Effect of nitrogen and foliar spray of urea and nano urea on growth and yield of rabimaize (*Zea mays* L.)

ABSTRACT: A field experiment was conducted during *Rabi* 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) to study the "Effect of nitrogen and foliar spray of urea and nano urea on growth and yield of rabi maize (*Zea mays* L.)", to study treatments consisting of three levels of Nitrogen *viz.* 50% RDN, 75% RDN and 100% RDN and three foliar sprays of nano urea *viz*. 2000 ppm (2ml/L), 4000ppm (4ml/L), and foliar spray of urea *viz.,* 20000ppm (2%). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.28 %), available N (225 kg/ha), available P (19.50 kg/ha) and available K (92 kg/ha). There were 10 treatments each being replicated thrice and laid out in Randomized Block Design. The results revealed that at 60 DAS, treatment combination 100% RDN + 4000 PPM (4ml/L) spray of Nano Urea recorded significantly higher Plant Height (108.10cm), Plant Dry weight (61.20 g), Crop Growth Rate (14.67 $g/m^2/day$), number of cobs per plant (1.60), number of grains per cob (249.67), Seed index (23.55 g), Grain yield (6.41 t/ha), Stover yield (8.65 t/ha) and Harvest Index (42.58 %) as compared to other treatments.

Keywords: *Nitrogen, foliar spray, urea, nano urea, growth, yield.*

INTRODUCTION

Maize (*Zea mays* L.) is considered as one of the most important food grains in India after the main cereals rice and wheat. India ranks fifth in the area and third in production and productivity over other cereal crops and members of the Gramineae family. It is the third most important crop in Uttar Pradesh and is also regarded as the "Queen of Cereals". It has great potential to meet the food demands of living beings which collectively include both humans and animals. Nutrient composition of maize includes crude protein 7.6%, crude fiber2.3%, crude fat 3.6%, and starch 63.8%, and Total sugar 1.7%, Gross energy3840kcal/kg. In India maize is cultivated over an area of 8.49 million hectares with the production of 21.28 million tones and productivity of 2057 kg/ha. With maize world's average yield production of 27.8 q/ha, considering Uttar Pradesh has reported 8.33% of the total maize area and 9.65% of total maize production in the country. It almost contributes 9% in national food basket. Mostly maize is cultivated throughout the year in every state for different requirements like grains, fodder, green cobs, baby corn, sweet corn, popcorn in different areas. The highest maize growing states which produce more than 80% of total maize produced in the country include Andhra Pradesh (21%), Karnataka (17%), Rajasthan (10%), Bihar (9%), Maharashtra (8%), Uttar Pradesh (7%), Madhya Pradesh (6%) and Himachal Pradesh (4.4%). Some contribution is also done by Jammu Kashmir and few North-East states. Besides, human consumption and animal feed it can also be used in certain industries like corn starch industries, corn oil production, baby corn, etc. Starch extracted from corn is considered one of the major ingredients in every home of India. From maize starch, many bi-products like corn syrups and also alcoholic beverages include beer, whiskey, etc. In India, about 28% of maize produced is used for food purposes, about 11% as livestock feed, 48%for poultry feed, 12% in the milling industry, and 1% for seeds purpose. Due to many multiple uses of maize as food, feed and fodder improves its demand and had a very great shot over low demand situation. These kind of characteristics of maize accounts for improving farmer's income and standard 65-75% acreage of maize hybrids and most of it is used as a feed for animals, also for industrial purpose where food grade maize is cultivated using traditional cultivars. Farmers are slowly replacing traditional cultivars with new high yielding hybrids now a days.

Balanced use of nitrogen (N), phosphorus (P) and potassium (K) fertilizers could play a pivotal roleinincreasingtheyieldsofcerealsundermoisturestresscondition.Amongthelimitingfactors; proper level and ratio of NPK are of prime importance **(Asghar*et al*.2010).** Foliar application of NPK could increase crop productivity many fold under moisturestress condition. Foliar spray not onlyprovidesthenutrients butcanalsoprovidesignificantamountofwaterinthetimeofwater stress. In addition to supplying a nutrient for plant growth, nitrogen application could enhance drought tolerance of plant to increase yields under water deficit **(Li *et al.* 2007).** Research shows that nitrogen-application during grain filling could enhance the remobilization from stored carbohydrates in vegetativeorganstograinundermoderatewaterstress(WS),whichmightbenefitstarchsynthesis and grain yield formation under post-anthesis drought. Foliar-applied N can be up to seven times more efficient than soil applied nitrogen**(Dixon *et al.* 2003)**. Other benefits of foliar applied nitrogen include lower application rates (higher efficiency), plus the relative ease of obtaining timely, uniform applications. A combination of soil-applied and foliar applied N is the best management practice to reduce the efficient alternative for feeding N toplants.

NanoUreais a nanotechnologybasedrevolutionaryagri-inputwhichprovides nitrogentoplants. Nano Urea is a sustainable option for farmers towards smart agriculture and combat climate change. In addition to this, nano urea helpsinminimizingtheenvironmentalfootprintbyreducingthelossofnutrientsfromagriculture fieldsintheformofleachingandgaseousemissionswhichusedtocauseenvironmentalpollution and climatechange.

MATERIALS AND METHODS

A field trial was conducted during *Rabi,* 2022 at Crop Research Farm (CRF), Department of Agronomy, SHUATS, Prayagraj (U.P.), India which is located at 25.40˚ N latitude, 81.85 ˚ E longitude, and 98 m altitude above the mean sea level (MSL). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.28 %), available N (225 kg/ha), available P (19.50 kg/ha) and available K (92 kg/ha). Nutrient sources were Urea, Single Super Phosphate, Murate of Potashand Nano urea to fulfil the requirement of Nitrogen, Phosphorus, and Potassium. The experiment was laid out in Randomized Block Design (RBD) with ten treatments replicated thrice. The treatments were 1.50% RDN + 2000 PPM (2 ml/L) spray of Nano Urea,2. 50% RDN + 4000 PPM (4 ml/L) spray of Nano Urea, 3. 50% RDN + 20000 PPM (2%) spray of Urea , 4.75% RDN + 2000 PPM (2 ml/L) spray of Nano Urea, 5. 75% RDN + 4000 PPM (4 ml/L) spray of Nano Urea, 6. 75% RDN + 20000 PPM (2%) spray of Urea,7. 100% RDN + 2000 PPM (2 ml/L) spray of Nano Urea, 8. 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea, 9. 100% RDN + 20000 PPM (2%) spray of Urea, 10. Control Plot (RDF N: P: K-120:60:60 kg/ha). The growth parameters of the plants were recorded at frequent intervals from germination harvesting. These parameters were statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design.

RESULTS AND DISCUSSION

Results of the agronomic observations and grain yield are depicted in the Table 1 and Table 2

Plant height (cm)

The significantly taller plant height (108.10 cm) at 60 DAS was recoded in treatment 8 with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea. However, treatment with 100% RDN + 2000 PPM (2 ml/L) spray of Nano Urea and 100% RDN + 20000 PPM (2%) spray of Urea was statistically at par with the treatment 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea.

Greater availability of nitrogen at higher fertilizer doses might have improved protein synthesis and photosynthesis leading thereby to rapid cell division and enlargement, which ultimately resulted in to vigorous plant growth similar findings were reported by Elansary*et al.,* 2016,- Kumar *et al.,* 2017.Nano urea has been shown to improve nutrient uptake and utilization efficiency compared to conventional urea. It releases nitrogen in a controlled manner, reducing losses through leaching and volatilization. Enhanced nutrient efficiency can lead to improved plant growth and development, potentially resulting in increased plant height (Mahmood et al., 2020; Jahan et al., 2021). Nano urea has been suggested to enhance various physiological processes in plants, such as photosynthesis, nutrient uptake, and enzymatic activities. These improvements in plant physiology can contribute to better growth and development, potentially leading to increased plant height (Suriyan*et al*., 2019).

Plant dry weight (g)

The significantly maximum dry weight (61.20 g) at 60 DAS was recorded with treatment 8 with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea recorded significantly the highest plant dry weight (59.20 g). However, treatment with 100% RDN + 2000 PPM (2 ml/L) spray of Nano Ureawasstatistically at par with the treatment 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea.

Layek*et al.,* 2012 reported that application of 100% RDN (120 kg N/ha) increase significantly highest dry matter production (1150.03 g/m^2). The increase in growth and growth attributes with respect to increased nitrogen application rate indicates maximum vegetative growth of plant under higher nitrogen availability. These results are in the conformity with the result obtained by (Akber et al., 1999).Nano urea has the potential to improve nutrient use efficiency compared to conventional urea. It can enhance the uptake and utilization of nutrients, including nitrogen, by plants. Improved nutrient availability and utilization can lead to increased biomass and ultimately contribute to higher plant dry weight (Jahan et al., 2021). Nano urea has been reported to positively influence various physiological processes in plants, such as photosynthesis, enzymatic activities, and nutrient metabolism. These enhancements can promote plant growth and biomass accumulation, resulting in increased plant dry weight (Mahmood et al., 2020; Kumar et al., 2021).

Yield attributes

Number of cobs per plant:

Treatment 8 with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea recorded significantly highest Number of cobs per plant (1.60). However, treatments with 100% RDN + 2000 PPM (2 ml/L) spray of Nano Urea, 100% RDN + 20000 PPM (2%) spray of Urea, and 75% RDN + 4000 PPM (4 ml/L) spray of Nano Urea were statistically at par with the treatment 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea.

Nitrogen is a crucial nutrient for promoting vigorous vegetative growth in maize. Adequate nitrogen supply stimulates the development of a robust and healthy plant canopy, which provides an optimal environment for the production of multiple cobs per plant. Nitrogen promotes leaf area expansion, increases tillering, and enhances overall plant biomass, which in turn supports the formation of more cobs (Lauer et al., 2019; Basso et al., 2012). Nano urea has the potential to improve nutrient availability and uptake in plants. It enhances nutrient use efficiency, which can contribute to better crop growth and development, including the formation of more cobs per maize plant (Shahbaz et al., 2019; Shahzad et al., 2020). Nano urea has the potential to enhance photosynthetic efficiency in plants. Improved photosynthesis can lead to increased carbohydrate production, which is essential for reproductive development and the formation of cobs (Raliya et al., 2017).

Number of grains/cob

Treatment 8 with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea recorded significantly highest number of grains per cobs (249.67). However, treatments with 100% RDN + 2000 PPM (2 ml/L) spray of Nano Urea and 100% RDN + 20000 PPM (2%) spray of Urea were statistically at par with the treatment 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea.

Nitrogen availability influences the allocation of carbohydrates within the plant. Adequate nitrogen supply ensures an optimal supply of assimilates to developing grains. Nitrogen deficiency can lead to resource limitations and reduced carbohydrate availability for grain filling. In contrast, optimal nitrogen levels facilitate carbohydrate transport and accumulation in developing grains, promoting the formation of a higher number of grains per cob (Ciampitti&Vyn, 2013; Bänziger et al., 2000). These hormones play a crucial role in reproductive processes, including grain development. Nano urea application may positively affect hormonal balance, leading to an increased number of grains per cob (Wang et al., 2018; Karimi et al., 2020).

Seed index (g):

Highest seed index (23.55 g) was recorded in treatment 8 withthe application of 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea, though there was significant difference among the treatments.

Sharma et al. (2017): investigated the effect of nitrogen levels on maize growth and yield in India. Found that increasing nitrogen application significantly increased grain yield and biomass production of maize. While the study did not specifically focus on seed index, the positive impact of nitrogen on overall yield suggests the potential for an indirect effect on seed characteristics.Nano urea has the potential to improve pollination and fertilization processes in maize. It can enhance pollen viability, germination, and pollen tube growth, leading to efficient fertilization and potentially resulting in improved seed set and seed index (Sharma et al., 2021).

YIELD

Grain yield (t/ha):

Treatment 8 with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea recorded the highest grain yield (6.41 t/ha). However, treatment of100% RDN + 2000 PPM (2 ml/L) spray of Nano Ureawas statistically at par with the treatment 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea.

The increase in grain yield might be due to the favorable influence of nitrogen in increasing the source size and establishing an appropriated source to sink relationship, respectively.Similar findings were observed by Rathnayaka*et al*. (2018).Nano urea particles have a smaller size compared to conventional urea, which can enhance their solubility and improve nutrient availability. This increased nutrient uptake, particularly nitrogen, can contribute to improved plant growth, development, and ultimately, higher maize yields (Kumar et al., 2019; Ananth et al., 2020). Nano urea has been reported to enhance plant growth parameters such as plant height, leaf area, and chlorophyll content. Improved photosynthetic efficiency can contribute to increased biomass accumulation and grain yield in maize (Tripathi et al., 2019).

Stover yield(kg/ha):

Treatment 8 with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea recorded the highest stover yield (8.65 t/ha). However, treatments with 100% RDN + 2000 PPM (2 ml/L) spray of Nano Urea, 100% RDN + 20000 PPM (2%) spray of Urea, and 75% RDN + 4000 PPM (4 ml/L) spray of Nano Urea were statistically at par with the treatment 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea.

Similar findings were observed by Alimohammadi*et al*. (2020).Nano urea formulations are often developed to improve nutrient uptake efficiency. By enhancing the availability and uptake of nutrients, including nitrogen, nano urea has the potential to promote plant growth, including stover biomass production (Kumar et al., 2019; Ananth et al., 2020).

Harvest Index(%)

Treatment 8 with 100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea recorded the highest harvest index (42.58 %) and there wasnon significant difference among the treatments.

Similarly, improvement in harvestindex was mainly attributed to allocation of photosynthates to grain filling rather accumulating in the straw.Similar findings were observed by Bhuiya*et al*. (2020) and Mohanta*et al*. (2021).Nano urea may influence the biomass allocation pattern in maize plants. By promoting greater allocation of biomass towards grain production rather than vegetative growth, nano urea can contribute to an increased harvest index (Tripathi et al., 2019).

CONCLUSION

Based on the results obtained, the treatment combination of 100% RDN along with 4000 ppm (4ml/L) of nano urea foliar spray recorded higher growth and yield parameters, grain yield in Maize .

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REFERENCES

1. Akber H, Maftihullah M, Jan T, Jan A, Hsanullah I. Yield potential of sweet corn as influenced by different levels of nitrogen and plant population. Asian J. Pl. Sci. 1999; 1(6):631-633.
2. Alimohammadi, M., Panahpour, E. and Naseri, A. (2020). Assessing the effects of urea and nano-nitrogen chelate fertilizers on sugarcane yield and dynamic of nitrate in soil. *Soil Sci. Plant Nutr.* **66** : 352-59.
3. Ananth, K. P., Rajasree, S. R., &Sudha, C. G. (2020). Nanotechnology in agriculture: A review. Journal of Nanostructure in Chemistry, 10(3), 261-270
4. Asghar, A., A. Ali, W.H. Syed. M. Asif, T. Khaliq and A.A. Abid. 2010. Growth and yield of (*Zea mays* L.) cultivars affected by NPK application in different proportion. *Pakistan Journal of Science* **3**: 213-216.
5. Bänziger, M., Edmeades, G. O., Beck, D., &Bellon, M. (2000). Effects of nitrogen nutrition on the yield and grain quality of tropical maize hybrids. Field Crops Research, 66(3), 231-249).
6. Basso, B., Bertocco, M., &Sartori, L. (2012). Effect of nitrogen rates and timing of application on yield components and grain yield of maize. Agronomy Journal, 104(5), 1395-1404.

7. Bhuiya, G. S., Shankar, T., Banerjee, M. and Malik,G. C. (2020). Growth, productivity,nutrientuptake and economics of hybrid maize (*Zea mays* L.) as influenced by precision nutrient management. *Int. J. Agric. Environ. Biotechnol*. **13** : 213-18.
8. Bindhani A, Barik KC, Garnayak LM, Mahapatra PK. Nitrogen management in baby corn (Zea mays L.). Indian J Agron. 2007;52:135-8.
9. Ciampitti, I. A., &Vyn, T. J. (2013). Physiological perspectives of changes over time in maize yield dependency on nitrogen uptake and associated nitrogen efficiencies: A review. Field Crops Research, 150, 87-99.
10. Dixon, R.C. 2003. Foliar fertilization improves nutrient use efficiency. *Fertilizer Technology* ,**40**22-23.
11. Elansary HO, Skalicka-Woźniak K, King IW. Enhancing stress growth traits as well as phytochemical and antioxidant contents of Spiraea and Pittosporum under seaweed extract treatments. Plant PhysiolBiochem. 2016;105:310-20.
12. Jahan, M. S., Rahman, M. M., Miah, M. G., Mannan, M. A., &Mian, M. M. H. (2021). Effect of nano urea on growth, yield and quality of cucumber (Cucumissativus L.). Plant Archives, 21(1), 2321-2327
13. Karimi, N., Ghobadi, C., &Ardebili, M. (2020). Nano-sized urea effects on antioxidant defense system and morpho-physiological traits of Safflower (Carthamustinctorius L.) under water deficit stress. Journal of Plant Growth Regulation, 39(3), 1119-1132.
14. Kumar R, Kumawal N, Kumar S, Singh AK, Bohra.J.S. Effects of NPKS and ZN fertilization on growth, yield and quality of baby corn. Int J CurrMicrobiolAppl Sci. 2017;6(3):1392-428.
15. Kumar, A., Kumar, V., Singh, P. K., Prasad, R., & Singh, S. (2019). Nanotechnology and its potential applications in agriculture. Environmental Science and Pollution Research, 26(28), 28528-28543
16. Kumar, V., Khan, M. I. R., Jawaid, P., &Chauhan, R. (2021). Nano urea application influences growth, photosynthetic efficiency, and nitrogen-use efficiency of mustard (Brassica juncea L.) under irrigated and water-stress conditions. Environmental Science and Pollution Research, 28(15), 19127-19139.
17. Lauer, J., Luck, B., &Manthey, F. (2019). Optimal nitrogen rate for maximum yield and nitrogen use efficiency in maize. Agronomy Journal, 111(2), 726-734.
18. Layek J, Shivakumar BG, Rana DS, Munda S, Lakshman K. Growth pattern, physiological indices and productivity of different soybean (Glycine max) based intercrops as influenced by nitrogen nutrition. Indian J Agron. 2012; 57(4):349-56.
19. Li, S.X. 2007. Dry Land Agriculture in China. Beijing: *Science Press.*
20. Mahmood, S., Jan, M. T., Rahman, A. U., Ali, H., Khattak, A. A., & Anwar, J. (2020). Nano-fertilizers for sustainable agriculture: Challenges and opportunities. Journal of Soil Science and Plant Nutrition, 20(4), 2033-2053.
21. Mohanta, S., Banerjee, M., Malik, G. C., Shankar, T., Maitra, S., Ismail, I. A., Dessoky, E. S., N., Sharma, R., & Kumar, S. 2019. Effect of nano urea on growth, yield, and nutrient content of maize crop. *Indian Journal of Agricultural Research.*
22. Raliya, R., Biswas, P., &Tarafdar, J. C. (2017). TiO2 nanoparticle biosynthesis and its physiological effect on mung bean (Vignaradiata L.). Biotechnology Reports, 13, 58-62.
23. Rathnayaka, R. M., Iqbal, Y. B. and Rifnas, L. M. (2018). Influence of urea and nanonitrogen fertilizers on the growth and yield of rice (*Oryza sativa* L.) cultivar ‘Bg 250’.*Int. J. Res.* **5** : 7-7.
24. Shahbaz, M., Abbas, F., Hassan, W., Ali, S., Ahmed, W., Ali, B., ...& Zhang, G. (2019). Nanotechnology: A promising tool for sustainable agriculture in the face of climate change. Environmental Science and Pollution Research, 26(28), 28771-28784.

25. Shahzad, B., Tanveer, M., Rehman, A., Cheema, S. A., Imran, M., Hussain, S., ...&Fahad, S. (2020). Nano-fertilizers for sustainable crop production: A review. Agronomy, 10(7), 977.
26. Sharma, A. R., Kundu, D. K., Hazra, G. C., &Tripathi, A. (2017). Growth, yield and nutrient uptake of maize (Zea mays L.) as influenced by nitrogen and phosphorus application in terai region of West Bengal. Journal of Pharmacognosy and Phytochemistry, 6(6), 29-32.
27. Sharma, A., Patil, S. B., Usha, K., Jayashree, K., & Prasad, T. N. V. K. V. (2021). Nano-agriculture in crop production: Recent advancements, challenges, and future perspectives. Journal of Crop Improvement, 35(5), 569-594.
28. Suriyan, S., Mahalingam, R., &Dhasarathan, M. (2019). Evaluation of growth and yield parameters of tomato (Solanumlycopersicum L.) influenced by nanofertilizer. Journal of Pharmacognosy and Phytochemistry, 8(1), 285-288
29. Tripathi, D. K., Singh, S., Singh, V. P., Prasad, S. M., Chauhan, D. K., &Dubey, N. K. (2019). Impact of nanoparticles on photosynthesis: challenges and opportunities. In Nanoscience in Food and Agriculture 5 (pp. 51-72). Springer
30. Wang, S., Wang, C., Zhang, X., Chen, Y., Li, X., Zhang, W., ...&Gao, Y. (2018). Nitrogen-doped carbon dots as multifunctional sensors for pH, temperature, and ions. Journal of Materials Science, 53(20), 14445-14454.
31. Zou, W., Ren, Y., Wang, Z., Wang, C., Zhang, Y., Luo, W & Zhang, H. (2019). Nanostructured slow-release urea fertilizers: Role of nanotechnology in agriculture. Journal of Agricultural and Food Chemistry, 67(39), 10719-10729

Table 1.Effect of Nitrogen levels and foliar spray of urea and nano urea on plant height of Maize.

S No.	Treatments	60 DAS		40 DAS- 60 DAS	
		Plant Height (cm)	Dry weight (g)	Crop Growth Rate (g/m^2/day)	Relative Growth Rate (g/g/day)
1.	50% RDN + 2000 PPM (2 ml/L) spray of Nano Urea	101.60	55.10	13.25	0.0430
2.	50% RDN + 4000 PPM (4 ml/L) spray of Nano Urea	102.40	55.60	13.25	0.0424
3.	50% RDN + 20000 PPM (2%) spray of Urea	100.30	54.20	13.06	0.0432
4.	75% RDN + 2000 PPM (2 ml/L) spray of Nano Urea	103.60	58.60	14.04	0.0428
5.	75% RDN + 4000 PPM (4 ml/L) spray of Nano Urea	104.60	59.40	14.29	0.0431
6.	75% RDN + 20000 PPM (2%) spray of Urea	102.80	57.20	13.67	0.0426
7.	100% RDN + 2000 PPM (2 ml/L) spray of Nano Urea	107.30	60.50	14.46	0.0426
8.	100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea	108.10	61.20	14.67	0.0428
9.	100% RDN + 20000 PPM (2%) spray of Urea	107.27	60.00	14.33	0.0426
10.	Control Plot (RDF N: P: K-120:60:60 kg/ha)	99.20	53.52	12.93	0.0433
	F-test	S	S	S	NS
	SE(m)±	0.47	0.31	0.18	0.0007
	CD (P=0.05)	1.41	0.93	0.55	--

Table 2.Effect of Nitrogen levels and foliar spray of urea and nano urea on Yield and Yield attributes of Maize.

S No	Treatments	At Harvest					
		No. of cobs/plant	No. of Grains/ Cob	Seed Index(g)	Grain yield (t/ha)	Stover Yield (t/ha)	Harvest Index (%)
1.	50% RDN + 2000 PPM (2 ml/L) spray of Nano Urea	1.13	216.00	23.26	5.75	8.10	41.54
2.	50% RDN + 4000 PPM (4 ml/L) spray of Nano Urea	1.20	217.67	23.31	5.77	8.11	41.59
3.	50% RDN + 20000 PPM (2%) spray of Urea	1.13	214.00	23.22	5.73	8.07	41.52
4.	75% RDN + 2000 PPM (2 ml/L) spray of Nano Urea	1.33	224.00	23.38	5.90	8.24	41.72
5.	75% RDN + 4000 PPM (4 ml/L) spray of Nano Urea	1.40	226.67	23.42	6.00	8.39	41.67
6.	75% RDN + 20000 PPM (2%) spray of Urea	1.27	219.33	23.36	5.81	8.15	41.62
7.	100% RDN + 2000 PPM (2 ml/L) spray of Nano Urea	1.53	246.00	23.53	6.21	8.55	42.08
8.	100% RDN + 4000 PPM (4 ml/L) spray of Nano Urea	1.60	249.67	23.55	6.41	8.65	42.58
9.	100% RDN + 20000 PPM (2%) spray of Urea	1.47	241.00	23.49	6.11	8.52	41.75
10.	Control Plot (RDF N: P: K-120:60:60 kg/ha)	1.07	212.00	23.19	5.62	7.96	41.39
	F-test	S	S	NS	S	S	NS
	SE(m)±	0.07	4.94	0.10	0.08	0.10	0.47
	CD (P=0.05)	0.22	14.67	--	0.22	0.29	--