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Research article

RESPONSE OF RICE VARIETIES TO HIGH LEVEL NITROGEN ON DRYMATTER PRODUCTION, YIELD AND NITROGEN UPTAKE OF RICE

V.Prasada Rao [1], G.Subbaiah[2] and K.Chandra Sekhar[3]

Department of Agronomy, Agricultural College, Bapatla, Acarya N.G Ranga agricultural University, Hyderabad

ABSTRACT: A field experiment was conducted during the kharif 2009 to study the response of rice varieties to over and above recommended dose of nitrogen on drymatter production, Yield and nitrogen uptake were significantly influenced by varieties and nitrogen levels. The variety NLR 28523 showed significantly higher drymatter production at 90 DAS and maturity, yield and nutrient uptake over other varieties *viz*., NLR 33892, BPT 5204 and NLR 1061. Application of 240 kg N ha^{-1} showed higher drymatter production at all stages, yield and nitrogen uptake.

Key words: Rice, Varieties, Higher nitrogen levels

INTRODUCTION

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. More than 90 per cent of rice is produced and consumed in Asian countries. In India, it is grown in an area of 43.77 M ha (29.4 per cent of the global rice area) with a production of 90 m t and productivity of 2.203 t ha^{-1} (Ministry of Agriculture, 2008). It constitutes 52 per cent of total food grain production and 55 per cent of total cereal production (Saxena and Singh, 2003). Among several agronomic practices that affect productivity of rice, fertilizer application, especially nitrogen, is of paramount importance. Among the essential plant nutrients, nitrogen play a very important role for growth and development of rice crop. 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. Much information is not available on the performance of these varieties in their response to higher levels of nitrogen.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* 2009, at Agricultural College Farm, Bapatla. The experiment was laid in a Randomized Block Design with Factorial Concept. The treatments were replicated three times with 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 N ha^{-1}. 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 potassium (384 kg ha^{-1}). 28 days seedling were transplanted with 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 both growth and yield parameters were recorded following standard procedures.

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RESULTS AND DISCUSSION

Effect of Variety

The highest drymatter production, grain yield straw, harvest index and nitrogen uptake were recorded with NLR 28523. The drymatter production was highest in NLR 33892 and MTU 1061 at 30 and 60 DAS respectively and the difference in these characters with varieties might be due to difference in their genetic make-up. Similar results with different varieties were noticed earlier by Murali and Madan Mohan Reddy, (1995); Bhaskar Reddy (1996) Singh and Srivastava (1999) Singh et al. (2000); Rakesh Kumar and Mohammed (2004), Srilaxmi et al. (2005) and Brij Lal et al. (2009).

EFFECT OF NITROGEN LEVELS

The drymatter productionat all growth stages, grain yield, straw yield, harvest index and nitrogen uptake were maximum at 240 kg ha^{-1} which was significantly superior over low level (120 kg N ha^{-1}). N uptake increased with increase in the levels of nitrogen upto 240 kg ha^{-1}. N uptake at 240 kg N ha^{-1} was significantly higher at all growth stages, grain,straw and total uptake which was comparable with 210 kg N ha^{-1}. The minimum (13.4 kg ha^{-1}) N uptake was with 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 keep leaves green even at the time of maturity. Hence, the contribution of carbohydrates from photosynthetic activity resulting in efficient translocation of food material into the sink (grain) thereby increased number of filled grains $panicle^{-1}$. These results ware in accordance with the findings of Singh and Singh (2000); Raju and Suneetha Devi (2005); Singh et al. (2006); Srivastava et al. (2006); Zaidi et al. (2007) and Narendra Pandey et al. (2008).

Table 1: Drymatter production (g m^{-2}) of rice as affected by varieties and nitrogen levels at different periods

Treatment	Days After Transplanting			Maturity
	30	60	90	
Variety				
BPT 5204	132.7	552.5	979.5	999.6
NLR 33892	147.0	596.7	1132.3	1261.1
NLR 28523	132.1	589.1	1164.1	1294.2
MTU 1061	137.4	609.3	1077.2	1166.5
SEm±	3.1	6.4	12.6	17.1
CD (0.05)	14.2	29	56.6	77.1
Nitrogen levels (kg ha^{-1})				
120	99.6	512.5	953.8	1114.8
150	118.2	564.8	1035.5	1134.5
180	143.6	597.1	1133.0	1180.3
210	154.9	622.8	1151.6	1220.9
240	170.1	637.3	1167.4	1251.2
SEm ±	3.5	7.2	14.1	19.2
CD (0.05)	13.8	28.3	55.2	75.2
V x N	NS	44.4	86.6	NS
C V (%)	8.9	4.3	4.5	1.9

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Table: 2 Grain yield, straw yield, harvest index and Nitrogen uptake of rice as affected by variety and N levels at different growth stages

Treatment	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index (%)	Nitrogen uptake		
				Grain (kg ha^{-1})	Straw (kg ha^{-1})	Total (kg ha^{-1})
		Varieties				
BPT 5204	4933	5766	46.0	72.6	34.4	107.0
NLR 33892	5253	5423	49.1	77.3	32.3	109.6
NLR 28523	5680	5225	52.1	83.4	31.2	114.6
MTU 1061	4773	4714	50.2	70.3	28.1	98.4
SEm±	102	90	0.59	1.5	0.5	1.73
CD (0.05)	461	404	2.67	6.8	2.4	7.77
Nitrogen levels (kg ha^{-1})						
120	4567	5066	47.4	57.5	28.9	86.4
150	4950	5166	49.0	69.3	30.5	99.8
180	5225	5247	49.8	78.4	31.5	109.9
210	5408	5281	50.6	83.8	32.2	116.0
240	5650	5650	50.0	90.4	34.5	124.9
SEm±	115	116	0.7	1.7	0.60	1.93
CD (0.05)	449	457	2.6	6.6	2.3	7.58
V x N	NS	NS	NS	NS	NS	NS
C V (%)	8	5	4.6	2.6	2.2	2.1

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