

EFFECT OF NON-EDIBLE OIL CAKES ON NITROGEN RESPONSE TO LOW LAND RICE

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Field experiments were conducted to study the effect of non-edible oil cakes like *Neem*, *mahua*, *Karanja*, *Kokum* and *Ratanjyoti* applied with urea and neem-extract treated urea on rice at CRRRI Farm Soil. The highest yield of rough rice was obtained with the neem extract treated urea. The yield of rough rice was significantly higher over control with all the cakes in dry season. Basal application of urea with cakes showed better performance compared to split application except with *Ratanjyoti* cake. Yields were lower in wet season. The N^{15} tracer technique supported the above contention. *Kokum* cake proved much better in dry season when rate of N added was 80 kg/ha. The difference method over-estimated the percent recovery.

Nitrogen use efficiency by crops has been and continues to be of major interest. In the past, studies were mainly aimed at the economics of fertilizer use. Recently concern about the possible presence of fertilizer-N in ground waters and streams has redirected the attention towards improving the efficiency of applied-N-fertilizers by using organic residues. Results of the studies to improve the efficiency of field applied N-fertilizers with various non-edible oil cakes and other additives are discussed hereunder.

MATERIAL AND METHODS

Field experiments were conducted at the farm of Central Rice Research Institute, Cuttack, Orissa in randomised block design with 3 replications and plot size of 4M². The test crop was rice (Var:Supriya) for the two conse-

cutive dry and wet seasons of 1975. The soil was sandy loam with PH 6.2, total N 0.06% CEC 10 me/100g, mineral N 20 ppm and organic matter 1.61%. The 15 treatments with urea and cake combinations under single and split application with a common control are presented in tables-1 and 2. The neem-extract treated urea was prepared as per the procedure outlined by Hulagur and Shinde (1981). The 60 mesh samples of cakes were used.

The single dose of 60 kg P205 (Super-phosphate) and 40 kg K2O/ha (Muriate of Potash) was applied. The cakes were applied a week before transplanting at 15X10 cm spacing. Three randomly selected hills from each pot were harvested at the soil level at maximum tillering and flowering stages just before top dressing urea. The 15 N urea was used with *Kokum* (*Garcinia Indica*) and *ratanjyoti* (*Jatropha*

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euphorbeaceae) cakes in the microplots as described by Hulagur and shinde (1977).

RESULTS AND DISCUSSION

In the field experiments conducted in the dry and wet seasons of 1975, application of urea with various cakes did not significantly increase the rice yield over that obtained with urea alone (Tables-1 and 2). However the yield response (kg rice/kg N applied) was generally higher due to the application of the cakes. The split application of *neem* (*Azadirachta indica*) extract treated urea in the wet seasons increased the N-uptake at flowering to 57 kg/ha from 35 with ordinary urea. At harvest the N-uptake by rough rice was significantly higher with basal applied *neem* extract treated urea in the dry season (Table-1) and from application of *ratanjyoti* cake in the wet season (Table-2) as compared to basal application of urea alone.

The recovery of applied N in the crop showed considerable improvement, particularly with the application of *Neem*, *Kokum* and *Karanja* cakes (Table-3). Direct measurement of the 15 N-nitrogen applied at 80 kg N/ha with *Kokum* showed the increased recovery of N by about 25% per cent over application of urea alone (Table-3) there by confirming the results of the trial. However, in the succeeding wet season the N dose reduced to 40 kg/ha when applied with *kokum* cake proved ineffective (Table-3), mostly because it might have been immobilized on account of its wide C:N ration (40.49 : 1).

Split application has improved the uptake of N from urea applied with *Kokum* and *Karanja* cakes in dry season. The beneficial effects of cakes blended with nitrogenous fertilizers in increasing nitrogen recovery in the plants and hence higher yields have been reported by several workers like Sinha *et. al.* (1981) with *neem* cake and Saharawat and Mukherjee (1977) with *Karanja* cake. Saharawat and Mukherjee (1977) observed significant increase in N-uptake and grain protein of rice when ammonium sulphate and urea were treated with *Karanjin*, a *furanol lavenoid* and *nitrapyrin* (N-serve). This may be attributed to its inhibitory effect of nitrification (Saharawat, 1981).

In the light of the information it is evident that the indiscriminate use of nitrification inhibitors like non-edible oil cakes are beneficial under certain situations. Therefore, further studies on the situations under which the nitrification inhibitors would be of great help in conserving nitrogen in soil to attain maximum yields may be taken up.

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Table 1 Yield of Rough rice and N-uptake by rice at different stages, Dry season, 1975.

Treatment	Rough Rice t/ha		Nutrient Uptake (kg/ha)						Kg Rough Rice/Kg N	
	Basal	Split	M. T.	FI	Harvest	M. T.	FI	Harvest	Basal	Split
Control	3.24	—	19.0	30.1	33.5	—	—	—	—	—
Urea	5.45	5.06	36.6	65.0	61.6	22.7	58.5	64.5	27.6	22.7
Neem + Urea	5.82	5.34	34.4	52.2	66.6	20.2	64.3	66.0	32.2	26.2
Mahua + Urea	5.44	4.85	42.5	40.1	63.9	21.9	44.3	61.3	27.5	20.1
Karanja + Urea	5.81	5.71	24.7	67.6	67.3	23.0	57.1	68.8	32.1	30.9
Kokum + Urea	5.43	5.23	33.8	40.3	68.5	32.1	65.9	70.2	27.4	24.9
Ratanjyoti + Urea	4.80	5.27	39.9	58.2	51.8	21.6	74.5	60.9	19.5	25.4
Neem extract+treat- ed—Urea	6.18	4.81	29.1	68.4	79.5	19.2	43.8	61.3	36.7	19.6

C. C. (0.05) Rough rice = 1.18
Yield

N-uptake M. T. = 15.16
FI = 23.16
Harvest = 16.68

M. T. = Maximum tillering
FI = Flowering
Cakes applied 50 kg/ha

Table 2. Yield of rice and N-Uptake by rice at different stages wet season, 1975.

Treatment	Rough rice t/ha		Nutrient uptake (kg/ha)						Kg rough rice kg-N	
	Basal	Split	M. T.	FI	Harvest	M. T.	FI	Harvest	Basal	Split
Control	3.78	—	15.9	22.4	37.2	—	—	—	—	—
Urea	4.46	4.41	19.4	38.2	46.3	19.9	35.1	50.8	17.0	15.7
Neem + Urea	4.86	4.34	28.7	51.7	51.5	26.2	38.0	50.2	27.0	14.0
Mahua + Urea	4.94	4.44	31.9	39.1	50.9	21.8	36.9	50.4	29.0	16.5
Karanja	4.65	4.83	23.2	43.7	51.0	25.1	42.9	52.1	21.7	26.2
Kokum + Urea	4.38	4.36	25.5	48.1	46.3	21.7	47.0	50.1	15.0	14.5
Ratanjyoti + Urea	4.77	4.25	25.6	50.0	52.5	23.2	42.1	50.3	24.7	11.7
Neem extract+treat- ed + Urea	4.49	4.56	24.0	35.4	46.6	21.6	57.5	48.2	17.7	19.5

C. D. (0.05) Yield of rough rice—N.S

N-Uptake at M. T. —N.S
FI —13.54
Harvest — 6.16

Cakes applied at 100 kg/ha

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Table 3 Percent recovery of fertilizer N in rice crop rough rice + Straw

(Oven dry basis ^{15}N experiment)

Treatment	Dry season 1975 N rate=80 kg/ha		Wet season 1975 N rate=40 kg/ha	
	^{15}N -Method	Difference method	^{15}N -Method	Difference method
Urea	43.83	73.43	44.45	74.90
Kokum cake+Urea	69.56	124.25	35.97	54.32
Ratanjyothi cake+Urea	46.75	84.38	—	—
Neem extract treated	43.40	73.26	36.07	70.40