

Effect of organic and inorganic fertilizers on yield and nutrient uptake of hybrid rice under upland condition

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SUMMARY

A field experiment was conducted during *kharif* season of 2007 to study the effect of organic and inorganic fertilizers on yield and nutrient uptake of hybrid rice under upland condition. The experimental results revealed that application of 100 % N through inorganic fertilizer recorded significantly more grain, straw and biological yield over rest of the treatments. Among combination of organic, inorganic nutrient sources and biofertilizer (75 % N through inorganic fertilizer + 25 % N through vermicompost (3.57 t/ha) + Azotobacter (0.75 kg/ha)) recorded more grain, straw and biological yield over rest of the treatments. The increased in yield was attributed to grains/panicle, panicle weight (g) and panicle /m². Nutrient uptake was significantly more in treatment T₁. As regards to combination of organic inorganic nutrient sources treatment T₉ has recorded significantly more nutrient uptake over rest of the treatments.

Key words : WUE, Photosynthetic rate, Transpiration and *kharif* groundnut.

Rice (*Oryza sativa* L.) is one of the important cereal crop of the world as it is staple food of over half of the world population and more than 70 per cent people obtained energy from rice. India has the largest area among rice growing countries and it stand second in production. Integrated nitrogen management involving organic and inorganic sources of nutrition has a great scope to increase the productivity by proper management. This not only sustain the soil fertility and productivity but also keeps the environment intact with reduced cost increment (Swaminathan, 1987). Presently indiscriminate use of chemical fertilizers alone has led to environmental pollution and deterioration of soil health, so balance use of nutrients through organic sources like FYM, vermicompost and biofertilizer is prerequisite to sustain soil fertility and to provide maximum crop yield with optimum input level. In view of this, the study was undertaken to find out effect of organic and inorganic fertilizers on yield and nutrient uptake of hybrid rice under upland condition.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* season of 2007 and was laid down in Randomized Block Design with three replications on the farm of Upland Paddy Research Scheme, Marathwada Agricultural

University, Parbhani. The soil was clayey in texture and slightly alkaline in reaction with pH 8.26, which was low in available nitrogen (240.36 kg/ha), medium in P (17.81 kg/ha) and high in K (351.48 kg/ha). In this experiment there were 10 treatments. T₁ - 100 % N through inorganic, T₂ - 100 % N through FYM (20 t/ha), T₃ - 75 % N through inorganic + 25 % N through FYM (5 t/ha), T₄ - 50 % N through inorganic + 50 % N through FYM (10 t/ha), T₅ - 75 % N through inorganic + 25 % N through FYM + Azotobacter (0.75 kg/ha), T₆ - 50 % N through inorganic + 50 % N through FYM + Azotobacter (0.75 kg/ha), T₇ - 75 % N through inorganic + 25 % N through vermicompost (3.57 t/ha), T₈ - 50 % N through inorganic + 50 % N through vermicompost (7.14 t/ha), T₉ - 75 % N through inorganic + 25 % N through vermicompost (3.57 t/ha) + Azotobacter (0.75 kg/ha), T₁₀ - 50 % N through inorganic + 50 % N through vermicompost (7.14 t/ha) + azotobacter (0.75 kg/ha). The rice hybrid KRH-2 was sown at spacing of 25 cm x 25 cm. The recommended dose of fertilizer is 100 : 50 : 50 kg NPK/ha. The basal dose of fertilizer *i.e.* 20 % N, 100 % P₂O₅ and 100 % K₂O applied at sowing and 50 % N at 30 DAS and remaining 30 % N/ha at 60 DAS, respectively. FYM, vermicompost applied before sowing. All the agronomic practices were carried out as per the recommendation. N uptake, P uptake and K uptake was estimated by following Kjeldahl's method (Piper, 1952), Olsen's method (Jackson, 1967) and Flame photometer method (Jackson, 1967), respectively.

RESULTS AND DISCUSSION

Result obtained are summarized in Table 1 and 2. Analysis of variance revealed that different level of organic

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Table 1 : Yield and yield contributing characters of hybrid rice as influenced by different treatments

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Biological yield (kg/ha)	Grains/panicle	Panicle weight (g)	Panicles / m ²
T ₁	5020	6593	11613	163.60	4.25	116.52
T ₂	2925	3870	6795	130.25	2.87	86.32
T ₃	4255	5160	9415	152.95	3.77	100.32
T ₄	3724	4746	8470	149.42	3.70	90.92
T ₅	4595	6093	10649	153.72	3.90	108.94
T ₆	3990	4915	8905	150.72	3.75	97.12
T ₇	4308	5267	9575	153.25	3.83	103.52
T ₈	3835	4810	8645	150.21	3.71	93.92
T ₉	4771	6270	11041	155.91	3.92	110.88
T ₁₀	4072	5044	9116	151.10	3.75	100.22
S.E. ±	74	94	134	0.75	0.10	0.67
C.D. (P=0.05)	218	279	394	2.23	0.28	1.99
Mean	4149	5276	9422	151.11	3.74	100.87

and inorganic fertilizers had significant effect on yield contributing attributed is presented in Table 1.

Effect on yield:

The data related to yield of hybrid rice shown in Table 1 revealed that treatment T₁ has recorded significantly more grain yield (5020 kg/ha), straw yield (6593 kg/ha) and biological yield (11613 kg/ha) than other treatments. Among combination of organic and inorganic fertilizer, treatment T₉ has recorded significantly more grain yield, straw yield and biological yield than all other treatments except treatment T₅. Similar view was also expressed by Singh and Verma (1971) and Singh *et al.* (2002).

Effect on yield contributing characters :

It is evident from data presented in Table 1 revealed

that all yield contributing characters, like grains/panicle, panicle weight (g) and panicles /m² were significant more in treatment T₁. The grains per panicle was significantly influenced due to different treatments, application of inorganic fertilizer has increased number of grains per panicle over combination or organic and inorganic sources. These results revealed that poor dose of nutrition reduces photomorphogenesis and resulted to lowering down the amount of photosynthate to be translocate to sink which decide the filled grains. Similar results were observed by Rafey *et al.* (1989). Panicle weight (g) was influence significantly due to different treatment. Treatment T₁ has recorded more panicle weight (4.25 g) than all other treatments. Treatment T₉ has recorded more panicle weight (3.92 g) than all other treatment except T₅ (3.90 g), T₇ (3.83 g), T₃ (3.77 g) and T₁₀ (3.75 g), respectively. The increase in panicle weight was the result of the associated increase in yield contributing characters viz. grains/panicle, panicle height (g) and panicle/m². Similar results were recorded by Dahiphale *et al.* (2003). Panicle /m² was influenced significantly due to different treatment. Treatment T₁ has recorded more panicle /m² (116.52) than all other treatments. Treatment T₉ has also more panicle /m² (110.88) than all other treatment except treatment T₅ (108.94).

Effect on uptake of nutrients:

The amount of NPK uptake by the crop was significantly more in treatment T₁ (100 % N through inorganic fertilizer). Treatment T₁ recorded N uptake 81.74 kg/ha, P uptake 31.10 kg/ha and K uptake 128.65 kg/ha (Table 2). Similar result was recorded by Das *et al.* (2003). Among combination of inorganic and organic fertilizer treatment T₉-75 % N through inorganic + 25 %

Table 2 : Nutrient uptake (kg/ha) as influenced by different treatments

Treatments	Nutrient uptake (kg/ha)		
	N	P ₂ O ₅	K ₂ O
T ₁	81.74	31.10	128.65
T ₂	51.90	15.81	74.78
T ₃	66.21	23.29	99.29
T ₄	55.35	17.48	80.36
T ₅	70.81	25.85	112.85
T ₆	60.84	20.58	89.51
T ₇	68.37	24.31	107.42
T ₈	57.75	18.87	83.54
T ₉	75.58	28.15	118.17
T ₁₀	63.56	22.21	94.03
S.E. ±	0.63	0.47	1.27
C.D. (P=0.05)	1.84	1.37	3.71
Mean	65.21	22.76	98.86

N through vermicompost (3.57 t/ha) + Azotobacter (0.75 kg/ha) has recorded significantly more nutrient uptake over other treatments. Treatment T₉ recorded N uptake - 75.58 kg/ha, P uptake 28.15 kg/ha and K uptake 118.17 kg/ha. Similar results were reported by Rafey *et al.* (1989). This confirms the superiority of treatment T₁ among inorganic treatment. N through organic (*viz.*, FYM, vermicompost) and inorganic (*viz.*, urea, single super phosphate and murate of potash) combination attributed favourable crop

environment and under this treatment aided the plant in better root development and proliferation. As nitrogen play vital role in the carbohydrate metabolism, protein synthesis and protoplasm formation (Gardner *et al.*, 1985). Thus application 100 % N through inorganic fertilizers has recorded significantly exalted these yield and uptake of nutrients than combination of organic and inorganic fertilizers.

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