

EFFECT OF MODIFIED UREA ON LOWLAND RICE

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The N use efficiency of low land rice was studied with the modified urea products, such as coaltar coated urea, Neem cake blended urea and urea supergranules in comparison with prilled urea as basal and in splits. Neem cake blended urea was significantly superior to coaltar coated urea and prilled urea. Urea super granules in placement recorded the highest gross return at both the levels of N and was significantly superior to all other sources. When comparing the prilled urea, at 75 per cent of the recommended level of N as urea super granule in placement was significantly superior to 100 percent level of N as Prilled urea, and indicating a saving of 25 per cent N.

Nitrogenous fertilizers gained more importance in rice production especially after introduction of high yielding and high fertilizer responsive varieties. In general, the soils of Tamil Nadu are deficient in N and the crop requires huge quantity of nitrogen for producing higher crop yields. This has led to a marked interest in the method of maximising yields by increasing N use efficiency of the fertilizers and make the 'N' available to the plant during the period of demand in sufficient amount for optimum growth

It has been estimated that only 30 to 40 per cent of the applied N is recovered by rice crops (Parr, 1967). The primary reason for low recovery lies in the fact, that most of the fertilizer N-used as urea is readily water soluble, which under optimum soil moisture condition releases the N at a faster rate. When the released N is not quickly absorbed by the plant and is left in the soil systems, it may be lost through fixation, leaching and volatilization (Shand and Ahmed, 1974).

It has been estimated that about 60 per cent of money invested on nitrogenous fertilizer goes as waste by leaching and volatilization and leads to low N use efficiency. The loss of N is prevented by adopting the agronomical practices such as use of ammoniacal form of fertilizer, placement, split application and use of nitrification inhibiting chemicals. Slow release materials are not commercially available in India. Besides, they are costly and beyond the reach of the average farmer. To overcome this problem locally available materials have been tested in this experiment.

MATERIALS AND METHODS

Field experiment was conducted at Soil and Water Management Research Institute, Thanjavur during kharif 1983. The experiment was laid out in split plot design with two levels of N at 75 and 100 per cent recommended level in the main plots and sources and modes of application in the sub-plots. Rice variety IR 50 was used as test crop in kharif 83, main crop and IR 20 in rabi 1983-84 residual crop.

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The soil of the experiment site is sandy loam in texture with PH 7.5 and EC 0.1 and is classified under Madukkur

series. The soil is low in available N and medium in available P, O₂ and K₂O.

Treatment Particulars:

Main Plot

Two levels of N :

A : 100% Per cent N as per soil test recommendation and

B : 75% Per cent of recommended N as per soil test.

Treatment No.	Mode of application.	Sub plot treatments.
T ₁	—	Control (No N (C)
T ₂	M2	Prilled urea (PU) 3 splits
T ₃	M1	Prilled urea (PU) (all basal)
T ₄	M2	Coaltar coated urea (CTU) (all basal)
T ₅	M2	Neemcake blended urea (NBU) (all basal)
T ₆	M2	Urea super granules (USG) (all basal)
T ₇	M1	50 per cent N as CTU as basal 50 per cent N as prilled urea top dressed in two equal splits.
T ₈	M1	50 per cent N as NBU as basal 50 per cent N as prilled urea top dressed in two equal splits.
T ₉	M1	50 per cent N as USG as basal 50 per cent N as prilled urea top dressed in two equal splits.

The entire dose of P and K as per soil test recommendation was applied basally to all plots including control plots.

RESULTS AND DISCUSSION:

Grain yield:

USG recorded the highest grain yield of 6084 kg/ha closely followed by NBU with 5771 kg/ha. (Table 1).

Among the levels 100% recommended N recorded the highest grain yield

of 5759 Kg/ha and was significantly superior to 75% recommended level of N.

In general split application was found to be significantly superior to basal application in respect of grain yield. USG in placement registered the highest grain yield in both levels of N (i.e 6306 kg in 100% N and 5989 kg/ha in 75%). But in NBU not much differences could be observed in respect of mode application. PU with best splits (3 splits) registered highest grain yield of 5477 and 4893 kg/ha at 100%

Table 1.. Grain yield in kg/ha

Modes	Sources	Kharif : 1983-84 IR 50			IR 20			Mean for mode	
		Main crop			Residual Crop				
		100% N	75% N	Mean	100% N	75% N	Mean		
M1 Basal *	C	3357	3353	3355		2285	2174	2233	
	PU	4591	4058	4325		2306	2212	2259	
	CTU	5853	4911	5382		2336	2332	2334	
	NBU	5990	5635	5813	5417	2455	2370	2413	2494
	USG	6306	5989	6146		3049	2892	2971	
	Mean	5685	5148	5417		2536	2452	2494	
	PU	5477	4893	5185		2451	2293	2372	
M2	CTU	5644	5266	5605	5585	2528	2498	2513	2549
Split **	NBU	5935	5522	5729		2651	2541	2596	
	USG	6275	5773	6019		2745	2685	2715	
	Mean	5833	5336	5585		2594	2504	2449	
Mean	PU	5034	4476	4755		2379	2253	2316	
	CTU	5749	5039	5344		2432	2415	2424	
Sources	NBU	5963	5579	5771		2553	2456	2505	
	USG	6291	5876	6084		2893	2789	2841	
	Mean	5759	5243	5489		2564	2478	2521	
			SE	CD		SE	CD		
Levels			61.58	277.13		25	159		
Sources			80.71	229.77		151	429		
Levels at sources			118.48	425.09		214	607		
Sources of levels			114.14	324.95		204	591		

* M1 - Entire dose of N applied as basal.

** M2 - 50% N - basal as PU, CTU, NBU and USG
+ 50% N as PU top dressed in two equal splits.

Table. 2 Economics of N fertilisation

Modes	sources	Main crop			Residual crop			Mean for modes	
		100%	75%	Mean	Mean for modes.	100%	75%		Mean
M1 All basal	C	5885	5996	5940		4469	4191	4330	
	PU	8456	7436	7947		4684	4376	4537	
	CTU	9610	8197	8904		4836	4762	4799	
	NBU	10124	9230	9678	9313	5142	4802	5022	5052
	USG	11375	10076	10725		6116	5593	5855	
	Mean	9891	8735	9313		5220	4883	5052	
M2 split**	PU	9814	8532	9173		5220	4883	5052	
	CTU	9464	8643	9054		5041	4823	4932	
	NBU	10375	9166	9771	9605	5353	5057	5205	5130
	USG	11180	9667	10424		5753	5297	5525	
	Mean	10208	9002	9605		5286	4973	5130	
Mean for sources	PU	9135	7984	8560		4840	4545	4693	
	CTU	9537	8420	8979		4939	4793	4866	
	NBU	10250	9198	9724		5298	4930	5114	
	USG	11277	9872	10574		5935	5445	5690	
	Mean	10050	8667			5253	4928		
			SE	CD		SE	CD		
Levels			18.97	85.37		16.96	76.32		
Source			25.49	72.56		24.81	70.60		
Levels at source			37.14	123.75		35.30	115.65		
Source at levels			36.05	102.62		35.07	99.85		

* M1-Entire dose of N applied as basal.

** M2 50% N basal as PU, CTU, NBU, and USG + 50% N as PU top dressed in two equal splits.

Table. 3 Cost of production and return per rupee invested (in rupees)

Modes of application	sources	Gross return per rupee of investment			
		Main crop	Residual crop		
		Rs. p.	Rs. p.		
M1 Basal *	C	1.87	1.36		
	PU	1.93	1.43		
	CTU	2.15	1.51		
	NBU	2.27	1.60		
	USG	2.52	1.85		
	Mean	2.18	1.60		
M2 split **	PU	2.20	1.53		
	CTU	2.19	1.53		
	NBU	2.33	1.64		
	USG	2.51	1.74		
	Mean	2.30	1.61		
Mean for sources	PU	2.06	1.48		
	CTU	2.18	1.52		
	NBU	2.30	1.62		
	USG	2.51	1.80		
	Mean	2.25	1.60		
		SE	CD	SE	CD
Source		0.23	0.10	0.02	0.06
Mode		0.02	0.07	0.01	0.04 (NS)
Mode X source		0.05	0.15	0.03	0.08

M1 - Entire dose of N applied as basal.

** M2 - 50% N - basal as PU, CTU, NBU and USG
+ 50% N as PU top dressed in two equal splits.

and 75% N and was significantly superior to single basal application. When urea super granules was compared with prilled urea, at 75% of the recommended N as urea super granules in placement was significantly superior (5989 kg/ha) to 100 per cent prilled urea in three splits (5773 kg/ha) indicating a saving of 25 percent N. (Pillai and Vamadevan, 1978).

In residual crop also, urea super granules recorded the maximum grain

yield of 2841 kg/ha proving the residual effect of USG (Govindasamy. *et al.* 1982).

Economics of N Fertilisation

Urea super granules recorded the maximum gross return of Rs. 10574 /ha followed by NBU (Rs.9724/ ha) CTU (Rs.8979 /ha) and PU (Rs. 8560/ha) (table 2 & 3).

The plots which received 100 per cent recommended level of N registered the highest gross return of Rs.10,050 /ha followed by 75 per cent level of N with Rs.8867 /ha.

The 100 per cent recommended level of N as USG in placement recorded the highest gross return of Rs 11375/ha followed by split application with Rs. 11180/ha. But irrespective of mode of application of USG recorded the gross return of Rs 11277/ha followed by NBU Rs. 10250/ha at 100 per cent recommended level of N.

On comparison between USG and PU, it was observed that USG at 100 per cent recommended level of N in placement registered an additional gross return of Rs.1561/ha over the PU in the splits.

It was also observed that USG at 75 per cent recommended level of N placement recorded an additional gross return of Rs.262/ha over 100 per cent N level applied in three splits. It revealed, that USG could save 25 per cent of N.

The urea super granules accounted the highest gross return of Rs. 2.51 per rupee of investment followed by NBU urea (Rs. 2.30), CTU (Rs. 2.18) and PU (Rs.2.06)

The expression of growth and yield components such as plant height leaf area index, number of productive tillers per hill and test weight were maximum in the plots which received 100 per cent

recommended N in the form of USG either basally or as split application compared to other treatments.

Marked differences could not be observed in the modes of application in respect of neem cake blended urea. When USG was compared with prilled urea, at 75 per cent of the recommended N as USG in placement was significantly superior to 100 per cent prilled urea in 3 splits indicating a saving of 25 per cent N.

In general, 100 per cent recommended level of N recorded the maximum gross return of Rs. 10,050 /ha followed by 75 per cent level of N accounting Rs. 8,667/ha. The cost benefit ratio for the plots which received urea super granules was found to be 1:2:51, compared to prilled urea (1:2:06).

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