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INFLUENCE OF INTEGRATED NUTRIENT MANAGEMENT PRACTICES ON GROWTH AND YIELD OF RICE–GREENGRAM CROPPING SYSTEM

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Abstract

Field investigation was conducted at Annamalai University Experimental farm, Annamalainagar to study the effect different organic manures with graded dose of nitrogen in the growth and yield of rice and the residual effect on succeeding greengram in rice–greengram cropping system. at the Experimental farm, Annamalai University, Annamalai nagar during 2017 – 2018. The experiment was laid out in RBD with three replications. It was observed that the growth and yield attributes of rice crop *viz.,* plant height, number of tiller hill^{-1}, LAI at tillering, productive tillers hill^{-1}, thousand grain weight, grain and straw yield were favourably influenced by combined application of inorganics and organics. Application of 75% of recommended dose of nitrogen as inorganic and 25% of nitrogen through vermicompost favourably influenced the growth and yield parameter of rice and recorded maximum yield of rice per hectare. Growth and yield parameters of succeeding green gram were also influenced by this application.

***Key words*:** Rice, Green gram, Vermicompost, Organic and Inorganic manures.

Introduction

Rice is the most important and widely cultivated food crop in our nation. In Asia alone, above 2 billion people obtain 70 per cent of their energy intake from rice and its derivatives. India produces 96.50 million tonnes of rice in an area of 44 million hectares with productivity of 2.2 tonnes per hectare. Although India is the second most rice producing country in World, the yield level is very low compared to the major rice producing countries. Indian soils have depleted their nutrient status. Motsra (2002) estimated that 90% of the soils are presently deficient in nitrogen, 80% in phosphrous and 50% in potassium. The depletion of secondary nutrients and micronutriens like Zn, Mn, B and iron has also become more conspicuous in decreasing the productivity of crops. The repeated use of inorganic fertilizer alone fails to sustain desired yield, impairs soil physical conditions and reduces organic matter contents (Mohammad, 2010) leads to environmental pollution especially due to their continuous use (Bhakiyathu, 2005).

Wetland rice removes a substantial amount of major and minor nutrients from the soil, and deficiency of either nutrient reduces its grain yield. But with the present day high yielding cultivars, which have higher nutrient requirements, the use of inorganic fertilizers has increased considerably leading to decline in the use of organic materials. The impact of increased fertilizer use on crop production has been large, but ever increasing cost of energy is an important constraint for increased use of inorganic fertilizer.

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Expenditure for inorganic fertilizer is high and thus, identifying appropriate and economically feasible approaches, which are environmentally friendly and healthy, is imperative. Integrated nutrient management seems to be a suitable approach to achieve these goals. The continued use of inorganic fertilizers over the years

in paddy field without application of organic amendments resulted in the change of soil structure as well as decreasing the soil fertility (Sannathimmappa *et al*., 2015). One third of the soils of the world are acidic having pH. Integrated nutrient management through use of inorganic fertilizers along with organic sources are applied to soil for increasing the status of plant available nutrients and improving the physico-chemical and biological properties of soil which directly affect soil fertility (Sannathimmappa *et al*., 2015). Organic and inorganic fertilizer amendments are used primarily to increase nutrient availability to plants, but they can also affect soil microorganisms. The INM may be a feasible approach to ensure the sustained availability of nitrogen and enhancing its use efficiency as well as microbial activity. Therefore augmenting soil resources are prerequisite to sustain soil nutrients, to produce higher crop yield with optimum input level (Dahiphale *et al*., 2003). But, the combined use of chemical fertilizers along with various organic sources is capable of improving soil quality and higher crop productivity on long term basis (Baradhan and Suresh Kumar, 2018). Hence, the study was carried out to combined use of inorganic fertilizers along with organics like pressmud, poultry manure, vermicompost, green manures and green leaf manures for the production of wet land rice. It is considered as the promising renewable, fertility rich source and have been served as a substitute to cut down the cost of fertilizer input and to increase the productivity.

Materials and Methods

The field experiments were conducted at Annamalai University Experimental farm, Annamalai Nagar. The treatments consisted of nine viz., control (T_1), 100% of RDF (T_2), 75% of N + Pressmud (T_3), 75% of N + Poultry manure (T_4), 75% of N + vermicompost (T_5), 75% of N + daincha (T_6), 75% of N + sunnhemp (T_7), 75% of N + Pungam (T_8) and 75% of N + gliricidia (T_9). The experiment was laid out in Randomized Block Design with three replication. The soil of the experimental site was clay loam in texture, having pH 7.9. The inorganic fertilizer were applied in the form of urea while phosphorus and potassium were applied in the form of SSP and MOP respectively. The inorganic fertilizers along with organics like pressmud, poultry manure, vermicompost, green manures and green leaf manures were applied as per the treatment schedules. The biometric observations recorded in the rice crop were plant height, number of tiller per hill, LAI at tillering, productive tillers per hill, DMP at harvest, 1000 grain weight, grain weight, grain and straw yield. The growth and yield attributes were recorded at harvest stage of green gram.

Result and Discussion

The result of the experiments showed that the growth components of rice viz., plant height, number of tiller per hill, LAI at tillering, productive tillers per hill, DMP at harvest, 1000 grain weight, grain weight, grain and straw yield which were influenced by integrated nutrient management practices (Table. 1).

Among the various treatments imposed on rice, the treatment with 75% N + vermicompost (T_5) recorded the highest values for growth and yield parameters. The increase in growth and yield parameters might be due to the presence of more available nutrients, vitamins microbial stimulation in vemicompost which might be responsible to favourable growth parameters particularly tiller number resulting in higher DMP. This is also due to vermicompost which is rich source of macro and micro-nutrients and growth hormones, which not only supply essential nutrients to the soil but also improve the physio-chemical and biological properties of the soil and slow release of nutrients over longer periods. Besides early mineralization (Christensen, 1998), presence of nitrogen fixers and other beneficial organisms in the vermicompost have contributed towards significant increase in growth parameters. The similar results were earlier reported by Gajalakshmi and Abbasi (2002).

The residual effects of the treatments over green gram were presented in Table 2. Among the various treatments, application of 75% N + vermicompost (T_5) recorded the higher growth attributes. The efficient utilization of mineralized nutrients from these organic manures has increased the availability of nutrients throughout the growth period which in turn increased the growth and yield parameters of green gram revealing higher better nutrient management. The present results are in conformity with the findings of Gedam *et al*. (2008).

Table 1: Effect of inorganic and organic on the growth and yield attributes of rice

Treatments	Plant height at harvest (cm)	LAI	No. of productive tillers m^{-2}	DMP at harvest (t ha^{-1})	1000 grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
T_1	78.2	3.78	189	7.88	19.86	2430	3855
T_2	90.1	4.77	244	10.17	19.94	3950	4920
T_3	100.4	5.58	283	11.34	19.93	4837	5685
T_4	107.0	6.06	317	11.97	20.2	5450	6170
T_5	112.3	6.45	335	12.53	20.0	5936	6520
T_6	101.9	5.65	290	11.97	19.93	4978	5820
T_7	101.2	5.61	287	11.39	19.92	4864	5760
T_8	95.5	5.68	291	11.45	19.9	4375	5820
T_9	95.0	5.19	261	11.36	19.0	4350	5335
SEd	2.33	0.159	7.11	0.277	0.21	134.5	165.5
CD (p=0.05)	4.86	0.341	14.80	0.565	NS	273.9	339.7

Table 2: Effect of inorganic and organic on the growth and yield attributes of greengram

Treatments	Plant height at harvest (cm)	DMP at harvest (t ha^{-1})	100 grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
T_1	36.50	1910	3.60	412	1274
T_2	38.34	2135	3.61	440	1452
T_3	41.16	2399	3.63	516	1741
T_4	42.9	2548	3.64	560	1903
T_5	45.8	2670	3.65	579	2032
T_6	42.20	2411	3.63	526	1760
T_7	41.90	2403	3.62	519	1746
T_8	42.20	2272	3.63	486	1605
T_9	40.30	222269	3.62	483	1589
SEd	0.621	58.0	0.125	13.50	61.30
CD (p=0.05)	1.249	118.2	NA	27.15	125.40

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