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Response of Medium Duration Rice Varieties to Nitrogen in Coastal Andhra Pradesh

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ABSTRACT

A field experiment was conducted at Regional Agricultural Research Station, Maruteru during *kharif*, 2017-2018 to study the effect of different levels of nitrogen on growth and yield of medium duration rice varieties. The treatments comprised of three levels of nitrogen (50% RDN, 100% RDN and 150% RDN) and four medium duration varieties. The results revealed that application of 150% RDN significantly recorded highest growth and yield attributes *viz.,* plant height, number of tillers per m^2, drymatter accumulation, more number of productive tillers per m^2, number of filled grains per panicle and panicle weight. Among medium duration varieties MTU 1153 recorded highest grain yield due to significant variations with respect to yield attributes *viz.,* length of panicle, number of filled grains per panicle, panicle weight over the rest of varieties and lowest yield of MTU 7029, MTU 1075 and MTU 1001 was due to less number of filled grains, length of panicle and panicle weight. The study indicated that application of 150% RDN to MTU 1153 recorded highest grain yield, straw yield and harvest index over the rest of the varieties.

Key words: *Medium duration varieties, Recommended dose of nitrogen, Yield attributes.*

Rice (*Oryza sativa*) is the 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. In India, rice is cultivated in an area of 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}.

Nitrogen is the key nutrient that limits crop growth of cereals in many production systems. Among essential plant nutrients, nitrogen plays a very important role for growth and development of rice crop. Nitrogen is an inevitable component for rice crop as it occupies prime position among plant nutrients in realizing the yield potential of rice varieties (Krishna *et al.,* 2015). Rice cultivars differ in their potential to respond to high fertility conditions. In India, medium duration rice cultivars gave maximum value on grain yield and its components, compared with short duration varieties (Habir *et al.,* 1998). The yield potential of medium duration rice varieties are high because, they have more period 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.

Godavari delta is the rice bowl of Andhra Pradesh. However, the total rice production has remained static for last ten years due to indiscriminate use of chemical fertilizers in Godavari region and increased pest and disease load besides yield reduction. It may be due to higher (or) lower doses of nitrogen application. The medium duration rice varieties have a potentiality of 8-10 t ha^{-1} which is not realized due to biotic and abiotic stresses. Much information is not available on the performance of medium duration rice varieties in coastal Andhra Pradesh and its response to higher levels of nitrogen. A suitable combination of high yielding varieties with appropriate dose of nitrogen is need of the hour for maximum and consistent yields in rice. Hence, the present investigation was formulated for standardization of nitrogen doses for medium duration rice varieties to attain maximum economic yield.

MATERIAL AND METHODS

A field experiment was conducted during *kharif* season of 2017-2018 at Regional Agricultural Research Station, Marteru. The experimental 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 (N_1- 50% RDN, N_2-100% RDN and N_3- 150% RDN) assigned to main plots and four medium duration rice varieties assigned to sub plots and replicated thrice. The duration of varieties was 135-140 days. The recommended dose of 90 kg N, 60 kg P_2O_5 and 60 kg K_2O were applied through SSP and MOP as a basal application. Nitrogen was applied through urea in three splits as per the treatments.

Table1. Growth parameters of rice varieties as influenced by nitrogen levels and medium duration varieties.

Treatments	Plant height (cm) at harvest	No. of tillers per m^2 at harvest	Drymatter accumulation (kg ha^{-1})
Nitrogen levels (N)			
50% RDN	107.9	389	11182
100% RDN	116.9	442	12566
150% RDN	120.0	491	13805
SEm±	2.01	13.2	333.9
CD (P = 0.05)	8.1	52	1211
Medium duration rice varieties (V)			
MTU 1075	119.7	421	12564
MTU 1153	111.1	419	13293
MTU 1001	121.2	423	11622
MTU 7029	107.8	497	12455
SEm±	3.27	11.5	306.7
CD (P = 0.05)	9.7	34	911
Interaction (NXV)			
SEm±	19.8	5.68	531.2
CD (P = 0.05)	NS	NS	NS

Table 2. Yield attributes of rice varieties as influenced by nitrogen levels and medium duration varieties

Treatments	Panicles per (m^2)	Panicle length (cm)	No of filled grains per panicle	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Nitrogen levels (N)					
50% RDN	260	23.59	124.5	4308	5923
100% RDN	307	23.97	139.5	5125	7023
150% RDN	335	23.94	157.4	5599	7597
SEm±	7.02	0.23	4.97	38.9	63.9
CD (P = 0.05)	27	NS	15	153	251
Medium duration rice varieties (V)					
MTU 1075	299	24.38	135.8	4915	7044
MTU 1153	310	24.42	159.3	5558	7037
MTU 1001	295	23.14	115.7	4483	6398
MTU 7029	300	23.39	151.4	5087	6911
SEm±	7.4	0.27	14.87	86.6	97
CD (P = 0.05)	NS	0.8	10.5	257	288
Interaction (NXV)					
SEm±	12.8	0.47	8.61	150	168.1
CD (P = 0.05)	NS	NS	NS	446	499

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. Weeding and plant protection measures were followed as and when needed. Observations regarding the periodical growth and yield attributing characters, grain and straw yield were recorded. The data were analyzed statistically by adopting the standard procedures described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Growth parameters:

In the present study, it was observed that all the growth parameters (Table 1) *viz.,* Plant height, number of tillers per m^2, 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) were 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 Ghasal *et al.* (2015) and Singh *et al.* (2015).

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 per m^2 (310), panicle length (24.42 cm), number of filled grains per panicle (159.3) as compared to other varieties. Similar results also reported by Mishra and Singh (2011), Pal and Mahunta (2010). Pradhan *et al.* (2014), Phillip *et al.* (2012) 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. Same 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. Interaction effect between nitrogen levels and varieties was found to be significant as reported by Santhosh Kumar *et al.,* (2013).

CONCLUSION

Thus, it may be concluded that both grain and straw yield were influenced by nitrogen levels and medium duration varieties. The yield potential of medium duration varieties with 150% applied nitrogen was as follows *viz.,* MTU 1153> MTU 7029> MTU 1075> MTU1001.

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