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RESEARCH ARTICLE

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Growth and yield of rice (*Oryza sativa* L.) as influenced by various levels of FYM and cattle urine application in Bhadra Command Area of Karnataka

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ABSTRACT

An experiment was conducted during *Kharif* 2009 in sandy clay loam soil at Agriculture Research Station, Kathalagere, Davanagere Dist, Karnataka to study the growth and yield of rice as influenced by various levels of FYM and cattle urine application under Bhadra command area. The investigation consisted of ten treatments were replicated thrice. Among different treatments application of FYM at 12.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1} recorded significantly higher plant height (83.8 cm), number of leaves per hill (49.7), leaf area per hill (374.2 cm^2), number tillers per hill (30.5), total dry matter production per hill (88.7 g), number of productive tillers per hill (26.7), panicle length (21.4 cm), panicle weight (4.35 g), test weight (23.2 g), grain yield (45.4 q/ha) and straw yield (57.8 q/ha) as compared to other treatments. Whereas, significantly lower plant height (68.4 cm), number of leaves per hill (34.0), leaf area per hill (316.8 cm^2), number tillers per hill (21.6), total dry matter production per hill (71.8 g), number of productive tillers per hill (19.9), panicle length (18.0 cm), panicle weight (2.96 g), test weight (17.9 g), grain yield (33.7 q/ha) and straw yield (46.3 q/ha) were recorded in the treatment with the application of FYM at 7.5 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}.

KEY WORDS : Growth, Yield, Plant height, Rice, Grain

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INTRODUCTION

Rice (*Oryza sativa* L.) is the principal food crop to billions of people around the world. India occupies a pride place in rice production among the food crops cultivated in the world. About 90 per cent of rice grown in the world is produced and consumed in Asian countries. China and India account for more than half of the total acreage in the world. Organic farming has gained popularity in recent years not only in India, but also in Australia, Argentina, USA, UK, Germany, South Africa, China, Japan and other Asian countries like Srilanka and Pakistan. The general acceptance of organic farming is not only due to greater demand for pollution free food, but also due to natural advantage in supporting the sustainability in agriculture. The essence of practicing organic farming lies in the use of naturally available resources like organic wastes, predators, parasites in conjunction with natural processes like decomposition, biological nitrogen fixation and resistance to achieve the needs of crop production. When rice crop is grown transplanted situation, there are chances of losses of nutrients with flooded condition. To reduce these losses, nutrients should be provided at right quantity and at right stage of crop. This is possible by applying suitable organic manures for transplanted rice crop, which inturn improves the organic matter status of soil. Organic matter not only helps to supply the nutrients, but also improves the physical condition of soil. Further, organic matter acts as a food for microorganisms and encourages the multiplication of their population, which inturn improves the mineralization of nitrogen in soil and thus, fertility and productivity of the soil is improved. In these aspects no systematic studies were carried out to find out the response of transplanted rice to varying levels of FYM and Cattle urine. Therefore, an attempt has been made to study the effect of FYM and cattle urine on growth and yield of rice in Bhadra command area, in order to achieve maximum production.

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MATERIALS AND METHODS

An experiment was conducted during *Kharif* 2009 at Agriculture Research Station, Kathalagere, Davanagere Dist, Karnataka. The soil of the experimental site was sandy clay loam with slightly acidic in pH (5.4), slightly high in organic carbon (0.60 %), low in available nitrogen (279.6 kg/ha), medium in phosphorus (22.6 kg/ha) and low in potassium (197.1 kg/ha). The experiment was laid out in Randomized complete Block Design with ten treatments was replicated thrice. Recommended dose of fertilizer (100: 50: 50 kg N, P_2O_5 and K_2O kg ha^{-1}, respectively) was applied through chemical fertilizers. N was applied in three split doses *viz.,* 50 per cent as basal, 25 per cent at 30 days after sowing and remaining 25 per cent at 60 days after sowing as top dressing with full dose of P and K as basal. The fertilizer application was done in treatment (T_{10}). The manurial treatments, FYM was applied as basal dose and cattle urine was applied in two splits. The nutrient composition of FYM and cattle urine are given in the Table 1. The rice variety –JGL-1798 was used for this experiment. The land was ploughed using bullock drawn

Table 1: Nutrient composition of different FYM and cattle urine

Parameters	FYM	Cattle urine
pH	7.8	7.4
EC (dsm^{-1})	0.16	1.3
OC (%)	10.71	2.5
N (%)	0.59	0.51
P (%)	0.3	0.02
K (%)	0.42	0.62
Ca (%)	2.1	0.0054
Mg (%)	0.95	0.0113
S (ppm)	4200	0.31
Fe (ppm)	1151.2	2.89
Zn (ppm)	89.2	3.52
Cu (ppm)	41.1	1.01

M.B. plough and leveled. Then raised beds of 1 m x 1 m width were prepared. The beds were prepared near to the main field and seeds were sown in nursery bed @ 62 kg/ha and twenty five days old seedlings were planted at a spacing of 20 cm x 10 cm (one seedling $hill^{-1}$). Irrigation at 2.5 cm water height was maintained from planting to 10 days after planting (DAP) and 5 cm water height was maintained from 11 DAP to physiological maturity. The growth and yield parameters were recorded at harvest by following standard procedures.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented in Table 2 and 3.

Effect of FYM and cattle urine application on growth parameters of rice:

The growth parameters *viz.,* plant height, number of leaves, number of tillers, leaf area, and total dry matter production of rice was significantly influenced by various levels of FYM and cattle urine application. Application of FYM at 12.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1} recorded significantly higher plant height (83.8 cm), number of leaves per hill (49.7), leaf area per hill (374.2 cm^2), number tillers per hill (30.5) and total dry matter production per hill (88.7 g) (Table 2). Significant increase in growth parameters *viz.*, plant height, number of leaves, number of tillers, leaf area and total dry matter production might be due to greater availability and steady release of nutrients from organic sources (FYM and cattle urine), which perhaps enabled the recovery of plant growth towards reproductive stage. Devaraju *et al.* (1998) opined that adequate supply of plant nutrients influenced the plant growth. Nitrogen increases the chlorophyll content at all growth stages as it is a constituent and might have increased the photosynthesis and resulted in increased plant growth (Gill and Singh, 1985). However, it was onpar with FYM at 12.5 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1} and recommended dose of fertilizer (100:50:50 kg NPK ha^{-1}) + 10 tonnes of FYM ha^{-1}. This could be due to greater solubility and accelerated release of nitrogen by chemical fertilizer and organic manure by providing an opportunity for transplanted rice to utilize higher quantum of nutrients (Vijayalakshmi and Nagarajan, 1994). Whereas, significantly lower plant height (68.4 cm), number of leaves per hill (34.0), leaf area per hill (316.8 cm^2), number tillers per hill (21.6) and total dry matter production per hill (71.8 g) were recorded in the treatment with the application of FYM at 7.5 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}. This might be due to least availability of nutrients from lower rate application of organic sources *viz.,* FYM and cattle urine. Similar results were obtained by Krishna Kumar (1986).

Effect of FYM and cattle urine application on yield and yield parameters of rice:

The results of the investigation showed that various levels of FYM and cattle urine significantly influenced the grain yield of rice. Application of FYM @ 12.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1} was found to be superior in giving maximum grain yield (45.4 q ha^{-1}) and

Table 2 : Growth parameters of rice as influenced by various levels of FYM and cattle urine application

Treatments	Plant height (cm)	Number of leaves/hill	Number of tillers/hill	Leaf area (cm^2/hill)	Total dry matter production (g/plant)
T_1: FYM 7.5 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}	68.4	34.0	21.6	316.8	71.8
T_2: FYM 7.5 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1}	69.3	35.1	22.4	329.9	73.0
T_3: FYM 7.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1}	70.0	36.1	22.7	343.3	75.0
T_4: FYM 10 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}	71.1	36.9	24.0	345.7	75.6
T_5: FYM 10 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1}	71.7	37.1	24.0	349.3	77.6
T_6: FYM 10 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1}	73.4	38.0	24.1	353.7	77.9
T_7: FYM 12.5 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}	74.3	38.9	24.1	356.9	78.1
T_8: FYM 12.5 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1}	80.1	48.0	28.3	368.0	87.9
T_9: FYM 12.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1}	83.8	49.7	30.5	374.2	88.7
T_{10}:Recommended dose of fertilizer + FYM 10 t ha^{-1}	79.9	44.3	28.2	366.1	87.5
S.E. ±	1.92	1.75	2.10	4.59	3.0
C.D. (P=0.05)	5.75	5.25	6.29	12.5	9.0

FYM: Farm yard manure

Table 3 : Yield and yield parameters of rice as influenced by various levels of FYM and cattle urine application

Treatments	Number of productive tillers $hill^{-1}$	Panicle length (cm)	Panicle weight (g)	1000 grain weight (g)	Grain yield (q ha^{-1})	Straw Yield (q ha^{-1})
T_1: FYM 7.5 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}	19.9	18.0	2.96	17.9	33.7	46.3
T_2: FYM 7.5 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1}	21.4	18.1	3.09	18.2	34.0	47.5
T_3: FYM 7.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1}	21.6	18.2	3.20	18.4	35.7	48.1
T_4: FYM 10 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}	21.7	18.2	3.32	18.7	36.3	45.2
T_5: FYM 10 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1}	22.0	18.3	3.33	18.7	37.7	46.3
T_6: FYM 10 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1}	22.5	18.5	3.47	18.5	37.8	47.7
T_7: FYM 12.5 t ha^{-1} + cattle urine equivalent to 75 kg N ha^{-1}	23.5	18.9	3.60	18.7	38.3	49.9
T_8: FYM 12.5 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1}	25.8	21.3	4.21	21.4	44.0	55.5
T_9: FYM 12.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1}	26.7	21.4	4.35	23.2	45.4	57.8
T_{10}: Recommended dose of fertilizer + FYM 10 t ha^{-1}	25.5	21.7	4.14	21.2	43.3	55.2
S.E. ±	0.92	0.73	0.17	0.84	1.63	1.59
C.D. (P=0.05)	2.77	2.19	0.51	2.51	4.88	4.77

FYM: Farm yard manure

straw yield (57.8 q/ha). However, it was at par with FYM @ 12.5 t ha^{-1} + cattle urine equivalent to 100 kg N ha^{-1} and recommended dose of fertilizer (100:50:50 kg N:P:K ha^{-1}) + 10 tonnes of FYM ha^{-1}. This significant increase in grain yield may be due to the improved yield parameters like productive tillers, 1000 grain weight, panicle length and panicle weight (Table 3). These results are in accordance with the findings of Ghodake *et al.* (2008) who reported that dry matter production, yield components and yield (6.6 t ha^{-1}) of rice improved significantly, when the crop was applied with 10 tonnes of FYM ha^{-1} as compared to 100 per cent recommended NPK alone. As a corollary to these, there will be increase in growth and yield components and both grain and straw yield (Tripathi *et al.*, 2007) or because of higher leaf area which was responsible for higher photosynthetic activity and promoted dry matter production resulting in higher grain and straw yield (Dhyani and Mishra, 1994).

Application of FYM @ 12.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1} produced significantly higher number of productive tillers per hill (26.7), panicle length (21.4 cm), panicle weight (4.35 g) and test weight (23.2 g), but it was at par with FYM @ 12.5 t ha^{-1} + cattle urine equivalent to 125 kg N ha^{-1} and recommended dose of fertilizer (100:50:50 kg N:P:K ha^{-1}) + 10 tonnes of FYM ha^{-1} (Table 3). These results are in conformity with the findings of Alagesan (1997) who proved the positive correlation between N application and formation of productive tillers. Use of higher dose of nitrogen, phosphorus and potassium through organic sources might

have helped in inducing good vegetative growth (Dhurandher and Tripathi, 1999) and this produced higher number of yield parameters *viz.,* productive tillers, panicle length, panicle weight and test weight leading to higher grain yield.

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