

## Effect of Neem Cake Blended Urea Application on the Yield and Nutrient Uptake of Rice (IR. 20)

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The results of a field experiment conducted to find out the effect of neem cake blended urea application at different levels to rice (IR 20) indicated that neem cake blended urea increased the grain and straw yield of rice over untreated urea. Nitrogen and P uptake by grain and straw were also increased. Potassium uptake in both grain and straw decreased with increase in the levels of N application. Among the doses of neem cake tried, 40 per cent by weight of neem cake blended with urea was better.

In recent years control of nitrification in soil has been attracting increasing attention for enhancing N use efficiency by minimising leaching of fertilizer N from the root zone in the form of  $\text{NO}_3\text{-N}$ . For this purpose various chemicals are either mixed with ammoniacal fertilizers (Goring, 1962; Gasser, 1970) or applied as coatings to fertilizer granules (Patrick *et al.* 1968; Reddy and Prasad, 1975). However, most of the chemicals used as nitrification inhibitors are not indigenously manufactured. Among the indigenous materials, neem cake has been found to increase the N efficiency when it is mixed with ammoniacal fertilizers (Ketkar, 1974); Harishanker *et al.* 1976). Therefore, an attempt was made to evaluate the effect of neem cake blended urea application on rice yield.

### MATERIAL AND METHODS

A field experiment was conducted in the wetlands of Tamil Nadu Agricultural University farm at Coimbatore to

study the effect of neem cake mixed urea application on yield and nutrient uptake by rice (IR 20). The experiment was laid out in randomized block design with 3 replications. The treatments consisted of three levels of N (60, 90 and 120 kg N/ha) and two doses of neem cake (20 per cent and 40 per cent by weight of urea used). The amount of N contributed by the neem cake was deducted from the corresponding N levels and the rest was applied as urea. Urea was mixed with neem cake by moistening the lots kept in the polythene bags with acetone (25 ml/kg of urea) and then adding the required quantity of finely powdered neem cake (passing through a 20 mesh sieve) and mixing the contents thoroughly. Nitrogen was applied in two split doses i.e. 50 per cent at the time of planting and the rest one month after planting. Superphosphate to supply 60 kg  $\text{P}_2\text{O}_5$ /ha and muriate of potash to supply 60 kg  $\text{K}_2\text{O}$ /ha were applied basally to all treatments. The yield of

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grain and straw were recorded separately. The plant samples collected at post-harvest stage were analysed for N, P and K contents as per the procedures outlined by Jackson (1967). From the nutrient concentrations uptake values were calculated by multiplying them with the respective yield data.

## RESULTS AND DISCUSSION

The yield of rice grain and straw are presented in Table I and nutrient uptake values in Table II.

**Yield:** Yield of rice significantly increased with increase in the levels of N tried irrespective of mixing with neem

cake or not. Also the neem cake blended urea application significantly increased rice grain and straw yield at all levels of N application compared to untreated urea. The per cent increase in grain yield at 60 kg N/ha level due to 40 per cent neem cake blending of urea was 25 and that of 20 per cent neem cake blending was 20. At all levels of N, blending of neem cake at 40 per cent by weight of urea significantly increased the grain yield compared to 20 per cent. Among the different levels of N tried, the highest yields of grain and straw were obtained at 120 kg N/ha level of neem cake blended urea application. But the per cent increase in grain and straw

TABLE I. Effect of neem cake mixed urea application on yield of rice (IR 20)

Treatments	Grain yield (kg/ha)	% increase over untreated urea	straw yield (kg/ha)	% increase over untreated urea
60 kg N/ha as urea	2361	—	3465	—
90 kg N/ha as urea	2798	—	3952	—
120 kg N/ha as urea	3280	—	4470	—
60 kg N/ha + neem cake 20 per cent	2833	19.22	3727	9.58
60 kg N/ha + neem cake 40 per cent	2951	24.99	3870	1.70
90 kg N/ha + neem cake 20 per cent	3178	13.56	4435	12.22
90 kg N/ha + neem cake 40 per cent	3255	16.33	4493	3.70
120 kg N/ha + neem cake 20 per cent	3675	12.02	4850	8.50
120 kg N/ha + neem cake 40 per cent	3747	14.22	5015	12.18

### Summary of statistical analysis

	S.E.M	C.D. (P=0.05)
i. N levels	0.144	0.431
ii. Doses of neem cake	0.083	0.248
iii. N levels x doses of neem cake	0.207	0.620

TABLE II. Effect of neem cake blended urea application on nutrient uptake by rice (IR 20) (kg/ha)

Treatment	Nutrient	Grain			Straw		
		N	P	K	N	P	K
60 kg N/ha as urea		57.3	8.41	19.61	34.1	2.60	29.56
90 kg N/ha as urea		63.1	10.21	17.56	39.4	3.65	24.88
120 kg N/ha as urea		69.4	12.25	14.91	43.2	4.38	19.85
60 kg N/ha + neem cake 20 per cent		62.3	9.30	20.93	37.4	3.13	32.70
60 kg N/ha + neem cake 40 per cent		64.9	10.36	22.76	39.8	4.07	34.96
90 kg N/ha + neem cake 20 per cent		68.6	12.53	18.66	40.6	4.87	28.10
90 kg N/ha + neem cake 40 per cent		71.6	14.16	20.83	42.7	5.67	29.66
120 kg N/ha + neem cake 20 per cent		74.7	13.83	16.70	45.6	6.93	24.66
120 kg N/ha + neem cake 40 per cent		79.3	15.33	18.20	49.5	7.97	27.30

## Summary of statistical analysis

	Grain		Straw	
	S.E. of mean	C.D.(P=0.05)	S.E. of mean	C.D. (P=0.05)
<b>N uptake</b>				
N levels	0.240	0.870	0.141	0.412
Doses of neem cake	0.140	0.490	0.077	0.223
N levels x Doses of neem cake	0.340	1.230	0.203	0.584
<b>P uptake</b>				
N levels	0.089	0.259	0.063	0.184
Doses of neem cake	0.044	0.128	0.031	0.089
N levels x Doses of neem cake	0.130	0.379	0.094	0.273
<b>K uptake</b>				
N levels	0.100	0.292	0.134	0.391
Doses of neem cake	0.054	0.157	0.077	0.223
N levels x Doses of neem cake	0.141	0.412	0.189	0.553

yields was higher under 60 kg N/ha and 30 kg N/ha levels of neem cake blended urea application respectively. Between the doses of neem cake tried, the highest grain yield (3098 kg/ha) was recorded when neem cake was applied at 40 per cent by weight of urea compared to 2988 kg/ha obtained with 20 per cent by weight of neem cake blended urea. A similar trend of results was observed in the straw yield for the various treatment combinations. These results are in close agreement with that of Ketkar (1974) and Harishanker *et al.* (1976). The increase in the yield of rice grain and straw due to the blending of urea with neem cake noted in the present investigation might be due to the retardation of nitrification of applied urea by neem cake. Such inhibition of nitrification of applied urea might have facilitated the slow and steady release of N to the plants thereby enhancing the growth and yield of rice.

**Nutrient uptake:** The data on uptake of N, P and K by grain and straw indicated that the highest uptake of N and P was observed at 120 kg N/ha level of urea blended with 40 per cent neem cake. Notwithstanding the levels of N tried, there was increased uptake of N and P due to neem cake blending of urea. Among the different levels of N tried, it was seen that 120 kg N/ha recorded the highest uptake of N and P in grain and straw with or without neem cake. Similar observation was also made by Harishanker *et al.* (1976). At each level of N, 40 per cent neem cake blending of urea registered the highest uptake of N and P in grain and straw. The interaction between N levels and doses of neem cake tried was also signi-

ficant. This again showed that 40 per cent neem cake blending of urea was superior to 20 per cent blending of urea in increasing the uptake of N and P in both grain and straw at all levels of N tried. The increase in uptake of N and P at 40 per cent neem cake blending of urea might be due to the increased but gradual availability of N in soil because of slow and steady release of N by way of regulated N mineralization.

The uptake of K in both grain and straw showed a decreasing trend with every increase in the level of N application. Increasing levels of N would have blocked the release of K from the clay colloids thereby reducing the availability and uptake of K. This was more pronounced at 120 kg N/ha level compared to other levels tried, irrespective of the doses of neem cake tried there was increased uptake of K due to neem cake blending in both grain and straw compared to untreated urea. Between the doses of neem cake applied, 40 per cent neem cake blending urea was found to be better in increasing the K uptake in both grain and straw samples compared to 20 per cent neem cake blending at all levels of N tried. This might be due to increased vegetative growth warranting a higher uptake of K.

From these results it is concluded that by treating the nitrogenous fertilizer like urea with neem cake, it would be possible to increase the yield of rice grain and straw. Such blending of N fertilizers with neem cake markedly increased the uptake of nutrients like N and P in both grain and straw.

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