

EFFECT OF NITROGEN AND PLANT POPULATION ON YIELD AND YIELD COMPONENTS OF JAYA RICE UNDER RECOMMENDED IRRIGATION PRACTICE

D. SRINIVASULU REDDY*

Studies were conducted at the Tirupati campus of the Andhra Pradesh Agricultural University to find out the effect of nitrogen (0, 90 and 180 Kg N/ha) and plant population (10 and 6.7 lakhs / ha) levels at recommended irrigation practice on yield and yield components of Jaya rice during *rabi* 1978 and *Kharif* 1979 on sandy loam soils. Increasing nitrogen levels from no nitrogen to 180 kg N/ha increased the number of productive tillers, filled grains and test weight. Lower plant population (6.67 lakhs / ha) resulted in more number of productive tillers per plant and filled grains per panicle. Higher grain and straw yields were obtained with 180 kg N/ha and 6.67 lakhs plant population / ha. The results indicated that rice under recommended water management practice of 2 and 5 cm depth of submergence during *Kharif* and *rabi* respectively, had response upto 180 kg N/ha. uptake of NPK increased with increase in nitrogen level and decrease in plant population level.

Several experiments have been conducted to determine optimum levels of nitrogen and plant population at several places under different soil and water management conditions. With each increase in the level of nitrogen from 40 to 160 kg/ha grain yield of Jaya, IR8 and IR5 increased significantly on sandy loam soils of Shimoga during both *kharif* and *rabi* seasons (Munegowda and Panikkar, 1977). Urs and Mahadevappa (1972) reported that IR 8 and Jaya gave higher yields with 120 kg N/ha at 20 × 10 cm and 20 × 20 cm spacings respectively compared to lower levels of N. However, the effect of these two key factors on sandy loam soils of South eastern region of Andhra Pradesh with a recommended water management practice of 5 cm submergence during *rabi* and 2 cm submergence during *kharif* has been rarely studied.

MATERIALS AND METHODS

Studies on the effect of nitrogen and plant population on yield and yield attributes of rice were conducted during *rabi* 1978 and *kharif* 1979 on sandy loam soils at Tirupati campus of Andhra Pradesh Agricultural University. The soil was moderately alkaline (pH 8.02), low in organic carbon (0.35%) medium in available P (17.02 kg/ha) and K (127.62 Kg/ha). The gross and net plot sizes were 5.2 × 5.0 m and 3.8 × 3.6 m respectively. The experiment was laid out in a randomised block design with factorial concept and with four replications. The treatments were three levels of nitrogen (0, 90 and 180 kg N/ha) and two levels of plant population, (10 lakhs/ha with 10X10 cm spacing and 6.617 lakhs/ha with 15X10 cm spacing). Nitrogen was applied in the form of urea as per the treatments. Single superphosphate to supply 26 kg

*Assistant Professor, Department of Agronomy, Andhra Pradesh Agricultural University, Tirupati - 517 502.

P/ha and muriate of potash to supply 50 kg K/ha were applied uniformly for all the treatments. Half of N and the entire dose of P and K were applied in two equal splits (at maximum tillering and at panicle initiation). Twenty six day old seedling of Jaya rice were transplanted with two seedlings per hill at 10 × 10 at 15 × 10 cm spacing as per the treatments. Uptake of N, P and K was studied by analysing the plant sample (grain + straw) collected at random from the net plots at harvest. Total uptake (kg/ha) was calculated by multiplying the N, P and K per cent with grain and straw yields.

RESULTS AND DISCUSSION

Maximum number of tillers per hill was recorded with N 180 during both seasons which was significantly higher than the rest (Table 1). In both seasons, maximum number of productive tillers per hill was recorded with N 180 while significantly less number of productive tillers per hill was recorded with no nitrogen. This might be due to more and free availability of N, P and K at higher levels of N as reflected in higher uptake rates. Munegowda and Panikkar (1977) reported that during both *rabi* and *kharif* the number of productive tillers increased significantly with increase in the level of nitrogen from 40 to 160 kg/ha. The number of total tillers and productive tillers per hill were significantly more

in lower population (6.67 lakhs/ha) in both the seasons.

During *rabi*, maximum number of filled grains per panicle was obtained with N 180 which was on a par with N 90 but significantly superior to N 0. During *kharif*, number of filled grains per panicle increased significantly with each increment of nitrogen from 0 to 180 kg/ha. Significantly higher number of grains per panicle was obtained with lower population (6.67 lakhs/ha). Maximum test weight was recorded with N 180 which was on a par with N 90 but significantly superior to N 0 during *rabi* while during *kharif* all the three levels of N were at par. Levels of plant population had no influence on test weight.

Grain yield was maximum with N 180 which was significantly superior to N 90 and N 0 in both seasons. Increase in grain yield with increase in levels of nitrogen might be due to increase in productive tillers per hill, number of filled grains per panicle and test weight. Similar increase in grain yield with increase in nitrogen was reported by Munegowda and Panikkar (1977).

A population of 6.67 lakhs/ha with a spacing of 15 X 10 cm gave significantly higher yield compared to a population of 10 lakhs/ha with a spacing of 10 X 10 cm in both seasons. The increase in grain yield with increase in spacing or decrease in plant population

Table 1. Yield attributes and yield of Jaya rice as influenced by levels of nitrogen and plant population

Treatments	Total tillers/hill		Productive tillers/hill		Number of filled grains/panicle		Test weight (g/1000 grains)		Grain yield (kg/ha)		Straw yield (kg/ha)	
	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif
N 0	6.56	6.72	5.03	5.46	80.37	75.95	23.98	23.38	6988	5366	8913	6957
N 90	7.31	7.39	6.10	6.26	91.00	84.05	25.17	24.60	7569	5779	10055	10181
N 180	8.37	8.61	7.11	6.92	101.62	91.75	25.65	25.39	8257	6281	11141	11444
CD 5%	0.86	0.57	0.38	0.96	13.32	4.48	1.00	1.30	490	323	385	840
Plant Population												
10 lakhs hills/ha	6.65	7.26	5.91	5.56	86.50	79.58	24.56	24.83	7385	5498	9687	9052
6.67 lakhs hills/ha	8.17	7.89	6.28	6.86	95.20	88.26	25.32	24.00	7824	6119	10386	10002
F test	Sig	Sig	Sig	Sig	Sig	Sig	NS	NS	Sig	Sig	Sig	Sig
CV %	10.88	7.10	5.91	14.40	5.49	5.00	3.73	6.09	6.04	5.22	3.61	8.27

Table 2. Nitrogen, Phosphorus and Potassium uptake (Kg/ha) is influenced by levels of nitrogen and plant population.

Treatments	Nitrogen uptake		Phosphorus uptake		Potassium uptake	
	rabi	kharif	rabi	kharif	rabi	kharif
NITROGEN LEVELS						
N O	110.56	91.30	30.20	27.05	109.88	87.23
N 90	140.84	130.96	37.00	31.92	99.85	105.04
N 180	206.92	193.56	41.61	32.32	104.86	107.97
POPULATION						
10 Lakhs hills / ha	145.66	136.20	36.06	29.38	125.26	95.18
6.67 Lakhs hills / ha	159.89	141.02	36.48	31.15	126.25	104.99

might be attributed to more number of productive tillers per hill and number of grains per panicle. Though the plant population per unit area was less with 15 X 10 cm spacing than with 10 X 10 cm, the plants with 15 X 10 cm more than compensated the yield by producing more number of productive tillers per hill and filled grains per panicle.

In both *rabi* and *kharif*, maximum straw yield was obtained with N 180 which was significantly higher than in N 90 and N O. Straw yield was significantly more in lower plant population than in higher plant population. This might be due to more number of total tillers per hill.

Among the levels of nitrogen, uptake of nitrogen was more with N 180 and minimum with N O both the seasons (Table 2). A similar trend was observed with uptake of P and K. Uptake of N, P and K was more at lower plant population.

REFERENCES

- MUNEGOWDA, R. K. and S. N. PANIKKAR, (1977). Effect of varying levels of nitrogen on yield and yield attributes of high yielding varieties of paddy. *Mysore J. Agric. Sci.* 11: 48-51.
- URS, Y. S. V. and R. MAHADEVAPPA, (1972). Effect of spacing and fertiliser application on growth and yield of Jaya, IR8 and IR 5 varieties of paddy. *Mysore J. Agric. Sci.* 6 (4): 399-404.