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Short Communication

EFFECT 0F SITE SPECIFIC NUTRIENT MANAGEMENT (SSNM) ON GROWTH AND YIELD OF RICE IN TUNGABHADRA PROJECT AREA

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ABSTRACT
A field experiment was conducted in vertisols at Agricultural Research Station, Siruguppa during rabi to study the Site Specific Nutrient Management (SSNM) in rice. The experiment consisted of seven treatments with application of different category of nutrients including control and Farmers Fertilizers Practice (FFP). Significantly higher grain (56.7q ha^{-1}) and straw (72.27q ha^{-1}) yield of rice was recorded in SSNM-major + secondary + micronutrient (T_6) and the increase was to an extent of 30 and 22.2 per cent, respectively when compared to Farmers' Fertilizer Practice (FFP). The increase in grain and straw yield of rice in T_6 could be the maximum No. of Panicles per hill (14.8), Length of panicle (17.5cm), Number of grains per panicle (136.3), Test weight (14.4g), lower sterility percentage (17.3), higher dry matter accumulation in leaves (42.5 g $hill^{-1}$), stem (53.0 g $hill^{-1}$), panicle (80.5 g $hill^{-1}$) and maximum leaf area (954.5 cm^2 $hill^{-1}$).

KEYWORDS: Rice, secondary nutrients, micronutrients, harvest index

INTRODUCTION

Rice is one of the most important staple food crops of the world and its area is concentrated mostly in South East Asia. Rice contributes around 45 per cent of India's total food grain production and it continues to hold the key for food sufficiency in the country. In India, rice is being grown on an area of 44.62 million hectares with a production of 93.08 million tonnes and average productivity is 2088 kg ha^{-1} (Anonymous, 2003a). The total area under rice in Karnataka is 14.82 lakh hectares with a production of 37.34 lakh tonnes and with an average productivity of 2520 kg ha^{-1} (Anonymous, 2003b). Tungabhadra Project Area (TBP) encompassing Raichur, Bellary and Koppal districts is known as rice bowl of Karnataka with nearly two lakh hectares under rice cultivation with an average yield of 4,800 kg ha^{-1} (Nagappa *et al*., 2002).

TBP area in our state is known for using imbalance dose of nutrients with a higher tendency for N application. This also causes environmental damage and increases the total cost of production as heavy N use makes the rice crop more susceptible to pest and disease and thus increases the cost on protection. To eliminate wastage of fertilizers and increase farmer's income, a new approach called Site Specific Nutrient Management (SSNM) which advocates for feeding nutrients as and when needed is recommended. SSNM ensures application of the correct nutrients at the right time and in the amount needed by the rice crop for obtaining target yields. Hence the present investigation is carried out to study the growth and yield of rice in SSNM approach.

MATERIALS AND METHODS

The experiment was conducted on vertisols, at Agricultural Research Station, Siruguppa, Bellary district during *rabi* season. The experiment was laid out in randomized block design and replicated four times with seven treatments *viz*., T_1 - Control (No NPK), T_2 - RDF (150: 75: 75 N P_2O_5 K_2O kg ha^{-1}) + FYM @ 10 t ha^{-1}, T_3 - SSNM (250: 125: 125 N P_2O_5 K_2O kg ha^{-1}), T_4 - T_3 + FYM @ 10 t ha^{-1}, T_5 - T_3 + Secondary nutrients (Mg @ 45.6 kg ha^{-1} and S @ 39 kg ha^{-1}), T_6 - T_5 + Micronutrients (Fe @ 5.0 kg ha^{-1}, Mn @ 6.0 kg ha^{-1}, Zn @ 6.0 kg ha^{-1}, Cu @ 2.0kg ha^{-1} and Mo @ 0.5 kg ha^{-1} and B @ 0.6 kg ha^{-1}) and T_7 - Farmers' Fertilizer Practice (282: 77: 56 N P_2O_5 K_2O kg ha^{-1}). Fifty per cent nitrogen, full dose of phosphorus and potassium were applied at the time of transplanting as per the treatment in the form of urea for nitrogen, DAP for nitrogen and phosphorus and muriate of potash for potassium. FYM, secondary nutrients and micronutrients were applied as described in the treatment details. The first top dressing of N (one-third quantity) was done at the tillering stage and second top dressing of N (one-third quantity) was applied at the panicle initiation stage. BPT-5204 (136 days) was transplanted during October with 2-3 seedlings $hill^{-1}$ with a spacing of 20 cm x 10 cm. The crop was harvested in February.

RESULTS AND DISCUSSION

Application of nutrients based on SSNM approach significantly influenced the grain and straw yields of rice. Application of all the essential nutrients *viz*., major, secondary and micronutrient in the SSNM treatment (T_6) produced significantly higher grain yield of rice (56.7 q ha^{-1}) compared to farmers' fertilizer practice (T_7). However, it was on par with application of major + secondary nutrients in SSNM (T_5) and other SSNM treatments (T_3 and T_4). The increase in grain yield of rice in T_6 was to an extent of 30 per cent when compared to Farmers' Fertilizers Practice (T_7) which could yield 43.4 q

ha^{-1} of rice. The yield advantage of SSNM over FFP was reported by several workers (Wang Guanghuo *et al.*, 2001 and Srinivas *et al.*, 2001). The higher grain yield in T_6 could be attributed to higher yield parameters *viz.*, number of grain per panicle (136.3), test weight (14.4 g), number of panicles per hill (14.8), length of panicle (17.5 cm) and lower sterility index (17.3%) (Table 1).

TABLE- 1. Number of panicles per hill, length of panicle (cm), number of grains per panicle, test weight (g) grain yield (q ha^{-1}), straw yield (q ha^{-1}) and harvest index of rice as influenced by different treatments

Treatments	No. of Panicles per hill	Length of panicle (cm)	Number of grains per panicle	Test weight (g)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index
T_1	5.1	13.5	69.1	11.8	18.0	26.8	0.39
T_2	11.2	15.7	113.4	13.4	48.7	66.4	0.42
T_3	12.3	16.3	117.0	13.6	50.2	67.2	0.43
T_4	14.2	16.6	128.7	13.7	52.8	70.6	0.43
T_5	14.3	16.7	131.2	14.0	53.3	71.1	0.44
T_6	14.8	17.5	136.3	14.4	56.7	72.2	0.45
T_7	10.2	14.8	95.5	13.2	43.4	59.1	0.41
S.Em±	0.51	0.38	3.05	0.40	2.17	1.64	0.006
C.D. (5%)	1.51	1.14	9.07	1.21	6.45	4.87	0.016

T_1 - Control (No NPK)
T_2 - RDF (N, P_2O_5 & K_2O @ 150:75:75 kg ha^{-1}) + FYM @ 10 t ha^{-1})
T_3 - SSNM (N, P_2O_5 & K_2O @ 250:125:125 kg ha^{-1})
T_4 - T_3 + FYM @ 10 t ha^{-1}
T_5 - T_3 + Secondary nutrients (Mg & S 45.6 & 39.0 kg ha^{-1})
T_6 - T_5 + Micronutrients (Zn, Mn, Cu , Fe, Mo & B 6.0, 6.0, 2.0, 5.0, 0.5 & 0.6 kg ha^{-1}, respectively)
T_7 - Farmers' fertilizer practice (N, P_2O_5 & K_2O @ 282:77:56 kg ha^{-1})

Straw yield also exhibited similar trend as that of grain yield. Application of all nutrients in SSNM approach (T_6) recorded significantly higher straw yield of 72.2 q ha^{-1} as against FFP (59.1 q ha^{-1}). The increase in the straw yield due to T_6 over FFP (T_7) was to the tune of 22.2 per cent. The higher straw yield due to higher growth parameters at harvest *viz.*, plant height (85.9 cm), number of tillers per hill (14.9), number of leaves per hill (53.0) higher dry matter accumulation in leaves (42.5 g $hill^{-1}$), stem (53.0 g $hill^{-1}$), panicle (80.5 g $hill^{-1}$) and maximum leaf area (954.5 cm^2 $hill^{-1}$) in Table 2. The effect of SSNM on harvest index was significant and application of major + secondary + micronutrients in SSNM approach (T_6) recorded higher harvest index (0.45) when compared to FFP and control (0.41 and 0.39 respectively) which may be attributable to higher grain yield as a consequence of increased dry matter accumulation in panicles and grains (Gangaiah and Prasad, 1999).

TABLE-2. Plant height, number of leaves per hill, number of tillers per hill, sterility percentage, dry matter accumulation in leaves, stem and panicles, leaf area and leaf area index at harvest as influenced by different treatments

Treatments	Plant height (cm)	No. of leaves per hill	No. of tillers per hill	Sterility percentage	Dry matter accumulation (g $hill^{-1}$)			Leaf area (cm^2 $hill^{-1}$)	Leaf area index
					Leaves	Stem	Panicles		
T_1	64.6	32.9	6.1	21.5	18.5	22.6	38.6	546.3	2.7
T_2	79.5	46.5	12.2	19.4	28.9	35.4	62.7	698.0	3.5
T_3	80.4	48.3	13.0	19.6	33.5	37.6	65.4	859.7	4.3
T_4	8.3	49.5	14.5	19.6	39.2	45.5	68.3	887.2	4.4
T_5	83.0	50.3	14.7	17.7	40.5	52.1	74.9	937.0	4.7
T_6	85.9	53.0	14.9	17.3	42.5	53.0	80.5	954.5	4.8
T_7	78.5	42.6	10.3	23.0	23.4	31.4	58.2	687.3	3.4
S.Em±	1.70	1.35	0.47	0.62	2.07	2.03	2.23	63.73	0.31
C.D. (5%)	5.07	4.01	1.41	1.84	4.59	6.05	6.63	189.29	0.91

T_1 - Control (No NPK)
T_2 - RDF (N, P_2O_5 & K_2O @ 150:75:75 kg ha^{-1}) + FYM @ 10 t ha^{-1})
T_3 - SSNM (N,P_2O_5 & K_2O @ 250:125:125 kg ha^{-1})
T_4 - T_3 + FYM @ 10 t ha^{-1}
T_5 - T_3 + Secondary nutrients (Mg & S 45.6 & 39.0 kg ha^{-1})
T_6 - T_5 + Micronutrients (Zn, Mn, Cu, Fe, Mo & B 6.0, 6.0, 2.0, 5.0, 0.5 & 0.6 kg ha^{-1}, respectively)

T_7 - Farmers' fertilizer practice (N, P_2O_5 & K_2O @ 282:77:56 kg ha^{-1})

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