

Original Research Article

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Influence of Nitrogen on Economics of Medium duration Rice Varieties

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ABSTRACT

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An investigation was conducted during *kharif*, 2017-2018 on clay loam soils of Regional Agricultural Research Station, Maruteru to study the effect of nitrogen on economics of medium duration rice varieties. The experiment was laid out in split-plot design with three nitrogen levels assigned to main plots and four medium duration rice varieties assigned to sub plots, each replicated thrice. Distinct disparities were noticed with regard to growth parameters, yield parameters and yield due to different nitrogen doses and medium duration varieties. The findings of the experiment revealed that growth stature and yield was significantly recorded superior with application of 150% RDN over 50 and 100% RDN. Among the medium duration varieties MTU 1153 recorded highest grain yield, straw yield and it was followed by another variety MTU 7029. Among all the treatments, application of 150% RDN recorded maximum net returns and B:C ratio with the variety MTU 1153.

Introduction

Rice (*Oryza sativa*) attains second place among cereal crops, both for acreage and production in the world (Siddiq *et al.*, 2011). It is staple food for more than half of the world's population and plays an important role in food security. More than 90 per cent of rice is produced and consumed in Asian countries. Area sown for rice is estimated at 43.39 M ha, with annual production of 104.32 m t and productivity of 2.4 t ha⁻¹. In Andhra Pradesh, rice is cultivated in an area of 2.16 M ha with an annual production of 7.49 M t and productivity of 3.4 t ha⁻¹ (Anonymous, 2016).

Fertilizer is one of the most efficient means of increasing rice. Balanced fertilization right from the very beginning of crop growth is utmost essential to achieve better harvest of crop (Singh and Namdeo, 2004). Nitrogen is the key nutrient that limits crop growth of cereals in many production systems. Nutrient requirement may however vary for based on duration of crop. The introduction of high yielding varieties of crops and utilization of various chemical fertilizers has brought a revolution in crop production. In India, medium duration rice cultivars gave maximum value on grain yield and its components, compared with short duration varieties. The yield potential of medium duration rice

varieties is high because, they have more periods for growth and accumulation of biomass. The nutrient uptake is also high because, of its higher biomass production (Prasad and Prasad, 1980). Higher levels of nitrogen are needed for high yielding under medium and long duration varieties. Although, the total rice production has remained stable for last ten years due to unsystematic use of chemical fertilizers in Godavari region. The application of fertilizer in proper amounts must be done to boost up agricultural production to an economically desirable level (Punauallh *et al.*, 1998). Fertilizer recommendations for crops in a cropping pattern needs change after a certain period of time with the advancement of research on fertilizer management in the country. A little information is only available on the performance of medium duration rice varieties in coastal Andhra Pradesh and its response to higher levels of nitrogen. A Hence, the present investigation was formulated to find out suitable combination of high yielding variety with appropriate dose of nitrogen for obtaining maximum and consistent yields in rice.

Materials and Methods

To ascertain the nitrogen requirement of medium duration rice varieties a field experiment was conducted during *khari* season of 2017-2018 at Regional Agricultural Research Station, Marteru situated at 82°30' E longitude, 18°20' N latitude with an altitude of 5m above MSL. The weekly mean maximum and minimum temperatures during the crop growth period were 30.02°C and 25.04°C respectively. The weekly mean average relative humidity at 8.30 hrs was 86.10 per cent and at 17.30 hrs was 75.60 per cent. A total rainfall of 777.8 mm was received in 49 rainy days during the crop growth period. The crop was transplanted with a spacing of 20 × 15 cm. The soil was clay loam in texture having a P^H of 6.74, low in available nitrogen

(280 kg ha⁻¹), medium in available phosphorus (23 kg ha⁻¹) and high in available potassium (336 kg ha⁻¹). The experiment was laid out in a split plot design with three nitrogen levels (N₁- 50% RDN, N₂-100% RDN and N₃- 150% RDN) allocated to main plots and four medium duration rice varieties allocated to sub plots in three replications. The duration of varieties was 135-140 days. The crop was fertilized with recommended dose of 90 kg N, 60 kg P₂O₅ and 60 kg K₂O applied through SSP and MOP as a basal application. Nitrogen was applied in the form of urea as per the treatments described in technical programme of work. All agronomic practices and other plant protection measures were followed as and when required. The data on growth parameters, yield attributes and yield as well as economics were recorded and subjected to statistical analysis as per Gomez and Gomez (1984).

Results and Discussion

Growth parameters

The statistical analysis resolved that all the growth parameters (Table 1) *viz.*, Plant height, number of tillers per m², drymatter accumulation were increased with increase in application of nitrogen from 50% to 150% RDN. Among medium duration varieties taller plants (121.2 cm) were noticed with MTU 1001 and shorter plants (107.8 cm) with MTU 7029 at harvest. More number of tillers m⁻² (497) was recorded with MTU 7029, lowest number was recorded (491) with MTU 1153 and it was on par with MTU 1001 and MTU 1075. Maximum drymatter accumulation (13293 kg ha⁻¹) was recorded with variety MTU 1153 and lowest (11622 kg ha⁻¹) was recorded with MTU 1001. The interaction effect was found to be non significant with respect to all growth characters. These findings are in conformity with results reported by Bhagel *et al.*, (2013).

Yield attributes

Regarding yield attributing characters (Table 2) they are increased with increase in N application from 50% to 150% RDN, whereas, among the medium duration varieties, MTU 1153 recorded highest yield attributing characters and lowest were with MTU 1001. MTU 1153 recorded highest number of panicles m⁻² (310), panicle length (24.42 cm), panicle weight (3.60 g) and percentage of filled grains panicle⁻¹ (87.77%) as compared with other varieties. Similar results also reported by Rajput *et al.*, (2016), Shukla *et al.*, (2015) and Pal and Mahunta (2010). Phillip *et al.*, (2012), Reddy and Kulakarni (2007) were reported that significant increase in yield attributes with increase in nitrogen rate from 50% RDN to 150% RDN. The grain and straw yields were

significantly influenced by both nitrogen levels and medium duration varieties. Irrespective of varieties highest grain yield (5599 kg ha⁻¹) was recorded with application of 150% RDN which was 15.94 and 23.06 per cent more compared to 50% and 100% RDN. Similar trend was followed in case of straw yield. Among medium duration varieties, highest grain yield (5558 kg ha⁻¹) was recorded with variety MTU 1153 and highest straw yield (7044 kg ha⁻¹) was recorded with variety MTU 7029 which was on par (7037 kg ha⁻¹) with MTU 1153. Whereas, harvest index was not influenced by nitrogen levels but in case of varieties MTU 1153 recorded highest harvest index (44.3%) over other varieties. Interaction effect between nitrogen levels and varieties was found to be significant with respect to grain and straw yields as reported by Krishna *et al.*, (2015).

Table.1 Influence of nitrogen on growth parameters of medium duration rice varieties

Treatments	Plant height (cm)	No of tillers (m ⁻²)		Drymatter accumulation (kg ha ⁻¹)	
	At Harvest	90 DAT	At harvest	90 DAT	At Harvest
Nitrogen levels (N)					
50% RDN	107.9	388	389	10726	11182
100% RDN	116.9	439	442	11483	12566
150% RDN	120.0	491	491	12352	13805
SEm±	2.01	13.2	13.2	191.2	333.9
CD (P = 0.05)	8.1	52	52	751	1211
Medium duration rice varieties (V)					
MTU 1075	119.7	418	421	11356	12564
MTU 1153	111.1	419	419	12206	13293
MTU 1001	121.2	422	423	10685	11622
MTU 7029	107.8	497	497	11834	12455
SEm±	3.27	11.3	11.5	222.9	306.7
CD (P = 0.05)	9.7	33	34	662	911
Interaction (NXV)					
SEm±	19.8	19.5	5.68	386.2	531.2
CD (P = 0.05)	NS	NS	NS	NS	NS

Table.2 Effect of nitrogen levels on yield attributes of medium duration rice varieties

Treatments	Panicles (m ⁻²)	Panicle length (cm)	Test weight (g)	Percentage of filled grains Panicle ⁻¹ (%)	Grain Yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Harvest index (%)
Nitrogen levels (N)							
50% RDN	260	23.59	22.11	72.61	4308	5923	42.2
100% RDN	307	23.97	21.91	82.30	5125	7023	42.1
150% RDN	335	23.94	21.22	87.07	5599	7597	42.4
SEm±	7.02	0.23	0.39	1.44	38.9	63.9	0.37
CD (P = 0.05)	27	NS	NS	5.66	153	251	NS
Medium duration rice varieties (V)							
MTU 1075	299	24.38	19.27	77.82	4915	7044	41.0
MTU 1153	310	24.42	23.20	87.77	5558	7037	44.3
MTU 1001	295	23.14	25.28	75.10	4483	6398	41.2
MTU 7029	300	23.39	19.23	81.95	5087	6911	42.4
SEm±	7.4	0.27	0.36	1.59	86.6	97.0	0.72
CD (P = 0.05)	NS	0.80	1.08	4.70	257	288	2.1
Interaction(NXV)							
SEm±	12.8	0.47	0.62	2.74	150.0	168.1	1.24
CD (P = 0.05)	NS	NS	NS	NS	446	499	NS

Table.3 Economics of medium duration rice varieties as influenced by nitrogen levels

Treatments	Cost of cultivation (Rs. ha ⁻¹)	Net returns (Rs. ha ⁻¹)	Returns per rupee investment
Nitrogen levels (N)	28074	45074	2.63
50% RDN	30634	58328	2.90
100% RDN	32194	63385	2.97
150% RDN	-	367.5	0.012
SEm±	-	1143	0.04
CD (P = 0.05)			
Medium duration rice varieties (V)			
MTU 1075	30301	54728	2.80
MTU 1153	30301	63609	3.07
MTU 1001	30301	47169	2.55
MTU 7029	30301	58257	2.92
SEm±	-	1021.2	0.033
CD (P = 0.05)	-	3034	0.10
Interaction (NXV)			
SEm±	-	1769	0.059
CD (P = 0.05)	-	5256	0.17

Economics

Perusal data on economics (Table 3) indicated that the gross returns, net returns and return per rupee investment was significantly influenced by both nitrogen levels and medium duration varieties and their interaction. Application of 150% RDN (Rs. 63385 ha⁻¹, 2.97) to the variety MTU 1153 (Rs. 63069 ha⁻¹, 3.07) recorded highest net returns and return per rupee investment due to highest grain and straw yields respectively over the other varieties tested in the experiment. Similar results were also reported by Santhosh Kumar *et al.*, (2013).

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