

Effect of Application of Urea and Ammonium Sulphate Blended with Neem Cake and Soil on the Growth and Yield of Rice (*Oryza sativa* L)

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Generally about 40 per cent of the nitrogen applied to rice is lost in different ways. The losses should be minimised to the possible extent in order to make best use of the applied nitrogen profitably. The alternate submerged and drained conditions in rice soils favour nitrification of ammonia and urea-nitrogen applied to the soil (Prasad and Bains, 1968). Nitrate nitrogen thus formed is easily lost either through leaching or denitrification. One of the ways to overcome this situation is to use nitrification retardants. Prasad *et al.* (1970) emphasized that studies should be carried out with indigenous products like *neem* cake which possess nitrification retarding properties of nitrogen from fertilizers applied to rice.

In view of the paucity of adequate experimental data on different techniques of N fertilizer application and nitrification inhibitors for *Kyari* land in Gujarat State, the present study was planned in the *khari* season of 1977-78 at the main Rice Research Station, Gujarat Agricultural University, Nawagam under low land condition.

There were 15 treatments which consisted of combinations of seven methods of N application and two levels of nitrogen along with a control (Table 1). The experiment was conducted in a Randomised Block Design with four replications. It was sown and transplanted on June 22, 1977 and July 25, 1977, respectively.

The soil of the experimental plot was sandy clay loam locally known as *Kyari* land. It was deep having good moisture holding capacity and slightly alkaline in reaction. The status of total nitrogen, available phosphate and available potash was 840, 64 and 220 kg/ha, respectively. The total rainfall during the crop season was 881 mm distributed over 45 rainy days. Sufficient rain was received in the months of June, July and August. Supplement canal irrigation was given as and when required.

The main effects of different treatments on growth and yield attributes of rice are presented in Table 1. Nitrogen applied in the form of urea blended with neem cake (M_2) remarkably increased productive tillers/m², number of filled spikelets/panicle, test weight and straw yield. This method ultimately registered the highest grain yield of 5762 kg/ha which was significantly higher than rest of the treatments. The lowest rice grain (4863 kg/ha) was produced under urea applied as such (M_1). The magnitude of increase was 15.6 per cent under M_2 over M_1 . Maximum net realization of

TABLE 1 Effect of different treatments on yield, yield attributing characters and uptake of nutrients in rice.

Treatments	Productive tillers/m ²	Filled spike- lets/panicle	Test weight, g	Grain yield kg/ha	Straw yield, kg/ha	Total uptake, kg/ha			Net re- lization, Rs/ha	Net incre- mental cost Benefit Ratio
Method of N application:										
M ₁ -N from Urea applied to soil in four equal splits	237.37	189.50	14.853	4863	4598	81.81	25.17	126.59	2692	7.72
M ₂ -N from Urea blended with Neem cake	285.62	232.62	15.449	5762	5412	100.89	26.24	158.11	3811	12.40
M ₃ -N from Urea blended with decoiled Neem cake	261.25	194.37	15.204	5266	5005	92.48	24.29	144.14	3179	9.90
M ₄ -9 from Urea (1 part) blended with soil (5 parts)	244.62	191.00	15.069	4869	4720	84.93	22.70	127.09	2681	7.89
M ₅ -N from Urea, 80% throughsoil + 20% through foliar spray	245.25	198.62	14.895	5012	4679	85.26	23.24	130.21	2873	8.31
M ₆ -N from Ammonium sulphate applied to soil in four equal splits	248.50	201.62	15.156	5135	5045	86.84	22.85	138.96	2976	7.16
M ₇ -N N from Urea mixed with sulphur	250.75	196.25	15.047	5110	4964	85.72	23.80	138.15	2470	2.38
SEm±	6.25	7.72	0.13	141.41	156.25	2.21	0.72	1.95	—	—
C.D. at 5%	17.90	22.04	0.37	403.71	449.22	6.32	2.02	5.60	—	—
Levels of Nitrogen:										
N ₁ -50 kg N/ha	232.67	191.82	14.933	4714	4488	77.74	22.52	126.21	2532	9.40
N ₂ -100 kg N/ha	274.03	209.32	14.258	5576	5348	98.80	25.76	149.30	3377	6.52
S.E.m±	3.35	4.13	0.07	75.33	91.25	1.17	0.39	1.04	—	—
C.D. at 5%	9.56	11.79	0.20	215.04	269.42	3.32	1.11	3.00	—	—
Fertilizer v/s control:										
Fertilizer Control	253.54	200.57	15.097	5154	4917	88.27	24.31	137.76	2955	—
S.E.m±	148.75	168.25	14.682	2856	2686	45.70	13.54	72.53	424	—
C.D. at 5%	6.49	7.99	0.13	146.48	158.85	2.30	0.78	2.02	—	—
C.V. %	18.54	22.80	0.38	406.25	455.73	6.51	2.21	5.79	—	—
	—	—	—	7.95	—	—	—	—	—	—

Rs. 3811/ha with a Net Incremental Cost Benefit Ratio of 12.40 was also secured from M_2 . There was no significant difference between two sources of nitrogen viz., urea (M_1) and ammonium sulphate (M_6) which yielded 4863 and 5135 kg/ha of rice grain, respectively. Addition of sulphur to urea (M_7) and urea blended with soil (M_4) did not differ significantly from the treatment of urea applied as such (M_1). Similarly, nitrogen from urea blended with deoiled neem cake (M_3) also did not differ significantly over rest of the methods except M_2 .

Nitrogen applied at 100 kg N/ha (N_2) recorded remarkably increased total number of productive tillers number of filled spikelets/panicle and test weight. The favourable effects of higher level of N were finally reflected in increased grain and straw yield of rice over lower level of 50 kg N/ha (N_1). The increase in the grain yield was 862 kg/ha. The application of 100 kg N/ha also resulted in increased mean net profit of Rs. 845/ha over 50 kg N/ha with a Net Incremental Cost Benefit Ratio of 9.40.

The interaction between methods of N application and levels of nitrogen was significant. Application of urea blended with neem cake at 100 kg N/ha gave the highest grain production of 5809 kg/ha. However, it was at par

with urea applied at 50 kg N/ha blended with neem cake which yielded 5714 kg/ha of rice grain with the maximum net profit of Rs. 3866/ha and the highest Net Incremental Cost Benefit Ratio of 16.64.

Total uptake study indicated higher values of N , P_2O_5 and K_2O by grain and straw under the application of urea blended with neem cake over rest of the treatments. The values were higher at 100 kg N/ha than at 50 kg N/ha.

On the whole, maximum yield was secured by application of N at 100 kg/ha as urea blended with neem cake. However, from economic point of view, application of 50 kg N/ha as urea blended with neem cake was superior. Hence, for maintaining the soil fertility, application of 100 kg N/ha as urea blended with neem cake is recommended for rice.

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