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RESEARCH ARTICLE

INFLUENCE OF ORGANIC AND INORGANIC NUTRIENTS ON SOIL MICROBIAL POPULATION IN RICE FALLOW COTTON

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ABSTRACT

Field investigations were carried out at the Annamalai University, Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai Nagar, which represents the tail end area of Cauvery Deltaic Zone of Tamil Nadu, India, during January 2007 and 2008 to evaluate the influence of integrated nutrient management technique on microbial population in rice fallow cotton (*Gossypium hirsutum* L.). The results indicated that considerable increase in microbial population (bacteria, fungi and actinomycetes) with the combined application of 75% RDF with vermicompost @ 2.5 t ha^{-1} along with soil application of *Azatobactor* and *Phosphobacteria*. This was followed by 100% RDF with vermicompost @ 2.5 t ha^{-1}.

Key words: Cotton, FYM, Vermicompost, Bacteria, Fungi and actinomycetes.

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INTRODUCTION

The changes in soil 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). 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). The present investigation was carried out to study the effect of organic inputs (FYM, Vermicompost, pressmud and biofertilizer) and inorganic inputs on soil Non-rhizosphere mycoflora population and species diversity in cotton field.

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MATERIALS AND METHODS

Field experiment were conducted during January 2007 and 2008 at Experimental farm , Department of Agronomy, Annamalai University, Annamalai Nagar to evaluate the influence of integrated nutrient management technique on microbial population in rice fallow cotton (*Gossypium hirsutum* L.). The soil was clay loam (Udic Chromustert), low in available nitrogen (201 kg/ha), medium in available phosphorus (19.9 kg/ha) and high in potassium (285 kg/ha), with organic carbon 0.52% and pH 7.3. The Experiment was laid out in randomized block design with three replications using variety of LRA 5166 as the test crop. The variety was raised under optimum conditions of agronomic practices and plant protection measures in the field. The soil was clay in texture having pH 6.7, EC 0.34 ds/m, low in available N (246.50 $kgha^{-1}$) medium in available P (18.5 $kgha^{-1}$) and high in available K (280.75 $kgha^{-1}$). Microbial population viz; bacteria, fungi, actinomycetes, present in rhizosphere were analysed. Serial dilution and standard plate count methods were used for isolation of rhizosphere bacteria, fungi and actinomycets using nutrient agar, Martin's rose bengal agar and Kuster's agar respectively. Inoculated plates were incubated at 32±2^{0}C for 5 days and the colony counts were recorded.

RESULTS AND DISCUSSION

Soil microbial status

Integrated nutrient management showed marked influence on bacteria, fungi and actinomycetes population.

Influence of organic and inorganic nutrients on Soil microbial status in post harvest soil of Rice fallow cotton

Treatments	Bacteria (10^{-6})		Fungi (10^{-4})		Actinomycetes (10^{-5})	
	2007	2008	2007	2008	2007	2008
T_1	17.64	17.56	6.02	5.99	2.09	2.07
T_2	32.82	29.96	11.19	10.22	3.88	3.54
T_3	39.40	39.62	13.43	13.51	4.66	4.68
T_4	55.24	53.94	18.83	18.39	6.53	6.38
T_5	46.09	45.94	15.71	15.66	5.45	5.43
T_6	22.11	21.87	7.54	7.46	2.61	2.58
T_7	35.75	35.66	12.19	12.16	4.23	4.21
T_8	29.08	26.60	9.92	9.07	3.44	3.14
T_9	42.33	42.57	14.43	14.51	5.00	5.03
T_{10}	55.46	54.67	18.91	18.64	6.55	6.46
T_{11}	49.06	48.27	16.73	16.46	5.80	5.70
$S.E_D$	1.05	1.08	0.50	0.40	0.18	0.15
CD (p=0.05)	2.12	2.15	0.98	0.85	0.35	0.33

T_1: Control (No fertilizer and organic manure); T_2: 100% RDF; T_3: T_2 + FYM @ 12.5 t ha^{-1}; T_4: T_2 + Vermicompost @ 2.5 t ha^{-1}; T_5: T_2 + Pressmud @ 10 t ha^{-1}; T_6: 75% RDF + FYM @ 12.5 t ha^{-1}; T_7: 75% RDF + Vermicompost @ 2.5 t ha^{-1}; T_8: 75% RDF + Pressmud @ 10 t ha^{-1}; T_9: T_6 + soil application of *Azotobacter* and Phosphobacteria; T_{10}: T_7 + soil application of *Azotobacter* and Phosphobacteria; T_{11}: T_8 + soil application of *Azotobacter* and Phosphobacteria

The maximum bacterial count of 55.46 (10^{-6}) and 54.67 (10^{-6}) and maximum fungi count of 18.91(10^{-4}) and 18.64 (10^{-4}) and maximum actinomycetes count of 6.55 (10^{-5}) and 6.46 (10^{-5}) were recorded under 75% RDF + Vermicompost @ 2.5 t ha^{-1} + soil application of *Azotobacter* and Phosphobacteria (T_{10}). This was followed by 100% RDF + Vermicompost @ 2.5 t ha^{-1} (T_4). The least bacterial count of was registered under control (T_1) in both the phases. The higher microbial population in soil might be due to the addition of organics, which has regulated soil temperature, available soil moisture and the humus content of soil. This might have created favourable soil environment for sustenance and rapid multiplication of micro organisms. The least microbial population was registered in control might be due to inorganic fertilizer to crop field significantly lowers the rhizosphere microbial population and diversity (Nelson and Mele, 2006). It may be concluded that among different treatments, application of 75% Recomended dose of fertilizer along with Vermicompost @ 2.5 t ha^{-1} followed by soil application of *Azotobacter* and Phosphobacteria registered higher microbial population viz. bacteria, fungi and actinomycetes and ensures sustainability in post harvest soil during both the years of study.

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