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Influence of urea (Ordinary) and neem coated urea (NCU) on performance of rice

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Abstract
The present study entitled, **"**Influence of Urea (ordinary) and Neem Coated Urea (NCU) on Performance of Rice." Involved field experiment conducted during Kharif season of year 2015 followed by laboratory analysis of the plant and soil samples in the department of agriculture chemistry and soil science, Udai Pratap Autonomous college, Varanasi (U. P). Treatment of this investigation were consisted of neem (*Azadirachta indica*) coated urea vis-a vis ordinary urea applied to rice variety Kashturi on the basis of soil test**.,** its involved treatment T_1 =Control**,** T_2 =Farmer practice**,** T_3=Farmer practice up to R.D of N by ordinary urea**,** T_4=Farmer practice up to R.D of N by Neem coated urea**,** T_5=150% N of R.D by ordinary urea and T_6 = 150% N of R.D by N.C.U Neem coated**.** The experiment was laid out in a randomized block design (RBD) with three replications. Maximum plant height (l22.00 cm), higher number of tillers (61.67 m row length), dry matter at o0 DAT (72.20 g m^{-1} row length), grain yield (62.38 Q ha^{-1}) and straw yield (69.80Qha^{-1}) of rice were obtained with T6, treatment followed by T_4>T_5>T_3 >T_2 and T_1, (control). Among various treatments the nutrients (N, P, K and S) uptake by rice plant was recorded highest fewer than 150 N of R.D by Neem coated urea (T_6) treated plots and lowers under control (T_1). Application of 150% N of R.D by Neem coated urea not only produced higher yield of rice, but also enhance soil fertility as compared uncoated urea. Higher nutrient availability was recorded in case of neem coated urea over uncoated urea.

Keywords: Neem coated urea, dry matter, plant height, plant population, RBD etc.

Introduction
Rice (*Oryza sativa* L) is the staple food of more than 65% of the world population. It is the grain with the second highest wide production after maize, producing more than one fifth of the calories consumed by the human species of the world. Among the rice growing countries, India has largest farm area (44.00 million hectare) followed by china (FAO 2015). India is the largest producer and consumer of rice in the world. The productivity of rice has increased from 1984 kg ha^{-1} in 2004-05 to 3075 Kg ha^{-1} in 2015-16. Nitrogen is the most important essential plant nutrient, makeup green and dark plant body. Nitrogen increase plant vegetative growth. To improve the production efficiency of rice, it is necessary to apply required dose of N, P, K and organic matter. Application of urea can the theoretically increase micronutrient availability either through the acidifying effect during its nitrification or through replacement of micronutrients from exchangeable sites on clays by the NH_4^+ formed after its hydrolysis. Urea is one of the best modern tools for agriculture. It is an invention of our modern agricultural science. Urea is applied in the agricultural field as replacement to our organic fertilizer. Obviously, the chemical fertilizers such as urea also environment friendly. Urea are not directly responsible for cancer causing agent and not also cause water, air and soil pollution. Urea stimulates microorganisms which promote the adequate supply and appropriate form of nutrient such as NO_3^- and $NH_4^+$and ensure their proper development growth and regulation of plant physiology. Only these (Nitrobactor, Nitrosomonas) microorganism are used which have specific functions to enhance plant growth and reproduction. Urea ordinary and neem coated (NCU) play a very significant role in improving soil fertility as well as soil productivity.

Materials and Methods
The present study entitled, **"**Influence of Urea (ordinary) and Neem Coated Urea (NCU) on Performance of Rice." Involved field experimentation conducted during Kharif season of year 2015 followed by laboratory analysis of the plant and soil samples in the department of agriculture chemistry and soil science, Udai Pratap Autonomous college, Varanasi (U. P)

All grasses were removed from the experimental plots and soil samples have been taken from each replication plots at 30 DAT, 60 DAT and at harvesting. Khurpi and auger was used as sampling tools. Samples were collected in clean plastic bags. Soil samples were brought to the laboratory, air dried soil samples were crushed and passed through 2mm sieve. The representative samples about 500 gm were collected in polythene bags. Samples were analyzed for important physic0-chemical properties. Plant samples drawn after harvesting of crop were dried in shade and chapped into pieces and then kept in oven at 70 ^{0}C for 12 hours for make free form moisture. Treatment of this investigation were consisted of neem (*Azadirachta indica*) coated urea vis-a vis ordinary urea applied to rice variety Kashturi on the basis of soil test., its involved treatment T_1 =Control, T_2 =Farmer practice, T_3=Farmer practice up to R.D of N by ordinary urea, T_4=Farmer practice up to R.D of N by Neem coated urea, T_5=150% N of R.D by ordinary urea and T_6 = 150% N of R.D by N.C.U Neem coated. The experiment was laid out in a randomized block design (RBD) with three replications. Field was prepared by ploughing, three cross harrowing followed by planking at the onset of mansoon. Thereafter, puddling was done by harrowing followed by planking, 21 days old rice seedling of cultivar Kasturi transplanted at spacing of 20x l5 cm. Recommended dose of P & K were applied in all plots through SSP & MOP respectively. Nitrogen was applied through urea (ordinary) and neem coated urea (N.C.U) as per treatment. Half dozen of nitrogen and full doze of P and K applied as basal dressing and rest half dose of N was applied in the two equal split one at 45 days and second 60 after transplanting. The rice crop experiment was laid out in randomized block design (R.B.D) with three replications. The data collected from field and laboratory were analyzed Statistically using standard procedure of randomized block design (RBD) (Cochram and Cox, 1959) Critical difference (C.D.) and standard error of mean (S.E.M.) were calculated to determine the significance among treatments mean.

Result and Discussion

The result of rice plant height at different growth stages under the influence of neem coated urea (NCU) and ordinary urea as a inorganic fertilizers depicted in table-1 The plant height of rice crop increased continuously with advancement in growth stages up to the harvesting under all treatments and was found in the order $T_6>T_5>T_4>T_3>T_2>T_1$. The average plant height under T_1, T_2, T_3, T_4, T_5 and T_6, treatment at 30 DAT were 58.67, 55.93, 52.93, 49.67, 45.60, 42.60 and at 90 DAT 122.00, 119.00, 116.53, 113.73, 110.47, 102.53 cm, respectively. Application of neem coated urea (NCU) significantly increased the plant height of rice as compared to ordinary urea at all level of N. higher plant height in neem coated urea treated plots might be due to continuous supply of nitrogen throughout period of crop and also neem coated urea decreased the loss of nitrogen through percolating water was also found that increasing rate of nitrogen significantly increased plant height in both the case (neem coated urea and ordinary urea). Table-1 also revealed that among different slow release modified forms of urea, neem coated-urea proved and sulphur coated urea more effective in increasing plant height, number of grain/panicle and dry matter accumulation/m^2.

Table 1: Plant height (cm) of rice crop as influenced by nitrogen levels and sources

Treatment	Day after transplanting (DAT)		
	30	60	90
T_1	42.60	62.87	102.53
T_2	45.60	66.13	110.47
T_3	49.67	68.73	113.73
T_4	55.93	74.13	119.00
T_5	52.93	72.00	116.53
T_6	58.67	75.33	122.00
S.Em+	0.333	0.497	0.632
CD (0.05%)	1.050	1.565	1.990

The data of number of tillers of rice crop under various treatments depicted in table-2 significantly higher number of tiller was recorded with application of nitrogen at all levels; through NCU (Neem Coated Urea) over ordinary urea. The number of tiller per meter row length of rice under different treatments increased with time and reached maximum at 60 DAT. The effect of various treatments on number of tillers could be arranged in the order of $T_6>T_5>T_4>T_3>T_2>T_1$, and values varied between 26.00 to 61.67.

Table-2 revealed that number of tillers significantly increased with neem coated urea (NCU) as compared ordinary urea at all levels of N. On other hand, increasing levels of nitrogen significantly increased number of tillers. It also revealed that among different slow release modified forms of urea, neem coated-urea proved and sulphur coated urea more effective in increasing number of tillers/m, number of panicle/hill, number of grain/panicle and dry matter accumulation/m^2.

Table 2: Effect of neem coated urea (NCU) and ordinary urea on number of tiller (meter^{-1} row length) of rice crop

Treatment	Day after transplanting (DAT)		
	30	60	90
T_1	26.00	45.00	54.00
T_2	27.00	46.67	55.33
T_3	29.00	47.67	58.33
T_4	31.33	53.33	60.67
T_5	29.67	50.00	59.00
T_6	33.33	56.00	61.67
S.Em+	0.612	0.800	1.043
CD (0.05%)	1.927	2.522	3.288

Data pertaining to effect of nitrogen level and sources of dry matter, grain and straw yield of rice presented in table-3 Increasing levels of nitrogen significantly increased the dry matter, grain and straw yield of rice. Application of neem coated urea as a source of N significantly increased the dry matter, grain and straw yield over ordinary urea at all level of N. the effect of various treatments on yield could be arranged in order of $T_6>T_5>T_4>T_3>T_2>T_1$, and values for dry matter varied between 38.83 to 72.20 g m row, straw yield 44.50 to 63.80 Q ha and grain yield from 34.02 to58.0 Q ha^{-1}. Higher yield under neem coated urea might be due to continuous supply of nitrogen to crop, higher urea use efficiency and little loss of N through percolating water in case of neem coated urea. Table -3 also revealed that dry matter, grain and straw yield based upon regression analysis, coating of prilled urea (PU) with different neem oil thickness did not affect dry matter grain and straw yield of rice significantly in first year, but did affect it significantly second year.

Results revealed that modified forms of urea *viz*. prilled urea (P.U), Neem Cake-Coated urea (NCU), Neem oil emulsion coated urea at varying N rates on productivity. Each treatment N level recorded significantly higher growth parameters, yield attributes, grain & straw yield and also N uptake over its preceding level.

Table 3: Dry matter (g m^{-1} row length), grain and straw yield (Q ha^{-1}) of rice crop as influenced by the neem coated urea (NCU) and ordinary urea

Treatment	Day after transplanting (DAT)		
	Dry matter at 60 (DAT) (g m^{-1} row)	Grain Yield (Q ha^{-1})	Straw Yield (Q ha^{-1})
T_1	38.83	34.02	44.50
T_2	43.50	38.00	47.98
T_3	45.00	40.93	52.50
T_4	66.00	45.56	60.20
T_5	62.00	43.52	56.03
T_6	72.20	58.00	63.80
S.Em+	0.31	0.20	0.56
CD (0.05%)	0.98	0.62	1.78

Summary and Conclusion

A field experiments conducted entitled, "Influence of Urea (ordinary) and Neem Coated Urea (NCU) on Performance of Rice" on sandy loam soil during *kharif* season (2015) to investigate on the basis soil test. The treatments were T1 (control), T2 (farmer practice), T3 (Farmer practice up to recommended dose (R.D) of N by ordinary urea), T4 (farmer practice up to R.D of N by Neem coated urea), T5 (150%% N of R.D by ordinary urea), T6 (150% N of R.D by Neem coated urea). The rice crop experiment was laid out in randomized block design (R.B.D) with three replications. Soil properties such as organic carbon, available nitrogen, available phosphorus, available potassium, and available sulphur, were made at different time intervals (30, 60, and 90 DAT). The various plant parameters such as plant height, number of tillers, dry matter, straw and grain yield. Uptake of nutrients was also measured under these treatments.

It concluded from the results that maximum plant height (l22.00 cm), higher number of tillers (61.67 m row length), dry matter at o0 DAT (72.20 g m^{-1} row length), grain yield (62.38 Q ha^{-1}) and straw yield (69.80Qha^{-1}) of rice were obtained with T6, treatment followed by T_4>T_5>T_3 >T_2 and T_1, (control). Among various treatments the nutrients (N, P, K and S) uptake by rice plant were recorded highest under 150 N of R.D by Neem coated urea (T_6) treated plots and lower under control (T_1). Results also revealed that application of 150% N of R.D by Neem coated urea not only produced higher yield of rice, but also enhance soil fertility as compared uncoated urea. Higher nutrient availability was recorded in case of neem coated urea over uncoated urea.

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