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RESEARCH ARTICLE

EFFECT OF NITROGENOUS FERTILIZERS (UREA AND AMMONIUM CHLORIDE) ON PLANT CHARACTERS AND YIELD OFRICE.

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Abstract

A pot experiment was carried out to determine the effect of nitrogenous fertilizers (urea and ammonium chloride) on growth and yield of rice comprising of 6 different treatments using completely randomized design with three replications. Three doses of nitrogen viz; 0, 100 and 120 kg ha^{-1}were applied with two sources namely urea and ammonium chloride. This study revealed that different characteristics of plant significantly affected by different treatments. Higher dose of nitrogen (120 kg ha-1) produced highest plant height, tillers, straw and grain yield.It was also observed that application of nitrogen through urea has more pronounced effect as compared to ammonium chloride.

Introduction-

Rice (*Oryza sativa* L.) is one of the most important cereal crops of the world, grown in wide range of climatic zones. Rice is the staple food for nearly half of the world ‘s population, most of whom live in developing countries. The crop occupies one-third of the world ‘s total area planted to cereals and provides 35 to 60% of the calories consumed by 2.7 billion people. Nitrogen (N) is the most important nutrient in irrigated rice production (Cassman et al., 1998). Current high yields of irrigated rice are associated with large applications of fertilizer N (Barker and Dawe, 2001; Pingali et al., 1997, Kumar et al., 2015). Nitrogen (N) is essential for rice, and usually it is the most yield-limiting nutrient in irrigated rice production around the world (Ladha and Reddy, 2003; Samonte et al., 2006).

Rice plants require large amounts of mineral nutrients including nitrogen for their growth, development and grain production, removing around 16–17 kg N for each ton of rough rice produced including straw (Sahrawat 2000). However, most of the rice soils of the world are deficient in N, so nitrogenous fertilizer applications (usually urea) are required to meet the N demand.Nitrogen is one of the major nutrients which is in adequate amount at early, mid tillering and panicle initiation and at ripening stage for better grain development(Matsushima, S., 1976).

Materials and Methods:

Pot culture experiment was conducted during the rainy (*Kharif*) season (June-November) of 2014 at the research farm of UdaiPratap College, Varanasi.The experiment was laid out in a completely randomized design with 6 treatments including control and three replications. The treatments were: T_0 (control; no input); T_1- (P, K: 60:60 kg ha^{-1}); T_2 – (T_1 + N @ 120kg ha^{-1} with urea); T_3- (T_1 + N @ 100 kg $ha^{-1}$with urea); T_4- (T_1 + N @ 120 kg $ha^{-1}$with ammonium chloride); T_5 - (T_1 + N @ 100 kg $ha^{-1}$with ammonium chloride). Full doses of P and K were applied

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through single super phosphate and muriate of potash respectively as basal dose before transplanting. Half dose of the nitrogen was applied as basal dose and rest half was applied in two equal split doses at crown root initiation stage and panicle initiation stage. Rice seedlings (21 days old) were transplanted at 20 cm×10 cm spacing, keeping two hills per seedling. Weeds were managed by using 2,4-D, Malathion and Carbofuran at 25 and 45 days after transplanting. The crop was harvested at maturity. Five hills in each pot were randomly selected and tagged for recording growth attributes. After threshing, cleaning and drying the grain and straw yields were recorded Straw yield was obtained by subtracting grain yield from total biomass. Nitrogen content in grain and plant samples wasanalysed as per standard method, viz; Nesseler's reagent colorimetric method (Linder R. C., 1944).

Result-

Plant height:

Different doses of nitrogen applied through fertilizer significantly affected plant height. Plant height ranged from 29-78.2 cm (30 DAT to 90 DAT). The highest plant height was produced by 120 kg ha^{-1} in case of urea followed by ammonium chloride and it decreased gradually with decreased level of nitrogen application.

Effective tillers:

In the present investigation it was observed that the effective tillers were increased with increasing the level of nitrogen upto 120 kg ha^{-1}in case of urea and it decreased in case of ammoniumchloride.

Grain yield:

Results showed that the maximum grain yield was produced when nitrogen was applied at 120 kg ha^{-1} through urea which is followed by same level applied with ammoniumchloride.Lower level of nitrogen (100 kg ha^{-1}) registered low yield.

Straw yield:

Results revealed that maximum straw yield was produced when nitrogen was applied at 120 kg ha^{-1}in case of urea which is followed by ammonium chloride at 120 kg ha^{-1}. Lowest straw yield was obtained in control (no input).

Table1: -Effect of nitrogen on growth and yield of rice.

Treatment	Plant height (cm)			Tiller number $plant^{-1}$			Straw Yield(q/ha)	Grain Yield(q/ha)
	30	60	90	30	60	90		
T_0	24	42.73	51.08	2.4	5.9	6.2	16.87	09.25
T_1	31.35	51.27	61.16	4.5	7.75	9.0	28.78	15.10
T_2	46.12	64.09	76.41	12.08	14.41	16.15	66.1	45.66
T_3	41.54	60.54	70.75	8.18	13.08	14.08	50.23	35.25
T_4	38.13	58.04	69.00	8.0	12.40	12.66	45.66	31.50
T_5	37.05	57.49	67.75	7.38	11.05	11.83	43.33	29.00
SE	7.28	3.60	3.13	1.49	1.35	1.34	8.92	5.39
CD(P=0.05)	6.23	8.03	6.97	3.34	3.02	2.99	19.87	12.02

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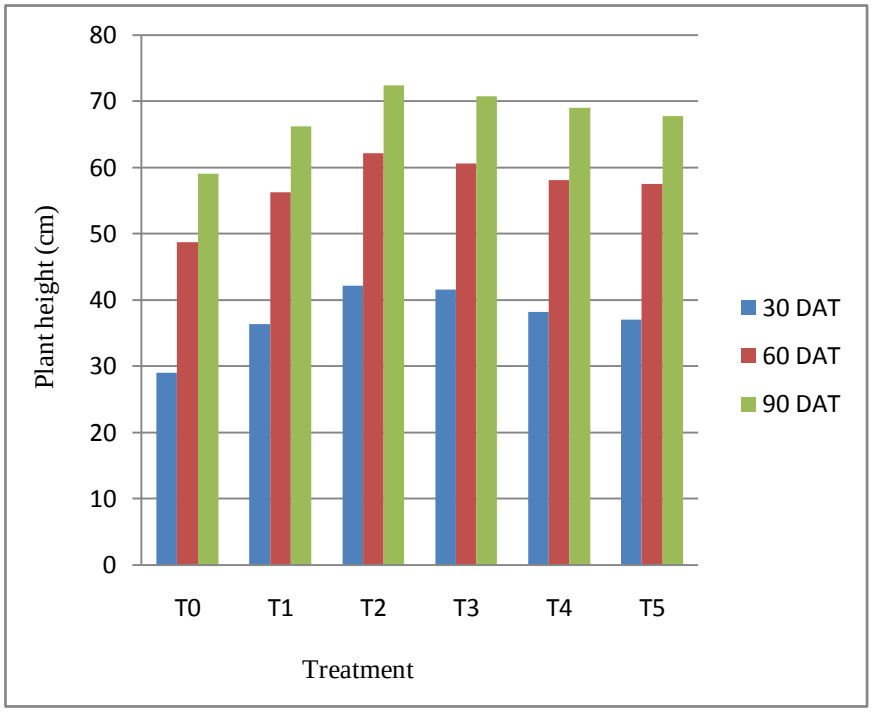
Figure 1 Effect of treatments on plant height (cm) at different growth stages of rice.



Discussion-

Rice plants require N during vegetative stage to promote growth and tillering, which in turn determines potential number of panicles. Nitrogen contributes to spikelet production during early panicle formation stage, and contributes to sink size during the late panicle formation stage. Nitrogen also plays a role in grain filling, improving the photo-synthetic capacity, and promoting carbohydrate accumulation in culms and leaf sheaths (Mae, 1997). Earlier studies revealed that judicious and proper use of fertilizers can markedly increase the yield and improve the quality of rice (Place et al., 1970)

Rice plants produced more number of productive tillers per hill as well as longest panicles where 120 kg nitrogen per hectare was applied. The lowest values of number of productive tillers per hill and shortest panicles were which recorded in control treatment receiving no fertilizer. These results are in line with those reported by Singh and Sharma (1987), Rafey*et al.* (1989), Munda (1989), Maqsood (1998), Nawaz (1999) and Meena*et al.*, (2003). Enhanced tillering by increased nitrogen application might be attributed to more nitrogen supply to plant at active tillering stage. The longer panicles obtained in treatments receiving higher nitrogen rates were probably due to better nitrogen status of plant during panicle growth period. No significant difference was observed between nitrogen levels of 120 and 100 kg ha^{-1} applied through both of the sources. But in case of urea and ammoniumchloride application significant difference was registered. Urea application shows higher plant height, tillers, straw and grain yield as compared to ammoniumchloride application. Lowest plant height, tillers, straw and grain yieldwere recorded in case of control where no fertilizerwas added.

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