

Response of rice cultivars to organic and inorganic nutrient sources under transplanted condition

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ABSTRACT

A field experiment carried out during two consequent rainy seasons for the year 2002 and 2003 on Lateritic basalt soil of Radhanagari to study the comparative performance of Phule Radha, a short slender, medium duration rice cultivar with KJT-4 and Zinia 63 under various nutrients sources and their effect on productivity under lowland conditions. The nutrient sources were inorganic and combination of inorganic and green leaf manuring. The inorganic source comprised of recommended dose of fertilizers (100:50:50 kg N:P:K ha⁻¹), fertilizer in the form of briquettes (56:30 kg N:P ha⁻¹), 50% of briquettes (28:15 kg N:P ha⁻¹) and the organic source was green leaf manuring (Gliricidia @ 5 ton ha⁻¹). The results revealed that Phule Radha was found to be superior in respect of yield contributing characters like panicle length, number of spikelets panicle⁻¹ resulting into significantly higher grain yield than KJT-4 and Zinia 63. However, amongst the different sources of nutrients under study, application of fertilizer in form of briquettes (56:30 N:P kg ha⁻¹) and combination of 50% of briquettes (28:15 kg N:P ha⁻¹) + green leaf manuring (Gliricidia @ 5 ton ha⁻¹) being at par, have shown significantly higher grain yield over other treatments indicating the possibility of substituting the inorganic fertilizers by the combination of inorganic fertilizers + green leaf manuring. The other yield contributing characters also showed similar trend.

Key words : Rice, Briquettes, Gliricidia.

INTRODUCTION

The paddy is the principal crop grown under transplanted conditions during Kharif season in Western Ghat Zone of Maharashtra owing to assured and fairly high rainfall (3000 to 4000 mm per annum). The high yielding rice cultivars need heavy doses of chemical fertilizers to realize the yield potential of the cultivars. This has resulted into increased demand for chemical fertilizers. However, the high cost of chemical fertilizers and low recovery of applied fertilizers especially in low land paddy due to leaching and other losses necessitates the use of alternative sources of nutrients.

In this context, the recent trend in fertilizer is to develop more efficient fertilizers i.e. fertilizers in briquette form or super granular form for minimizing the nutrient losses (Prasad and Powar 1995). Similarly, green manures offer greater potential as a feasible and cheap substitute for chemical fertilizers and it also helps to modify the soil environment favourably for puddled paddy.

The present study was undertaken to study the performance of high yielding paddy cultivars having test weight between 10 to 14 g under various sources of nutrients i.e. chemical fertilizers, briquettes and green leaf manuring.

MATERIALS AND METHODS

The present field experiment was carried out at ARS, Radhanagari, Dist. Kolhapur (M.S.) during *Kharif* 2002 (rainfall 3135 mm) and 2003 (rainfall 2829 mm) on slightly acidic lateritic soils having pH 6.43, E.C. 0.14 dS m⁻¹, organic carbon 1.55%, N (243 kg ha⁻¹), P₂O₅ (9.1 kg ha⁻¹) and K₂O (298 kg ha⁻¹). Treatments *viz.* three short slender rice cultivars having test weight between 10 to 14 g (Phule Radha, KJT-4 and Zinia 63) and four sources of nutrients *viz.* F₁ : RDF (100:50:50 kg N:P:K ha⁻¹), F₂ : Urea-DAP briquettes (56:30 kg N:P ha⁻¹), F₃ : 50% of F₂ in briquette form (28:15 kg N:P ha⁻¹) and F₄ : F₃ + gliricidia @ 5 t ha⁻¹ (12 combinations) were laid out in factorial RBD with 3 replications. Seedlings were transplanted after 25 days at 15x25 cm X 15x25 cm. Surface application of basal RDF (50% N and entire dose of P and K) was done at the time of transplanting and remaining 50% of N was applied 30 days after transplanting (25%) and 60 days after transplanting (25%). Fertilizer in briquette form was applied immediately after transplanting and gliricidia @ 5 tons ha⁻¹ was incorporated in soil at the time of puddling (before transplanting).

RESULTS AND DISCUSSION

Effect of rice cultivars

The short slender rice cultivar Phule Radha produced

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Table 1 : Grain yield, growth and yield contributing parameters of rice as influenced by different treatments

Treatment	Grain yield (q ha ⁻¹)			Plant height (cm)		No. of panicles (per m ²)		Panicle length (cm)		No. of spikelets (per panicle)		Sterility (%)	
	2002	2003	Pooled	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Cultivars													
Phule Radha	35.29	36.02	35.65	79.6	85.8	217.3	229.3	18.0	20.3	135.8	139.8	13.48	10.25
KJT-4	27.83	26.30	27.06	78.2	77.5	232.0	235.8	18.2	20.0	125.9	129.3	12.37	12.02
Zinia 63	33.64	30.74	32.19	100.7	111.0	212.5	231.3	19.5	20.8	120.7	131.3	9.41	7.10
S. E.	0.91	1.16		0.65	0.98	4.32	6.16	0.25	0.24	1.96	3.11	0.48	0.57
C. D. (5%)	2.68	3.46	2.46	2.7	4.1	18.2	26.0	1.0	1.0	8.2	13.1	2.05	2.42
Nutrient source													
F ₁ : 100:50:50 kg N:P:K ha ⁻¹	28.42	28.26	28.34	83.7	90.0	204.7	218.3	17.6	20.3	121.3	131.0	11.35	8.99
F ₂ : Fertilizer in the form of briquettes (56:30 kg N:P ha ⁻¹)	36.51	33.79	35.15	91.1	97.3	231.0	242.7	19.4	21.0	133.6	137.3	12.08	9.77
F ₃ : 50% of briquettes (28:15 kg N:P ha ⁻¹)	25.06	27.01	26.03	82.4	87.7	199.3	211.7	18.4	19.6	123.1	124.0	11.77	10.31
F ₄ : 50% of briquettes (28:15 kg N:P ha ⁻¹) + Green leaf manuring (Gliricidia @ 5 tons ha ⁻¹)	39.01	35.02	35.01	87.4	90.7	247.3	255.7	18.8	20.3	131.8	141.3	11.83	10.10
S. E.	1.07	1.34		0.75	1.14	4.99	7.12	0.29	0.27	2.26	3.59	0.56	0.66
C. D. (5%)	3.10	3.99	2.83	3.1	4.7	21.0	30.0	1.2	1.1	9.5	15.1	2.37	2.79

significantly higher grain yield over Zinia 63 and KJT-4 on pooled basis (Table 1). The increase in grain yield with respect to Phule Radha was obtained to the extent of 31.74% over KJT-4 and 10.75% over Zinia 63. Zinia 63 also was found to be significantly superior yielder over KJT-4 with grain yield advantage of 18.96%. Both the cultivars *viz.* Phule Radha and Zinia 63 showed superiority over KJT-4 owing to the yield contributing characters like plant height, length of panicle and no. of spikelets panicle⁻¹ during both the years. However, more number of panicles per m² was recorded in the case of KJT-4. Similarly, considering the sterility percentage, Zinia 63 recorded minimum when compared with rest of the two. The variation in yield parameters and finally in grain yield can be attributed to the genetical variations among the varieties. Thakur (1993) also reported similar results.

Effect of nutrient sources

The performance of the treatments *viz.* application of fertilizers in briquette form (56:30 kg N:P ha⁻¹) and 50% of briquettes (28:15 kg N:P ha⁻¹) + green leaf manuring (gliricidia 5 tons ha⁻¹) was at par and recorded significantly higher grain yield over rest of the two treatments during both the years and on pooled basis too (Table 1).

Grain yield advantage of 24.02% was recorded in the case of fertilizer in briquette form and 23.53% in case of 50% briquettes + green leaf manuring (gliricidia @ 5 t ha⁻¹) over the recommended dose of fertilizers. The enhanced grain yield with respect to application of fertilizers in briquette form and 50% of briquettes + green

leaf manuring was due to increased plant height, more number of panicles per m², spikelets per panicle and length of panicle recorded during both the years. The similar results were reported by Savant *et al.* (1993), Talekar and Dongale (1993), Powar and Deshpande (2000) and Kadam and Sahane (2001). The advantage of application of Urea-DAP briquettes over surface application of recommended dose of fertilizers for increased grain yield are in conformity with the results found in the present study.

The superiority of the fertilizers in briquette form and 50% of briquettes + green leaf manuring over surface application of recommended dose of fertilizers indicates the saving of chemical fertilizers and substitution of sole chemical fertilizers by using green leaf manuring in combination with chemical fertilizers. Application of chemical fertilizers in combination with organic manures has an additional advantage of retaining soil properties. The beneficial effect of chemical fertilizers in combination with green leaf manuring on the productivity of rice was also reported by Kalidurai and Kannaiyan (1990) and Budhar and Palaniappan (1997).

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