

NEW NITROGEN CARRIERS FOR RICE

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The results of a field experiment conducted at IARI with rice variety improved Sabar-mati showed that urea super granules, sulphur coated urea, neem cake coated urea, N-serve and coal polyacid treated urea were superior to ordinary urea. Spraying of a culture of phyllosphere N-2 fixing microorganisms isolated from water hyacinth also increased the rice yields. The results obtained suggest that several alternatives are available for increasing the efficiency of nitrogen applied to rice.

Rice is the staple diet for about half of the world population, yet millions of people in many rice growing countries do not get enough rice to meet their daily needs (Prasad and De Datta, 1978). The introduction of high yielding dwarf and semi-dwarf varieties has considerably helped in increasing the rice production. Due to higher production potential these high yielding varieties require more nutrients and respond upto 150 kg N/ha or even higher (Prasad and Prasad, 1980). The present experiment was conducted to evaluate some nitrification inhibitor blended and slow-release N fertilizers. A treatment involving the use of N₂-fixing micro-organisms from water hyacinth was also included in the present study. Favourable effects of these micro-organisms have been reported by Sen Gupta (1982).

MATERIALS AND METHODS

The field experiment was conducted at the Indian Agricultural Research

Institute, New Delhi during *Kharif* 1979 on a sandy clay loam alluvial soil of pH 7.4 (Soil to solution ratio 1:25), CEC. 15.2 m.e./100 g soil, Organic C 0.45%, total Kjeldahl N 820 ppn, 0.5 N Na CO₃ extractable P 7.0 ppm and 1 N NH₄OH AC extractable K₂O 110 ppm.

The experiment was laid out in split plot design with three replications. Three N levels (0,75 and 150 kg/ha) were the main plots, while the sub-plots were N-carriers. N-carriers studied besides urea were urea super granule, sulphur coated urea (TVA & IEL), neem cake coated urea (IARI & Alchemie made), urea treated with N-serve (DOW chemicals USA) and Urea treated with coal polyacids (Central Fuel Research Institute, Dhanbad). A treatment involving soil application of urea and spraying of rice plants with the culture of phyllosphere N₂-fixing micro-organism isolated from water hyacinth also was included. Coal-polyacids have been reported to have nitrification inhibiting properties (Majumdar,

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1980) while Phyllosphere culture, is reported to fix atmospheric nitrogen and there by increase the efficiency of applied N (Sen Gupta, 1982). Detailed description of other experimental materials has been reported by Thomas and Prasad (1982).

A uniform dose of 50 kg P₂O₅ and 30 kg K₂O was applied as single super-phosphate and muriate of potash before transplanting rice. Thirty days old seedlings of rice (variety improved Sabarmati) were transplanted at 15 x 15 cm spacing at the rate of 2-3 plants/hill. Rice was transplanted on 22nd July 1979 and harvested on 20th October 1979. Observations on yield attributes and grain and straw yield were recorded.

RESULTS AND DISCUSSION

Yield attributes : Nitrogen application had a significant effect on most of the yield attributes of rice (Table 1). Number of panicles/m² and grains/panicle, panicle length and panicle weight were significantly more with 75 kg N/ha than in control plots. The additional increase in panicles/m² and grains/panicle was also significant when the rate of application was further increased from 75 to 150 kg/ha. Beneficial effects of N application on yield attributes has been reported by Sharma and Prasad, (1980). The 1000-grain weight was not significantly influenced by N-application.

As regards N-carriers, significant differences were observed in panicles/m² and grains/panicle only and for

these characters the interaction N-levels x N-carriers was also significant (Table 2). Panicles/m² were significantly more when nitrogen was applied at 150 kg/ha as urea super granules sulphur coated urea, (TVA & IEL), urea treated with N-serve and when plants were sprayed with a culture of phyllosphere N₂ fixing micro-organisms. There was no significant difference between N-carriers at 75 kg/ha level. As regards grains/panicle, the difference between N-carriers was larger at 150 kg N/ha. Also at this level, all the N-carriers gave significantly more grains/panicle than urea; urea super granules gave the largest increase and neem cake coated urea the least. At 75 kg N/ha only neem cake coated urea (IARI and Alchemie), urea treated with N-serve, urea super granules and sulphur coated urea (IEL) gave significantly more grains/panicles than urea.

Grain and Straw Yield : Grain yield of rice increased significantly as the level of N was raised from 0 to 75 and then to 150 kg N/ha. (Fig 1). The response equation of rice to nitrogen was : $Y = 51.73 + 0.3433x$, where Y is the grain yield of rice in q/ha and x is kg N/ha. The increase in straw yield was also linear in relation to N-applied. Urea super granule, N-serve treated urea, neem cake coated urea (Alchemie) and urea treated with coal polyacids gave significantly more grains than ordinary urea. Sulphur coated urea (TVA & IEL) and neem cake coated urea (IARI) also produced 5-6

Table 1. Effect of N-carrier application on yield attributes.

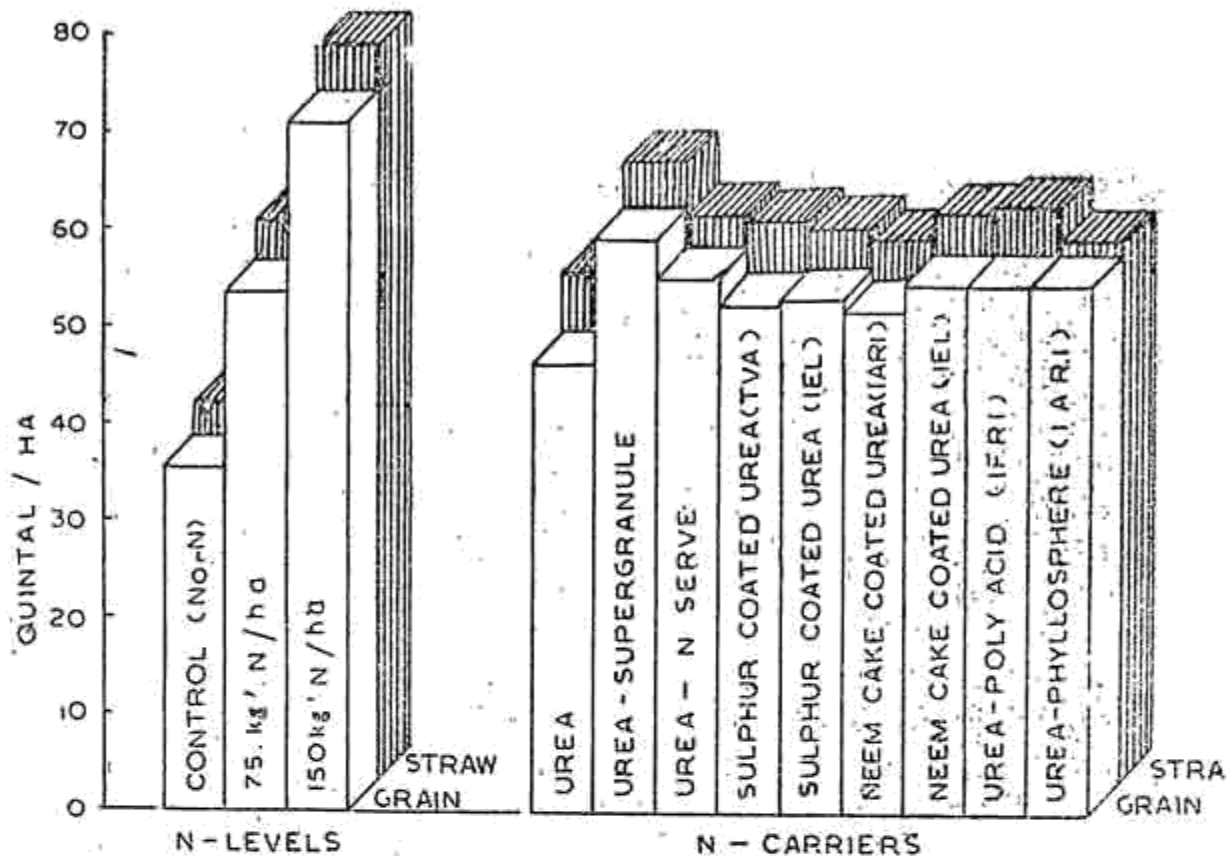
	Panicle/m ² (Nos)	Panicle length (cm)	Grain/ panicle (Nos)	Panicle weight (g)	1000 g. wt. (g)
<i>N Levels (Kg/ha).</i>					
0 Control	224	17.5	65	1.43	25.9
75	299	19.8	76	1.63	26.7
150	422	20.6	114	1.76	26.1
CD at 5%	15.9	0.67	4	0.14	NS
<i>N-Carriers</i>					
Urea	295	18.5	77	1.57	26.4
Urea super granule (USG)	345	19.9	91	1.66	26.2
Urea-N-Serve	336	19.3	88	1.66	26.3
Sulphur coated urea (TVA)	329	19.3	83	1.61	26.0
Sulphur coated Urea (IEL)	316	19.2	87	1.57	26.0
Neem cake coated Urea (IARI)	298	19.4	84	1.62	26.2
Neem cake coated Urea (ALCHEMIE)	295	19.1	86	1.60	26.2
Urea-coal Polyacid (IFRI)	299	19.2	86	1.57	26.3
Urea-Phyllosphere (IARI)	324	19.6	84	1.58	26.2
C. D. at 5%	32.6	N. S.	3.3	N. S.	N. S.

- TVA : Tennessee Valley Authority, Muscle Shoals, Alabama USA
 ALCHEMIE : Alchemie Research centre, Bombay
 IARI : Indian Agricultural Research Institute, New Delhi
 IFRI : Indian Fuel Research Institute, Dhanbad.

Table 2. Panicles/m² and grains/panicle in rice as affected by N-carriers at different levels of N

N-Carriers	N-Level (Kg/ha)			
	75	150	75	150
	Panicle/m ² (Nos)		Grains/Panicle (Nos)	
Urea	298	347	70	100
Urea super granule (USG)	326	489	81	122
Urea-N serve	317	459	83	120
Sulphur coated Urea (TVA)	287	482	74	114
Sulphur coated Urea (IEL)	287	439	71	119
Neem cake coated Urea (IARI)	311	364	81	108
Neem cake coated urea (ALCHEMIE)	293	385	75	113
Urea Coat Polyacid (IFRI)	287	388	74	116
Urea-Phyllosphere (IARI)	301	444	72	114
CD at 5%	46.1		4.6	

Fig. 1 : RESPONSE OF RICE TO NITROGEN AND RELATIVE EFFICIENCY OF N-CARRIERS



q/ha more grains than urea and barely missed the level of significance. These results are in accordance with those of Prasad and Prasad (1980).

Thus the new N fertilizers tested in the present study were superior to ordinary urea. Of these, urea super granules; and neem cake coated urea hold considerable promise, the former because of its low production cost and the latter because it involves the use of an indigenous raw material.

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