×10^7	36×10^4	31×10^4
T7	Residues 5 t ha^{-1} +T2	66×10^7	29×10^4	27×10^4
T8	FYM 6 t ha^{-1}	60×10^7	26×10^4	25×10^4
T9	Residues 5 t ha^{-1}	52×10^7	28×10^4	23×10^4

Acknowledgement

We are thankful to Department of soil science of College of Agriculture, AICRPDA Indore for well conduction of our research. Also thankful for the scientists who supported and guided us.

References

Khaddar, V.K. and Yadav, S. (2006). Effect of integrated nutrient management practices on soil microbial population in a soybean-wheat cropping sequence. *J. Env. Res. and Deve.* 1 (2).

Thakur, R., Sawarkar, S.D., Vaishya, U.K. and Singh, M. (2011). Impact of continuous use of inorganic fertilizers and organic manure on soil properties and productivity under soybean-wheat intensive cropping of a Vertisols. *J. Indian Soc. Soil Sci.* 59 (1): 74-78.

Kumar, P., Thakur J. and Mohit (2017). Effect of conjoint application of nutrient sources and PGPR on soil microbiological properties of cauliflower. *J. Pharmacognosy and Phytochemistry*. 6 (3):672-676

Nakhro, N. and Dkhar,M.S. (2010). Impact of Organic and Inorganic Fertilizers on Microbial Populations and Biomass Carbon in Paddy Field Soil. *Journal of Agronomy, 9: 102-110.*

Thornton, H.G. (1922). On the development of standardised agar medium for counting soil bacteria, with especial regard to the repression of spreading colonies. *Ann. Appl. Boil.*,9:241-274.

Wollum, A.G. (1982). Cultural methods for soil microorganism. In: page, A.L., Miller, R.H., Keeney, D.R., (eds). Methods of soil analysis. Part . Chemical and Microbiological properties. Agronomy Monograph no. 9. Madison (U.S.A.), pp. 781-814.