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NIRTROGEN NUTRITION AND YIELD OF RICE (CULTURE 1727) AT DIFFERENT LEVELS OF MAJOR NUTRIENTS

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Abstract: In a fertilizer management experiment conducted during 1988 crop seasons with different levels of N, P and K, it was observed that 50 kg N/ha was sufficient for the rice cultivar Culture 1727 from the point of view of economics and nitrogen use efficiency, in laterite soil with low available nitrogen status. Application of different levels of N, P and K did not show any marked effect on the grain and straw yield. Plant nitrogen content decreased and uptake increased up to 50 per cent flowering. Maximum nitrogen uptake was observed in between 30 to 40 days after transplanting. Better utilization of nitrogen was observed during the second crop season (Oct-Jan).

INTRODUCTION

Nitrogen is the nutrient most often limiting rice yields. Among the various factors affecting yield of rice, the varietal type is of particular significance. Considerable differences have been found between varieties not only for uptake of total quantities of nutrient but also its efficient utilization for the production of economic plant parts. The full potential of varieties can be exploited only with judicious nutrient management. Comparing the nitrogen uptake pattern of Cauveri, Kranti and Patel 85 having 105, 120 and 135 days duration, Dubey and Bisen (1989) reported that rice cultivar Kranti had maximum nitrogen content at all phases of growth and showed high uptake except at the initial stage. It is therefore, important to assess the uptake of nitrogen at different stages of growth, nitrogen use efficiency and yield of the newly released rice cultivar, Culture 1727.

MATERIALS AND METHODS

Field experiments were conducted in the lowland laterite soil at the Regional Agricultural Research Station, Pattambi during 1988 crop seasons viz., first crop (June-Sept) and second crop (Oct-Jan). The soil of the experimental field was sandy loam in texture with available N, P_2O_5 and K_2O content of 211, 20 and 60 kg/ha respectively. The treatments consisted of five fertilizer schedules (control, 50:25:25, 70:35:35, 90:45:45, 110:55:55 kg N, P_2O_5 and K_2O/ha respectively) and were arranged in a randomised block design with four replications. Entire dose of P and K as single superphosphate and muriate of potash, respectively was basally applied at planting. Nitrogen as urea was applied in two equal splits at planting and 30 days aftertransplanting (DAT). The test variety Culture 1727 (Triveni x IR 2061-464) is having white slender grain with medium height and having a duration of 120 days. Straw samples were analysed for nitrogen content at 10 days interval from planting to 50 per cent flowering and grain and straw at harvest by microkjeldahl method (Jackson, 1958),

RESULTS AND DISCUSSION

Plant nitrogen content

Nitrogen content in plants at different stages of growth increased up to 20 DAT and then decreased continuously during first crop, whereas during the second crop, values continuously

decreased from 10 to 60 DAT with maximum and minimum N content at 10 and 60 DAT respectively (Table 1). Nitrogen content in plants decreased with increasing age due to dilution effect caused by higher dry matter production (Dubey and Bisen, 1989). Increasing levels of N, P and K increased the accumulation of N in both seasons. Similar trend of N accumulation has been observed by Patnaik *et al.* (1982). This may be due to the increased nitrogen availability through fertilizer as well as better growth and activity of roots.

There was no significant variation in the N content of grain and straw at harvest between treatments during both seasons. However, there was an increasing trend in the N content with increasing rate of applied N, P and K.

Plant nitrogen uptake

The N uptake by the plants significantly increased from 5.31 to 4227 kg/ha and from 3.27 to 7.87 kg/ha at 10 to 60 DAT during the first and second crop respectively (Table 2). The mean N uptake was maximum in between 30 and 40 DAT in both seasons due to the increased dry matter accumulation during this period (Sudhakara, 1984). The linear relationship between the increased dry matter production and N uptake has been reported by Fagi and De Datta (1981) and Upadhyay and Pathak (1981). There was a progressive increase in the N uptake with increased rate of applied N, P and K and maximum value was recorded for the treatment receiving 110: 55:55 kg N, P_2O_5 and K_2O/ha. The difference in N uptake between seasons can be attributed to the differences in the magnitude of N losses and climatic factors.

Nitrogen uptake increased with increasing levels of N, P and K in grain and straw (Table 3). Maximum uptake was found in the teatment receiving 110 kg N/ha and minimum under control in both the seasons.

Yield, N use efficiency and economics

The levels of fertilizers did not significantly influence the grain and straw yields of Culture 1727 during both the seasons (Table 4). Even though higher grain yield was recorded by the treatment receiving 110:55:55 kg/ha of N, P_2O_5 and K_2O, the N use efficiency (32.51%), net return (Rs 11359) and benefit : cost ratio (2.03) were maximum for the treatment receiving 70:35:35 kg N, P_2O_5 and K_2O/ha. This treatment was closely followed by the application of 50:25:25 kg N:P_2O_5: K_2O/ha which recorded maximum return per rupee invested on N fertilizer (41.62). In general, the N use efficeincy was higher during the second season due to lower rate of N loss through leaching (Anon., 1987). It can be concluded that on the economic point of view and N use efficiency, 50 kg N/ha was sufficient for the rice cultivar Culture 1727 for better growth and yield in low land laterite soils with low available N status.

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Table 1. Effect of different levels of N, P and K on nitrogen content (%) in plant samples at different periods

Treatment (T) N : P_2O_5 : K_2O (kg/ha)	Days after transplanting (P) 10	20	30	40	50	60	Mean	CD (0.05)
a) First crop								
0:0:0	2.56	3.12	2.59	1.56	1.23	1.03	2.02	
50:25:25	2.83	3.24	2.71	2.17	1.48	1.16	2.27	T 0.153
70:35:35	2.77	3.55	2.78	2.47	1.57	1.05	2.37	P 0.168
90:45:45	2.43	3.04	2.73	2.16	1.41	1.31	2.18	TxP NS
110:55:55	2.88	3.27	2.96	2.77	1.85	1.26	2.50	
Mean	2.69	3.25	2.75	12.23	1.51	1.6		
b) Second crop								
0:0:0	3.07	2.80	2.71	1.73	1.25	1.06	2.10	
50:25:25	3.23	2.93	2.23	2.08	1.41	1.30	2.20	T 0.199
70:35:35	3.52	2.95	2.51	2.08	1.46	1.23	2.29	P 0.218
90:45:45	3.49	3.14	2.35	2.46	1.72	1.41	2.43	TxPNS
110:55:55	3.75	3.31	2.51	2.53	1.64	1.43	2.53	
Mean		3.41	3.03	2.46	2.18	1.50	1.28	

Table 2. Effect of different levels of N, P and K on nitrogen uptake (kg/ha) in plants samples at different periods

Treatment (T) N : P_2O_5 : K_2O (kg/ha)	Days after transplanting (P) 10	20	30	40	50	60	Mean	CD (0.05)
a) First crop								
0:0:0	4.04	5.84	13.29	17.05	21.18	32.82	15.70	
" 50:25:25	4.55	8.30	17.87	9.65	40.01	33.30	23.95	T 5.138
70:35:35	6.44	13.99	18.19	34.99	44.26	39.15	26.17	P 5.629
90:45:45	5.45	12.70	33.70	46.44	44.12	52.47	32.48	TxP 12.59
100:55:55	6.07	11.05	34.05	51.53	62.88	53.60	36.53	
Mean	5.31	10.38	23.42	37.93	42.49	42.27		
b) Second crop	3.00	13.07	42.70	41.77	57.51	58.55	36.10	
50:25:25	2.40	12.48	36.60	77.17	61.73	78.11	44.75	T 7.195
70:35:35	3.43	26.24	41.06	70.63	71.57	81.52	49.07	P 7.882
90:45:45	3.14	21.07	45.86	90.13	57.11	83.78	50.18	TxP 17.62
100:55:55	4.40	19.19	51.37	88.58	61.33	87.41	52.04	
Mean	3.27	18.41	43.52	73.65	61.85	77.87		

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