

IMPACT OF VARIOUS SOURCES OF NUTRIENTS AND METHODS OF APPLICATION ON YIELD AND ECONOMICS OF RICE

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ABSTRACT: Field experiment was conducted to study the influence of different sources of nutrients on yield parameters, yield and economics of rice (ADT 36). The experiment was laid out in a Randomized Block Design (RBD) with three replications consisting of twelve treatments viz., T₁-100 % Recommended dose of NPK kg ha⁻¹ (120:38:38), T₂-T₁+ soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT, T₃-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT, T₄-T₁ + foliar spray of panchagavya 3 % at 30 and 45 DAT, T₅-T₁+ soil application of Beema green granules 25 Kg ha⁻¹ 20 DAT + foliar spray of panchagavya 3 % at 30 and 45 DAT, T₆-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ 20 DAT + foliar spray of panchagavya 3 % at 30 and 45 DAT, T₇-T₁ + foliar spray of Nitrobenzene 750ml ha⁻¹ at 20 DAT, T₈-T₁+ soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 30 DAT, T₉-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 30 DAT, T₁₀-T₁ + foliar spray of panchagavya 3 % at 30 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 45 DAT, T₁₁-T₁ + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray of panchagavya 3 % at 30 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 45 DAT, T₁₂-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray panchagavya 3 % at 30 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 45 DAT.

The yield parameters of rice viz., number of panicle hill⁻¹, number of filled grains panicle⁻¹, grain yield (kg ha⁻¹), straw yield (kg ha⁻¹) and net income was markedly influenced by 100 % recommended dose of NPK kg ha⁻¹ (120:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray of panchagavya 3 % at 30 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 45 DAT (T₁₁). It recorded the highest number of panicle hill⁻¹, number of filled grains panicle⁻¹, grain yield (kg ha⁻¹) and straw yield (kg ha⁻¹).

Key Words: Rice, Beema green granules, Panchagavya, Nitrobenzene, grain yield

INTRODUCTION

In India Rice is grown in an area of 44.10 million hectares and the production of 159 million tonnes with the productivity of 3.58 t ha⁻¹ (FAO, 2013) and in Tamil Nadu, it is grown in an area of 2.2 million hectares resulting in production of 8.65 million tonnes with the productivity of 3.93 t ha⁻¹ and it continues to hold the key to sustain food production by contributing 20 to 25 per cent of agriculture GDP and assures food security in India for more than half of the total population. (Balamurugan and Sudhakar, 2012). To full fill the increased rice demand with shrinking resources, it is necessary to increase yield per unit area with sustainable nutrient management practices which would increase the rice production sustainably without harming the precious environment.

Nutrients supplied exclusively through chemical sources, though enhance yield initially lead to unsustainable productivity over the years (Mahajan *et al.*, 2008). In view of escalating cost of fertilizers and their hazardous polluting effects on environments, there is an increasing awareness among the researchers to make rice cultivation more efficient in terms of profit on farmer investments and with using of chiefly available source of organic manures. Humic acid, a decomposed product of organic matter, influences plant growth by modifying the physiology of plant and by improving the physical, chemical and biological properties of soil and ultimately crop yield. Panchagavya, an organic source of nutrition is an indigenous material which is used widely for agricultural and horticultural crops. Nitrobenzene is a combination of nitrogen and plant growth regulators that act as plant energizer, flowering stimulant and yield booster (Aziz and Miah, 2009). In view of sustainable agronomic integrated practices to increase the yield of rice in an efficient way, the field investigation was taken up.

MATERIALS AND METHODS

Field experiment was conducted at the Experimental Farm, Department of Agronomy, Annamalai University, Tamil Nadu, to study the influence of different sources of nutrients on yield parameters, yield and economics of rice (ADT 36). The soil was clay loam in texture with low in available nitrogen, medium in available phosphorus and high in available potassium. A short duration rice variety ADT36 was chosen with a duration of 110 days.

The experiment was laid out in Randomized Block Design (RBD) with three replication and consists of twelve treatments viz., T₁-100 % Recommended dose of NPK kg ha⁻¹ (120:38:38), T₂-T₁+ soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT, T₃-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT, T₄-T₁ + foliar spray of panchagavya 3 % at 30 and 45 DAT, T₅-T₁+ soil application of Beema green granules 25 Kg ha⁻¹ 20 DAT + foliar spray of panchagavya 3 % at 30 and 45 DAT, T₆-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ 20 DAT + foliar spray of panchagavya 3 % at 30 and 45 DAT, T₇-T₁ + foliar spray of Nitrobenzene 750ml ha⁻¹ at 20 DAT, T₈-T₁+ soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 30 DAT, T₉-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 30 DAT, T₁₀-T₁ + foliar spray of panchagavya 3 % at 30 DAT+ foliar spray of Nitrobenzene 750ml ha⁻¹ at 45 DAT, T₁₁-T₁ + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray of panchagavya 3 % at 30 DAT+ foliar spray of Nitrobenzene 750ml ha⁻¹ at 45 DAT, T₁₂-75 % Recommended dose of NPK kg ha⁻¹ (90:38:38) + soil application of Beema green granules 25 Kg ha⁻¹ at 20 DAT + foliar spray panchagavya 3 % at 30 DAT + foliar spray of Nitrobenzene 750ml ha⁻¹ at 45 DAT.

Beema green granules is an organic humic granules and it contain humic acid, fulvic acid, amino acid and micronutrients. Beema green granules @ 25 kg ha⁻¹ was applied at 20 DAS evenly over respective plots. The panchagavya was applied through foliar spray @ 3 % at different growth stages of rice. Nitrobenzene plant growth promoter was used as foliar spray @ 750 ml ha⁻¹. The solution was uniformly sprayed using hand sprayer (knap sack) at 30and 45 DAT as per the treatment schedule. Twenty six days old paddy seedlings were transplanted.

RESULTS AND DISCUSSION

1. Number of panicle hill⁻¹ and filled grains panicle⁻¹

All the treatments exerted a significant influence on the number of paniclehill⁻¹and filled grains panicle⁻¹(Table.1). Among the treatments, higher number of panicle hill⁻¹and filled grains panicle⁻¹was recorded under T₁₁-100 % recommended dose of NPK kg ha⁻¹ (120:38:38)+ soil application of Beema green granules 25 kg ha⁻¹ + foliar spray of Panchagavya 3% + foliar spray of Nitrobenzene 750 ml ha⁻¹. It was on par with the treatment T₁₂-75% recommended dose of NPK kg ha⁻¹ (90:38:38)+ soil application of Beema green granules 25 kg ha⁻¹ + foliar spray of Panchagavya 3% + foliar spray of Nitrobenzene 750 ml ha⁻¹. The least number of panicle hill⁻¹and filled grains panicle⁻¹was recorded in T₃-75% recommended dose of NPK kg ha⁻¹ (90:38:38)+ soil application of Beema green granules 25 kg ha⁻¹. Judicious use of organic and inorganic fertilizers enabled rice plant to assimilate sufficient photosynthesis resulted in increased productive tillers. Similar results was reported by Hossaenet *et al.* (2011). Also Phosphorous application at higher level initiated early tillering and took lesser time for completion of flowering and this available nutrients were directed to the production of not only more number but also resulted in significantly higher number of filled grains panicle⁻¹, Similar observation were made by Mondal *et al.*, (2003).

2. Grain yield and Straw yield(kg ha⁻¹)

Among the treatments, the highest grain and straw yields was obtained under the T₁₁-100 % recommended dose of NPK kg ha⁻¹ (120:38:38)+ soil application of Beema green granules 25 kg ha⁻¹ + foliar spray of Panchagavya 3% + foliar spray of Nitrobenzene 750 ml ha⁻¹which recorded a grain yield of 5792 kg ha⁻¹ and straw yield of 7244 kg ha⁻¹(Table.1). It was par with the treatment T₁₂-75 % recommended dose of NPK kg ha⁻¹ (90:38:38)+ soil application of Beema green granules 25 kg ha⁻¹+foliar spray of Panchagavya 3% + foliar spray of Nitrobenzene 750ml ha⁻¹. The least grain and straw yields wererecorded under treatment with 75 % recommended dose of NPK kg ha⁻¹ (90:38:38)+ soil application of Beema green granules 25 kg ha⁻¹(T₃).The positive effect of major nutrients viz., N, P, K influenced the growth and yield components which led to increased grain and straw yields (Shanmugasundaram and Selvakumari,1994 and Yadav *et al.* 2005).

3. Gross and net income

The data recorded on economics are presented in Table 2. The maximum gross income of Rs.88331 and net return of Rs. 57359was recorded in T₁₁- (100% Recommended dose of NPK kg ha⁻¹ (120:38:38)+

soil application of Beema green granules 25 kg ha⁻¹ + foliar spray of Panchagavya 3% + foliar spray of Nitrobenzene 750 ml ha⁻¹). This was followed by T₁₂ - (75% Recommended dose of NPK kg ha⁻¹ (90:38:38)+ soil application of Beema green granules 25 kg ha⁻¹ + foliar spray of Panchagavya 3% + foliar spray of Nitrobenzene 750 ml ha⁻¹). The lowest gross and net income was noticed in T₃ - (75% Recommended dose of NPK kg ha⁻¹ (90:38:38)+ Soil application Beema green granules 25 kg ha⁻¹) which recorded Rs. 41994 and Rs.12329 respectively.

The increase in gross and net return with integrated nutrient management system might be attributed to significant improvement in yield of rice, due to balanced application of organic and inorganic nutrients through soil and foliar spray. Similar results were reported by Sharma *et al.* (2007).

Table 1. Influence of organic and inorganic sources of nutrients on yield parameters and yield of rice

Treatment	No. of panicle hill ⁻¹	No. of filled grains panicle ⁻¹	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)
T ₁ -100% RD(120:38:38NPK kg ha ⁻¹)	4.87	62.41	3710	6387
T ₂ - 100 % RD (120:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹	5.10	63.96	4000	6545
T ₃ - 75 % RDF(90:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹	4.63	60.88	3423	6238
T ₄ -100% RD (120:38:38 NPK kg ha ⁻¹) + Panchagavya 3%	5.37	65.50	4230	6613
T ₅ - 100 % RD (120:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹ + Panchagavya 3%	6.57	73.38	4942	6569
T ₆ - 75 %RD(90:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹ + Panchagavya 3%	5.86	68.64	4334	6301
T ₇ -100 % RD(120:38:38 NPK kg ha ⁻¹) + Nitrobenzene 750ml ha ⁻¹	5.63	67.03	4620	6950
T ₈ - 100 % RDF (120:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹ +Nitrobenzene 750ml ha ⁻¹	6.33	71.81	4843	5744
T ₉ - 75 %RD(90:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹ + Nitrobenzene 750ml ha ⁻¹	6.08	70.23	4348	6101
T ₁₀ -100 % RD (120:38:38 NPK kg ha ⁻¹) + Panchagavya 3% + Nitrobenzene 750ml ha ⁻¹	6.80	74.94	5234	6800
T ₁₁ - 100 % RDF (120:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹ + Panchagavya 3% + Nitrobenzene 750ml ha ⁻¹	7.08	77.21	5792	7244
T ₁₂ -75 %RD (90:38:38 NPK kg ha ⁻¹) + Beema green granules 25 kg ha ⁻¹ + Panchagavya 3% + Nitrobenzene 750ml ha ⁻¹	7.02	76.49	5750	7212
SE _d	0.09	0.70	140	73
CD (P = 0.05)	0.21	1.52	287	158

CONCLUSION

Application of recommended dose of NPK with different source of nutrients such as Beema green granules, Panchagavya and Nitrobenzene increasing the rice yield. Especially application of 100% recommended dose of NPK kg ha⁻¹ (120:38:38) + soil application of Beema green granules 25 kg ha⁻¹ + foliar spray of Panchagavya 3% + foliar spray of Nitrobenzene 750 ml ha⁻¹ was found to be the most efficient in increasing the grain, straw yield and net income in rice.

Table. 2 Influence of organic and inorganic sources of nutrients on economics of rice

Treatment	Cost of cultivation (Rs ha ⁻¹)	Gross income (Rs ha ⁻¹)	Net income (Rs ha ⁻¹)
T ₁	29855	44760	14904
T ₂	30026	49082	19056
T ₃	29665	41994	12329
T ₄	30213	53584	23371
T ₅	30381	75756	45375
T ₆	30023	62340	32317
T ₇	30443	57985	27542
T ₈	30614	71333	40719

T ₉	30253	66972	36719
T ₁₀	30801	80075	49274
T ₁₁	30972	88331	57359
T ₁₂	30611	87712	57101

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