Indian J. Plant Physiol., Vol. XXXIV, No. 3, pp. 257-260, (Sept., 1991)

SHORT COMMUNICATION

EFFECT OF FORMS OF UREA AND THEIR TIME OF APPLICATION ON NUTRIENT UPTAKE OF RAINFED LOWLAND RICE

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Received on 23 Oct. 1990

A field experiment was conducted to study the influence of different forms of urea and their time of application on nutrient uptake by rainfed lowland rice in sandy loam soil during rainy season. The results revealed that nitrogen uptake was significantly higher with urea gypsum than that obtained with prilled urea, urea rockphosphate, urea supergranules and neem blended urea. Phosphorus uptake was also higher with urea gypsum than that obtained with neem blended urea and prilled urea. All the forms of urea gave higher uptake of nitrogen and phosphorus when applied in three splits compared to their application in single basal dose or in two splits.

Farmers sow rice in the month of August as an upland crop and once the tanks are filled, it is converted into lowland rice. This type of rice cultivation is known as rainfed lowland rice. Severe weed infestation and nutrient deficiency are the two serious problems in this type of cultivation. Farmers apply nitrogen only when the crop is irrigated i.e. the first 40 to 60 days rice does not receive any nitrogenous fertilizers.

Prilled urea is the most common nitrogenous fertilizer used in India. About 60 to 70 per cent of applied nitrogen is lost either due to volatilization, leaching or denitrification etc. To reduce these losses, modified forms of urea like urea supergranules (De Datta, 1981) and neem coated urea (Rajendra Prasad, 1981) were recommended. All these modified forms of urea were tried under lowland conditions and applied in single basal dose. For upland rice, split application of urea gave higher recovery of applied nitrogen (Ram *et al.* 1984). A field experiment therefore was conducted as the information on different forms of urea and their time of application on nutrient uptake on rainfed lawland rice was not available.

The experiment was conducted on sandy loam soil at S.V. Agricultural College, Tirupathi during S.W. Monsoon season of 1986. The forms of urea tried were, prilled urea, urea gypsum, urea rockphosphate, neem blended urea and urea supergranules.

Urea gypsum and urea rockphosphate were supplied by Madras Fertilizers Ltd., India. Urea gypsum contains 36.8 per cent N, 4.6 per cent Ca and 3.6 per cent S while urea rockphosphate contains 36.5 per cent N, 5.1 per cent P_2O_5. Urea supergranules were supplied by M/S. N.S.M. Holland. The average weight of each urea supergranule is 0.17 g. Neem blended urea was prepared by mixing neem cake powder and urea in 1 : 1 ratio.

These different forms of urea were applied at three different times : entire dose as basal, half basal and half at the time of first irrigation; one-fourth basal, one-fourth at 20 days after sowing and half at the time of first irrigation. The nitrogen applied was 80 kg/ha in all the treatments. In addition, 40 kg P_2O_5 and 30 kg K_2O/ha were applied at the time of sowing in the form of single superphosphate and muriate of potash, respectively. All the forms of urea were applied by broadcasting method. The experiment was conducted in a Randomized Block Design with factorial concept. The gross and net plot sizes were 4.2 m $\times$ 4.0 m and 3 m $\times$ 3 m, respectively. 'BPT 2740' which is a suitable variety for rainfed lowland conditions was sown on September 1, 1986 with a spacing of 15 $\times$ 10 cm. The crop was grown under rainfed conditions during the first 60 days after sowing and subsequently the crop was irrigated to maintain 5 $\pm$ 2 cm of continuous submergence. Two hand weedings were done at 30 and 50 days after sowing to control weeds.

Nitrogen uptake was significantly higher (61.2 kg N/ha) with urea gypsum than that obtained with all other forms of urea and lowest uptake of nitrogen was obtained with neem blended urea (51.2 kg N/ha). The higher uptake of nitrogen with urea gypsum might be due to higher availability of nitrogen. In the present experiment, volatilization lossess of ammonical nitrogen was 10 per cent of applied nitrogen with urea gypsum and 14 per cent with prilled urea. Nitrogen uptake of lowland rice grown with neem blended urea was more than that recorded with prilled urea (Darvesh *et al.*, 1990). The reason for reverse trend in case of rainfed lowland rice was due to its peculiar growing conditions in which part of the growing period was under upland conditions. The slow release nature of neem blended urea might be the main reason for low uptake of nitrogen under rainfed lowland conditions.

Phosphorus uptake was higher (18.2 kg P_2O_5/ha) with urea gypsum than that obtained with neem blended urea (14.1 kg P_2O_5/ha) and prilled urea (14 2 kg P_2O_5/ha). The better growth of rice due to higher availability of nitrogen with urea gypsum probably helped in higher uptake of phosphorus.

All the forms of urea when applied at sowing, tillering and panicle initiation recorded higher uptake of nitrogen compared to their application in single basal dose or two splits at sowing and panicle initiation stage (Table 1.) Application of urea

Table I. Effects of forms and time of application of urea on nitrogen and phosphorus uptake

Forms/Time	Nitrogen uptake (kg N/ha)				Phosphorus uptake (kg P_2O_5/ha)			
	Basal	Two splits	Three splits	Mean	Basal	Two splits	Three splits	Mean
Prilled urea	50.4	46.8	69.4	55.5	12.8	14.5	15.2	14.2
Urea gypsum	48.6	57.4	77.7	61.2	14.7	19.3	20.6	18.2
Urea rockphosphate	40.3	52.2	67.3	53.3	12.3	14.5	15.4	14.1
Neem blended urea	43.9	48.5	61.3	51.2	12.2	14.7	15.3	14.1
Urea supergranules	50.9	51.0	71.4	57.8	16.2	14.2	18.3	16.2
Mean	46.8	51.2	69.4		13.6	15.4	16.9	
	Forms	Time	Interaction		Forms	Time	Interaction	
CD 5%	2.1	1.6	3.6		0.7	0.5	1.2	

gypsum in three splits resulted in higher N uptake (77.7 kg/ha) which was significantly superior to all other forms and their time of application. The same trend was observed with phosphorus uptake. This might be due to continuous supply of nitrogen at all important growth stages of crop with three split applications. Singh and Modgal (1979) reported that application of nitrogen in three splits increased the nitrogen uptake in lowland rice.

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