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STUDIES ON SITE SPECIFIC NUTRIENT MANAGEMENT (SSNM) ON THE GROWTH AND YIELD OF TRANSPLANTED RICE

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Abstract

Field experiments were conducted at the Annamalai University Experimental Farm, Annamalai nagar, Tamil Nadu to study the effect of Site Specific Nutrient Management for Transplanted Rice Cv. ADT 36 and ADT 43. There are fifteen treatments *viz.*, T_1 – 150: 15: 50 kg NPK ha^{-1}, T_2 – 150: 30: 50 kg NPK ha^{-1}, T_3 – 150: 45: 50 kg NPK ha^{-1}, T_4 – 150: 60: 50 kg NPK ha^{-1}, T_5 – 150: 15: 75 kg NPK ha^{-1}, T_6 – 150: 30: 75 kg NPK ha^{-1}, T_7 – 150:45:75 kg NPK ha^{-1}, T_8 – 150: 60: 75 kg NPK ha^{-1}, T_9 – 150: 15:100 kg NPK ha^{-1}, T_{10} – 150:30:100 kg NPK ha^{-1}, T_{11} – 150:45:100 kg NPK ha^{-1}, T_{12} – 150:60:100 kg NPK ha^{-1}, T_{13} – LCC:15:80 kg NPK ha^{-1}, T_{14} – 150:50:50 kg NPK ha^{-1}, T_{15} – control. The treatments were replicated thrice adopting randomized block design. The study revealed that in both the seasons, growth and yield components viz., plant height, number of tillers $hill^{-1}$, leaf area index and dry matter production were increased by the application of T_8 – 150: 60: 75 kg NPK ha^{-1}. Application of treatment, T_8 – 150: 60: 75 kg NPK ha^{-1} recorded the highest grain yield of 5280 and 5390 kg ha^{-1} with ADT 36 and ADT 43 respectively. The treatment $T_{8,}$ was followed by the treatment, T_{12} – 150:60:100 kg NPK ha^{-1}.

Key words: Rice, SSNM, different levels of P and K, LCC.

Introduction

Rice (*Oryza sativa*) is the most important staple food crop of the world. It provides more than half of the calorific need of the population. Current fertilizer recommendations normally consist of one recommendation with fixed amount and timings for large rice growing areas, they do not assist farmers in dynamic decision making and do not consider needs of rice growth in different places and seasons. The SSNM approach is a dynamic field as well as season specific nutrient management technique developed especially for cereal crops (Dobermann *et al*., 2004). Site specific crop management or precision agriculture is aiming at increased crop productivity, while optimizing resources (Gebber, 2010). SSNM principles were developed for determining the field specific N, P and K requirements (Pauline, 2019). Lowering the input requirement and losses of chemical fertilizers can be achieved by this method (Lokesh, 2015). SSNM provides guidelines for effective N, P and K management to help farmers make better decisions on fertilizer input and output levels in rice production (Divina, 2016). The present investigation was under taken to study the growth characters and yield of rice plant under different fertilizer levels of P & K.

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Materials and Methods

Field experiments were conducted during Navarai season at the Faculty of Agriculture, Annamalai University, Annamalainagar. The soil of the experimental field was clay loam with pH – 7.4. The experiment was conducted in RBD with three replications. The treatments were T_1 – 150: 15: 50 kg NPK ha^{-1}, T_2 – 150: 30: 50 kg NPK ha^{-1}, T_3 – 150: 45: 50 kg NPK ha^{-1}, T_4 – 150: 60: 50 kg NPK ha^{-1}, T_5 – 150: 15: 75 kg NPK ha^{-1}, T_6 – 150: 30: 75 kg NPK ha^{-1}, T_7 – 150:45:75 kg NPK ha^{-1}, T_8 – 150: 60: 75 kg NPK ha^{-1}, T_9 – 150: 15:100 kg NPK ha^{-1}, T_{10} – 150:30:100 kg NPK ha^{-1}, T_{11} – 150:45:100 kg NPK ha^{-1}, T_{12} – 150:60:100 kg NPK ha^{-1}, T_{13} – LCC:15:80 kg NPK ha^{-1}, T_{14} – 150:50:50 kg NPK ha^{-1}, T_{15} – control. Observations on plant height, leaf area index, no of tillers $hill^{-1}$, DMP and yield were recorded.

Results and Discussion

The results indicated that the maximum plant height (96.84 cm and 109.76 cm), number of tillers m^{-2} (12.25 and 13.87), LAI (6.13 and 6.52), DMP (13.40 t ha^{-1} and

Table 1: Impact of Site specific nutrient management on growth and yield of rice varieties ADT 36 and ADT 43.

Treatments	Plant height (cm)		Leaf area Index		Tillers hill^{-1}		Grain yield (t ha^{-1})	
	ADT 36	ADT 43	ADT 36	ADT 43	ADT 36	ADT 43	ADT 36	ADT 43
T_1-150:15:50 kg NPK ha^{-1}	75.55	81.77	3.73	4.46	8.42	8.58	2.33	2.47
T_2-150:30:50 kg NPK ha^{-1}	82.26	90.92	4.49	5.13	9.67	10.33	3.30	3.39
T_3-150:45:50 kg NPK ha^{-1}	85.59	95.26	4.83	5.47	10.29	11.15	3.76	3.86
T_4-150:60:50 kg NPK ha^{-1}	93.55	105.36	5.74	6.18	11.65	12.98	4.81	4.90
T_5-150:15:75 kg NPK ha^{-1}	77.23	83.98	3.93	4.63	8.72	9.02	2.56	2.66
T_6-150:30:75 kg NPK ha^{-1}	83.92	93.01	4.66	5.29	9.96	10.75	3.54	3.63
T_7-150:45:75 kg NPK ha^{-1}	88.91	99.65	5.24	5.79	10.90	12.02	4.22	4.34
T_8-150:60:75 kg NPK ha^{-1}	96.84	109.76	6.13	6.52	12.25	13.87	5.28	5.39
T_9-150:15:100kg NPK ha^{-1}	78.93	86.35	4.12	4.82	9.05	9.47	2.81	2.88
T_{10}-150:30:100 kg NPK ha^{-1}	87.22	97.44	5.04	5.64	10.59	11.58	3.97	4.12
T_{11}-150:45:100 kg NPK ha^{-1}	90.56	101.84	5.43	5.96	11.19	12.43	4.46	4.58
T_{12}-150:60:100 kg NPK ha^{-1}	95.20	107.52	5.94	6.37	11.95	13.42	5.25	5.31
T_{13}-LCC:15:80kg NPK ha^{-1}	80.61	88.54	4.29	4.98	9.36	9.87	3.04	3.14
T_{14}-150:50:50 kg NPK ha^{-1}	92.24	104.05	5.61	6.12	11.49	12.86	4.72	4.81
T_{15} – Control	73.83	79.46	3.51	4.31	8.09	8.12	1.15	1.29
SEd	0.87	1.00	0.07	0.06	0.13	0.17	0.09	0.11
CD (p = 0.05)	1.62	2.01	0.14	0.13	0.27	0.36	0.19	0.21

13.80 t ha^{-1}) at harvest were significantly influenced by site specific nutrient management. Similar results of influence of SSNM was observed by Patil *et al*., (2017). The Treatment T_8 (150:60:75 kg NPK ha ^{1}) recorded the maximum plant height and LAI. Significant influence of increased dose of P and K reflected on growth of crop in terms of plant height and increased tiller rate, LAI and correspondingly increased dry matter production of rice. Similar reports of increased growth character by increased application of P and K was recorded by Xian *et al*., (2007).

The Treatment T_8 was followed by T_{12} (150:60:100 kg NPK ha^{-1}) in terms of all the growth parameters observed. Compared to conventional recommendation of fertilizer 150:50:50 kg NPK ha^{-1} (T_{14}), T_8 registered as the best dose of fertilizer schedule for the tail end of cauvery deltaic zone. Notably, LCC (T_{13}) was also found to be useful when compared with the same level of P & K application (T_5). The fertilizer dose of 150: 60: 75 kg NPK ha^{-1} provided a balanced dose of nutrients which resulted in better plant growth and increased the leaf area and dry matter accumulation that directly correlated with grain yield. Treatment T_8 helped in improving the growth attributes which owes to the supply of nutrients as per plant needs which helped in better utilization of nutrients in terms of higher photosynthetic efficiency of rice plants. Similar observations were recorded by Kumar *et al.*, (2019). Panicles per plant and grain yield in rice were remarkably increased in Treatment 150:60:75 kg NPK ha^{-1} SSNM with increased dose of P (60 kg ha^{-1}) and K (75 kg ha^{-1}), increased the efficient LAI rates, dry matter accumulation, ratio of root to shoot, photosynthetic rate in flag leaves and resulted in higher grain yield. Similar findings were observed by Liu *et al*., (2010) and Singh *et al*., (2015).

Conclusion

The results clearly indicated the advantage of site specific nutrient management on the growth and yield of rice , application 60 kg of P ha^{-1} and 75 kg of K ha^{-1} along with 150 kg of N ha^{-1} found be effective in achieving highest growth parameters and yield of rice.

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