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IMPACT OF COATED UREA AND NITROGEN LEVELS ON YIELD, N-CONTENT AND N-UPTAKE IN RICE (*ORYZA SATIVA*)

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Abstract

A pot experiment on rice was conducted during *kharif*, 2012 at Kanpur (U.P.) on sandy loam soil medium in fertility. The treatments comprised 10 combinations of 3 N-levels (50, 100, 150 kg/ha) and 3 urea fertilizers (prilled urea, neem coated urea, sulphur coated) alongwith one common control. The results revealed that grain and straw yield, N-content and uptake in grain and straw and total N-uptake increased with increasing N-levels upto 150 kg N/ha. The values of these plant characters were maximized with SCU while lowest were recorded in prilled urea. The dose of 150 kg N/ha recorded highest grain yield of 72.58 g/plant, straw yield of 81.71 g/plant and total N-uptake of 1.484 g/plant against lowest of 42.24 g/plant grain yield, 52.53 g/plant straw yield and 0.840 g/plant total N-uptake. SCU recorded highest of 71.89 g/plant grain yield, 82.69 g/plant straw yield and 1.475 g/plant total N-uptake, N-content in grain and straw also showed the similar trend under different N-levels and urea fertilizers.

Key words : Rice, coated urea, N-levels, yield, N-uptake

Introduction

Rice is grown under different situations in India and n the state of Uttar Pradesh. When it is cultivated in low lands the losses of applied fertilizer nitrogen through different ways is a major problem which decreases the N-use efficiencies. Either the higher doses of N-fertilizer are to be added for normal yield or yields are to be scarified. The research evidences are their that the use of N-inhibitors and modified urea help in reducing the N-losses under such conditions. It was, therefore, felt necessary to conduct an experiment on rice to evaluated the efficacy of neem coated and sulphur coated urea against commercial prilled urea with different doses of nitrogen application under central Uttar Pradesh condition.

Materials and Methods

A pot experiment on rice was conducted during *kharif*, 2012 in the Department of Soil Science and Agricultural Chemistry of C.S. Azad University of Agriculture and Technology, Kanpur (U.P.), India. The soil filled in pots was sandy loam in texture with 7.5 pH. It contained O.C. 0.42%, available N 250 kg/ha, available P_2O_5 15.0 kg/ha and available K_2O 280 kg/ha. Among the treatments, a combinations of 3 N doses (50, 100, 150 kg/ha) and 3 urea fertilizers (prilled urea, neem coated urea and sulphur coated urea) were tested against one common control in a factorial completely randomized design with 3 replications. Cemented pots of 25 cm diameter size were used for the study. Well prepared fine tilth soil was filled in the pots. In each pod, an uniform dose of 60 kg P_2O_5 through single super phosphate and 40 kg K_2O/ha through muriate of potash was added and well mixed with soil. At the same time half dose of N as per treatment through respective urea fertilizers was added in treatment pots. The seedling of 20 days all variety were transplanted @ 3 seedlings per pot on after 15 days of planting, 2 week or seedlings from each pot were removed and only one healthy seedling in pot was left for proper growth and development of plant. Remaining half dose of N was top dressed in two equal splits at maximum

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Table 1 : Effect of nitrogen levels and N-fertilizers on yield, N-content and N-uptake of rice grain and straw.

Treatments	Rice yield (g/plant)		N-content (%)		N-uptake (mg/plant)		
	Grain	Straw	Grain	Straw	Grain	Straw	Total uptake (g/plant)
N-levels (kg/ha)							
50	66.26	75.79	1.330	0.565	882.10	432.10	1.314
100	68.73	80.20	1.339	0.577	920.50	458.40	1.379
150	72.58	81.71	1.357	0.610	984.80	499.00	1.484
S.Ed. ±	1.63	1.61	0.007	0.012	18.90	11.70	-
C.D. (P = 0.05)	3.43	3.39	0.014	0.025	39.80	24.50	-
N-fertilizers							
Prilled urea	66.97	76.08	1.329	0.563	890.80	428.20	1.319
Neem coated urea	68.71	78.93	1.338	0.588	919.40	463.50	1.383
Sulphur coated urea	71.89	82.69	1.359	0.601	977.20	497.40	1.475
S.Ed. ±	1.63	1.61	0.007	0.012	18.90	11.70	-
C.D. (P = 0.05)	3.43	3.39	0.014	0.025	39.80	24.50	-
Control v/s treated							
Control	42.24	52.53	1.313	0.540	556.20	283.80	0.840
Treated	69.19	79.23	1.342	0.584	929.10	463.20	1.392
S.Ed. ±	2.11	2.08	0.009	0.016	24.40	15.00	-
C.D. (P = 0.05)	4.43	4.38	0.018	0.033	51.30	31.60	-

tillering and panicle initiation stage as per treatment through respective urea fertilizers. Each pot was watered frequently as per plant need. Other operations like weeding and plant protection measures were done as per need of plant. The observations were recorded on plant basis. Harvesting was done at proper maturity of plant. After plant harvest, the produce was left for sun dried then weight of whole plant was taken. Seeds were separated and cleaned and weighed for grain yield. Straw yield was computed by difference method for each treatment pod. Grain and straw samples were analyzed for N-content using the standard method suggested by Jackson (1973). N-uptake in grain and straw was worked out by multiplying the yield with respective N-content.

Results and Discussion

Yield

Increasing levels of N increased grain yield significantly with upto 150 kg N/ha, while increase in straw yield was not significant beyond 100 kg N/ha. The dose of 150 kg N/ha produced highest grain yield of 72.58 g/plant, which was found 3.85, 6.32 and 30.34 g/plant or 5.6, 9.5 and 71.8% of higher than grain yield of 100 kg N, 50 kg N and control treatment, respectively. Similarly, 81.71 g/plant straw yield at 150 kg N/ha was found 1.51, 5.92 and 29.18 g/plant or 1.9, 7.8 and 55.5% higher than the yield at 100 kg, 50 kg N and control, respectively. It shows that impact of increasing N levels was more pronounced on grain than straw yield. Such higher yields might be attributed to increase availability of N at higher rates of application, which was properly utilized by crop plant. It is also evident from N-uptake data in grain and straw both. Shivay *et al.* (2001) also reported almost similar results. Among fertilizers, SCU registered highest grain (71.89 g/plant) and straw (82.69 g/plant) yields, though this grain yield was not found significantly higher over NCU. However, SCU recorded 4.6, 7.3 and 70.2% higher grain yield and 4.8, 8.7 and 57.4% higher straw yield over NCU, prilled urea and control treatment, respectively. The difference between NCU and prilled urea was not found significant in yield of grain or straw. The higher yields with coated urea might be attributed to slow N-releasing property of coated material, which made the N available for plants for longer time and it was utilized by plants even during reproductive phase thus impact was more or grain yield compared to straw. These results support the findings of Singh and Singh (1991); and Survesh and Piria (2008).

N-content and uptake

In general, N-content was estimated higher in grain

than straw. It might be attributed to translocation of more nitrogen from sources to sink, which accumulated in grains and increased its content. Increasing N-levels increased N-content in grain and straw both significantly highest values were recorded at 150 kg N/ha application. It might be attributed to more absorption of nitrogen by plant at higher rates of N application because of better N-availability. Among urea materials, SCU caused significantly maximum N content while prilled urea recorded lowest N content in both grain and straw samples. It might be due to slow N releasing property of SCU and NCU which increased N availability for longer crop period. It was utilized by plants in higher amount. Thus increased N-content. Treated crop recorded significantly higher N-content than in control pots in both grain and straw by the margins of 2.21 and 8.15%, respectively. These results are in agreement with the findings of Upadhyaya and Tripathi (2000).

N-uptake increased significantly with each increase in nitrogen level upto 150 kg N/ha in both grain and straw. Total N-uptake at 150 kg N/ha level was recorded 1.484 g/plant which was found 7.6, 12.9 and 76.7% higher than the N-uptake at 100 kg N, 50 kg N and in control treatment, respectively. It might be attributed to the cumulative effect of both grain and straw yield and N-content in grain and straw. N-uptake in grain and straw was also differed significantly between different urea fertilizers, where SCU recorded highest N-uptake followed by NCU. The SCU registered highest total N-uptake of 1.475 g/plant which was found 6.7, 11.8 and 75.6% higher than the N-uptake with NCU, prilled urea and in control treatment, respectively. It might be attributed to the yield of grain and straw and their N-content which also behaved in similar way. The treated plants recorded 0.552 g/plant or 65.7% higher total N-uptake than control plants. These results corroborate with the findings of Shivay *et al.* (2001).

The interaction effect of N-levels x fertilizers was not found significant in any of the above rice characters. Therefore, combined use of 150 kg N/ha through SCU was proved a better option of N-application in rice.

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