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Validation of Nitrogen Recommendations for Popular Rice (*Oryza sativa* L.) Varieties of Coastal Andhra Pradesh

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ABSTRACT

A field experiment was conducted during *kharif* 2009 to study the response of rice varieties to over and above recommended dose of nitrogen on yield components and yield. Yield components and yield were significantly influenced by varieties and nitrogen levels. The variety NLR 28523 showed significantly higher growth parameters, yield components and yield over other varieties *viz*., NLR 33892, BPT 5204 and MTU 1061. Application of 240 kg N ha^{-1} showed higher growth and yield components and yield.

Key words : Coastal, Rice, Nitrogen Recommendations.

Rice (*Oryza sativa* L.) is one of the most important staple food for about 50 per cent of the world's population that live in Asia. In India, it is grown in an area of 43.8 M ha (29.4 per cent of the global rice area) with a production of 90 m t and productivity of 2.2 t ha^{-1} (Ministry of Agriculture, 2008). In Andhra Pradesh, it is grown in an area of 3.94 M ha with a production of 13.2 m t and productivity of 3.4 t ha^{-1} (Directorate of Economics and Statistics, 2008). Cultivars respond differently to different levels of N fertilization. Recently a few high yielding varieties suitable for cultivation have been evolved, but their responsiveness of nitrogen especially at higher levels has to be studied to come up with suitable recommendation. Moreover, currently used recommendations which are old and over dependent need to be validated to provide a good balance between soil nutrient supply and crop requirement for sustained production. Information is not available on the performance of these varieties and their response to higher levels of nitrogen in coastal Andhra Pradesh. Keeping this in view the present investigation was taken up.

MATERIAL AND METHODS

A field experiment was conducted during *kharif* 2009, at Agricultural College Farm, Bapatla. Treatments consisted combination of four varieties of rice viz., BPT 5204, NLR 33892, NLR 28523 and MTU 1061 and five nitrogen levels 120, 150, 180, 210 and 240 kg ha^{-1}. The experiment was laid in a Randomized Block Design with Factorial Concept. The soil was sandy clay loam in texture, slightly alkaline in reaction (pH 7.14), low in organic Carbon (0.42%) and available Nitrogen (198 kg ha^{-1}), available phosphorus (9 kg ha^{-1}) and high in available potassium (384 kg ha^{-1}). Rice seedling of 28 days old were transplanted with a spacing 20x15 cm. Nitrogen was applied as per treatments in three splits (1/2 as basal, ¼ at maximum tillering and ¼ at panicle initiation). A recommended dose of phosphorus 40 kg P_2O_5 and potassium 40 kg K_2O ha^{-1} was applied uniformly to all plots as basal in form of Single Super Phosphate and Murate of Potash respectively. Recommended agronomic practices and plant protection measures were followed. Pre and post-harvest observations in respect of both growth and yield parameters were recorded following standard procedures.

RESULTS AND DISCUSSION

The results indicated that the growth parameters such as number of tillers m^{-2}, drymatter production, number of green leaves per culm, SPAD reading, days to 50 per cent flowering and maturity, yield attributes, grain and straw yield, harvest index and nitrogen uptake were significantly influenced by variety and nitrogen levels. However, interaction between varieties and nitrogen levels was significant except with plant height only at maturity and drymatter production at 60 and 90 DAT.

Effect of variety

The highest drymatter production (1294 g m^{-2}) number of total and filled grains $panicle^{-1}$ (211.7), test weight (20.0 g), grain yield (5680 kg ha^{-1}), harvest index (52.1) and nutrient uptake (114.6 kg ha^{-1}) were recorded with NLR 28523 (Table 2). whereas, the maximum productive tillers m^{-2} was with BPT 5204. The difference in these characters with variet-

Table 1. Growth, SPAD reading and nitrogen uptake of rice varieties as affected by nitrogen levels

Treatment	Plant height	Number of tillers at harvest (m^{-2})	Number of green leaves $culm^{-1}$		SPAD reading		N uptake (Kg ha^{-1})
			Panicle initiation	Grain filling	Flowering	Milky	
Variety							
BPT 5204	92.0	416.0	4.30	3.20	42.1	38.7	107.00
NLR 33892	149.5	344.0	3.90	3.30	41.9	41.7	109.60
NLR 28523	143.8	361.0	3.60	3.10	41.5	41.4	114.60
MTU 1061	107.7	385.0	4.10	3.90	40.2	40.1	98.40
SEm±	0.8	5.0	0.04	0.04	0.3	0.5	1.73
CD (0.05)	3.5	23.0	0.20	0.20	1.4	2.0	7.77
Nitrogen levels (kg ha^{-1})							
120	115.0	334.0	3.50	2.90	39.5	38.5	86.40
150	120.4	364.0	3.80	3.20	41.0	39.6	99.80
180	123.6	386.0	4.00	3.40	41.6	40.3	109.90
210	127.3	393.0	4.20	3.60	42.2	41.5	116.00
240	129.4	406.0	4.40	3.80	42.9	42.4	124.90
SEm ±	0.9	6.0	0.50	0.05	0.4	0.5	1.93
CD (0.05)	3.4	22.0	0.20	0.20	1.4	2.0	7.58
V x N	5.3	NS	NS	NS	NS	NS	NS
C V (%)	2.4	5.0	4.60	4.80	2.9	2.0	2.10

NS: Non-significant

ies might be due to difference in their genetic make-up. Even though, the numbers of productive tillers, total grains were less for NLR 28523, more number of filled grains $panicle^{-1}$, test weight might have compensated for the lesser productive tillers. Similar results with different varieties were noticed earlier by Srilaxmi et al. (2005) and Brij Lal *et al*. (2009).

Effect of nitrogen levels

The growth parameters *viz*., plant height, number of tillers, drymatter production, number of green leaves and SPAD reading, yield attributes *viz*., productive tillers, total and filled grains $panicle^{-1}$, test weight, grain and straw yield , harvest index and nitrogen uptake (Table 1& 2) were the maximum at 240 kg ha^{-1} which was significantly superior over lowest level (120 kg N ha^{-1}). The increase in growth might be due to enhanced cell division and cell elongation induced by abundant nitrogen supply with increase in nitrogen levels, favouring enlargement and better development of panicle resulting in more number of total grains $panicle^{-1}$ and keeping the leaves green even at the time of maturity. These results were in accordance with the findings of Raju and Suneetha Devi (2005); Singh *et al.* (2006); Srivastava *et al*. (2006); Zaidi *et al.* (2007); Narendra Pandey *et al*. (2008) and Saoji *et al*. (2008).

Response function

Quadratic response model was found to be the best fit for BPT 5204 whereas, linear response model incase of other varieties *viz*., NLR 33892, NLR 28523 and MTU 1061. The optimum dose for BPT5204 was 229.0 kg N ha^{-1}. For other varieties, the optimum doses can be fixed by trying few more doses of nitrogen. The best fit equations are as follows:

I.	BPT 5204	$Y= 1328.15 + 33.59x – 0.071x^2$	(R^2= 0.89992)
II.	NLR 33892	$Y= 3453.62 + 9.99 x$	(R^2= 0.99609)
III.	NLR 33892	$Y= 3185.06 + 21.90 x$	(R^2= 0.99759)
IV.	MTU 1061	$Y= 2731.06 + 1235 x$	(R^2= 0.99897)

Table 2. Yield attributes and yield of rice as affected by varieties nitrogen levels

Treatment	Drymatter production (gm^{-2}) at maturity	Productive tillers at maturity (m^{-2})	Total grains $panicle^{-1}$	Filled grains $panicle^{-1}$	1000 grain weight (g)	Grain yield (Kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index (%)
Variety								
BPT 5204	999.6	371.6	116.6	108.0	15.0	4933	5766	46.0
NLR 33892	1261.1	325.2	221.3	207.0	19.8	5253	5423	49.1
NLR 28523	1294.2	321.2	219.8	211.7	20.0	5680	5225	52.1
MTU 1061	1166.5	366.7	123.1	114.8	19.6	4773	4714	50.2
SEm±	17.1	6.2	0.9	0.5	0.1	102	90	0.5
CD (0.05)	77.1	27.9	3.9	2.2	0.4	461	404	2.6
Nitrogen levels (kg ha^{-1})								
120	1114.8	325.1	166.9	156.0	18.0	4567	5066	47.4
150	1134.5	338.5	169.2	158.6	18.3	4950	5166	49.0
180	1180.3	346.8	170.4	160.3	18.8	5225	5247	49.8
210	1220.9	357.8	171.9	162.8	18.9	5408	5281	50.6
240	1251.2	362.7	172.6	164.3	19.1	5650	5650	50.0
SEm ±	19.2	6.9	1.0	0.6	0.2	115	116	0.7
CD (0.05)	75.2	27.2	3.8	2.2	0.1	449	457	2.6
V x N	NS	NS	NS	NS	NS	NS	NS	NS
C V (%)	1.9	6.9	2.0	1.2	1.8	8	5	4.6

NS: Non-significant

LITERATURE CITED

Brij Lal, Verma D K, Jaiswal L M, Shiva Prasad, Giri S P and Yadav R A 2009. Effect of nitrogen level on yield attributes of aromatic rice. Oryza 46 (2): 158-159.

Directorate of Economics and Statistics, 2008.

Ministry of Agriculture 2008. Government of India. www.indiastat.com.

Narendra Pandey, Verma A K and Tripathi R S 2008. Effect of planting dates and N levels on N concentration in the leaf, grain yield and N uptake by hybrid rice. Oryza 45(1): 18-22.

Raju M S and Suneeta Devi K B 2005. Performance of rice hybrids at different level of nitrogen and phosphorus application. Oryza 42 (1): 27-30.

Saoji B V, Patil M J Moom M K, Vinod Nagdeote and Khade A H 2008. Response of hybrid and high yielding rice varieties to nitrogen levels in command area of Gondia district. Annals of Plant Physiology 22 (2): 205-207.

Singh K K, Kalian Singh, Raghavendra Singh, Yogeswar Singh and Singh C S 2006. Response of nitrogen and silicon levels on growth, yield and nutrient uptake of rice (*Oryza sativa*). Oryza 43 (3): 220-223.

Srilaxmi G, Subbaiah G and Chandra Sekhar K 2005. Performance of direct seeded rice as affected by variety and nitrogen level. The Andhra Agricultural Journal 52 (3&4): 326-329.

Srivastava V K, Govinda Sarma, Bohra J S, Avijit Sen, Singh J P and Gouda S K 2006. Response of hybrid rice to application of Nitrogen, Magnesium and Boron. Annals of Agricultural Journal 61 (9): 644-645.

Zaidi S F and Tripathi H P 2007. Effect of nitrogen on yield, N uptake and nitrogen use efficiency of hybrid rice. Oryza 44 (2): 181-183.

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