Original Research Article

EFFECT OF SOWING METHODS AND DIFFERENT LEVELS OF NITROGEN ON YIELD ATTRIBUTES AND YIELD OF MAIZE

ABSTRACT

The field experiment was carriedout at Research Farm, Integral University, Lucknow, Uttar Pradesh, India during Kharif season, 2021. The experiment envisages to study the effect of Sowing methods and different Nitrogen levels on yield and attributes of maize crop. The experiment was laid down in the Split Plot Designand the treatments was replicated three times.Among the sowing methods, the maximum length of a cob (18.52 cm) was obtained in the ridge sowing method (S1) while among nitrogen levels the maximum length of cob (19.51 cm) was obtained with the application of 25% N through granular urea + 75% N through Nano-urea (N5). Among nitrogen levels highest number of grains per row (40.76) were obtained in the application of 25% N through granular urea + 75% N through Nano-urea (N5). Seed Index was achieved to be highest in ridge method of sowing(S1) with the application of 25% N through granular urea + 75% N through Nano-urea (N5). Number of grains per cob were highest (385.55) in the N5 treatment among the nitrogen levels treatments. Among sowing methods, the maximum grain yield of 51.75 q ha^{-1} was founded in the ridge method of sowing. Among nitrogen levels the highest grain yield of 57.76 q ha^{-1} was obtained in N5 treatment. However, harvest index was found to be non-significant. Ridge method of sowing was found to be most effective than broadcasted method. Application of Nano-urea alone did not give good results. Granular urea along with nano-urea was found to be more effective in maize crop under this region.

Keywords: granular urea, ridge, treatments

INTRODUCTION

Maize, scientifically classified as *Zea mays* L., is a highly significant fodder and cereal crop renowned for its extensive availability and it belongs to the Poaceae

family**(Sachan et al., 2023)**. Globally, it ranks as the third most important cereal crop, following wheat and rice, and is celebrated for its exceptional production capabilities and adaptability to a variety of agroclimatic conditions, earning the title of 'Queen of Cereals'**(Sachan et al., 2024)**. Worldwide, maize is cultivated across approximately 193.7 million hectares, yielding about 1,147 million metric tons with an average productivity of 5.75 tons per hectare**(FAOSTAT, 2020)**.

Sowing methods or land management system plays a major role in improving water and nutrient use efficiency of field crops. Land configuration increases water use efficiency and also increases availability of nutrients to crops **Chiroma et al., (2008)**. The superiority of ridges and furrow system could be ascribed to proper drainage of excess water coupled with adequate aeration at the time of irrigation or heavy rainfall. Ridges and furrow method of sowing improved grain as well as stover yield of maize over the flat bed method of sowing corroborate the studies of **Parihar et al., (2009).**

Among the plant nutrients, nitrogen (N) management is one of the most important factors required for improving crop productivity **(Amanullah, 2016).** According to **Guo et al., (2016)**, Nitrogen is the most yield-restraining nutrient in crop production, globally.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at Research Farm, Integral University, Lucknow, Uttar Pradesh, India during Kharif, 2021. Lucknow has a humid subtropical climate with hot, sunny summers from March to May. The city receives an average of 835 millimetres of rainfall from the southwest monsoon winds between June to October. Summers are very hot with temperatures rising to 40-45 °C (104-113 °F) range.

Edaphic condition

The soil in the experimental field was clayey in texture and slightly alkaline with pH of 7.8. Organic carbon in the soil was 0.31% which was estimated by rapid titration method given by **Walkley and Black (1934)**. The available Nitrogen in soil was 138 kg ha^{-1}, which was estimated by the Alkaline permanganate method given by **Subbiah and Asija (1956)**. The available Phosphorus was 17.7 kg ha^{-1} estimated by Olsen's method given by **Olsen et al., (1954)**. The available K was 294.1 kg ha^{-1} which was estimated by the Flame photometer method given by **Jackson (1973)**.

Experimental design and treatment details

The experiment was designed as Split Plot Design. The treatments were replicated thrice. The details of the treatment are as follows: -

Treatments Details	
Main plots (Method of sowing)	
S1	Ridge sowing
S2	Flat-bed sowing
S3	Broadcasting
Sub plot (Nitrogen Management)	
N1	100% N through granular urea
N2	100% N through Nano-urea
N3	75% N through granular urea + 25% N through Nano-urea
N4	50% N through granular urea + 50% N through Nano-urea
N5	25% N through granular urea + 75% N through Nano-urea

*RDF= 120 N : 60 P_2O_5 :60 K_2O

Preparation of the experimental field and application of fertilizers

The seed bed was prepared by ploughing with a cultivator followed by rotavator. The field was then manually laid out according to the plan, and *TMMH 826* Hybrid seeds were sown at a rate of 25 kg ha^{-1} with a spacing of 45 cm × 20 cm. Granular Urea (46% N) and Nano urea (4% N) was applied as per the treatments, while DAP (46% P_2O_5) and MOP (60% K_2O) were uniformly applied as a basal application across all treatments.

RESULTS AND DISCUSSION

Effect of sowing methods and Nitrogen Levels on yield attributes of maize

Cob length and cob girth

The data on cob length (cm) have been presented in table-1. The maximum length of a cob was obtained in the ridge sowing method (S1) with the application of 25% N through granular urea + 75% N through Nano-urea (N5). The minimum length of a cob (15.46 cm) was reported in the broadcasting method of sowing. Among the nitrogen levels the minimum

cob length was reported in the N2 treatment (100% N through Nano-urea). Results showed that sole application of granular urea (46 % N) performed better than nano-urea. Similar results were also reported by **Reddy et al., 2022.**

The data on cob girth (cm) have been presented in table-1. The minimum girth of a cob (13.27 cm) was reported in the broadcasting method of sowing. Among the nitrogen levels the minimum cob girth of 11.65 cm was reported in the N2 treatment (100% N through Nano-urea).The maximum cob girth was obtained in the ridge sowing method (S1) with the application of 25% N through granular urea + 75% N through Nano-urea (N5). Results showed that sole application of granular urea (46 % N) performed better than nano-urea. Similar results were also reported by **Samui et al., 2022; Naik et al., 2022.**

Number of grains per row and Number of grains per cob

The data pertaining to number of grains per row differed significantly and is given under table 1. Among sowing methods, the maximum (35) and minimum (28) number of grains per row was obtained in the ridge method of sowing (S1) and broadcasting method, respectively. Among nitrogen levels the maximum number of grains per row (40.76) was obtained in the N5 treatment with the application of 25% N through granular urea + 75% N through Nano-urea.

Number of grains per cob was obtained in the ridge method of sowing with the application of 25% N through granular urea + 75% N through Nano-urea. Similar type of results was also obtained by **Manwar and Mankar, 2015; Thakur et al., 2011.**

Grain weight per cob and Seed Index

The data pertaining to grain weight per cob and seed index is given in table 1. The highest grain weight per cob (249.37 g)and Seed Index (372.80 g) was reported in Ridge sowing (S1). Among the nitrogen levels, the treatment N5 was found to be superior among all the treatments. Seed index (weight of 100 seeds) was found to be maximum in ridge sowing method and the application of 25% N through granular urea + 75% N through Nano-urea. However, sole application of granular urea was comparatively higher than nano-urea. Similar types of results were also reported by **Naik et al., 2022; Manwar and Mankar, 2015.**

Table-1: Cob length, cob girth, grain weight per cob, number of grains per row, seed index and number of grains per cob

Treatments	Cob Length(cm)	Cobgirth (cm)	Grain weight cob^{-1} (g)	Number of grainrow^{-1}	Seed Index (g)	Number of grains cob^{-1}
Method of sowing						
S1	18.52	15.75	249.37	35.00	302.40	372.80
S2	17.58	14.43	244.30	31.13	296.80	364.86
S3	15.46	13.27	233.33	28.00	293.26	359.73
SEm±	0.25	0.015	0.55	0.17	1.58	1.53
CD (P=0.5)	1.02	0.67	2.22	0.68	6.42	6.17
Nitrogen levels						
N1	15.86	12.95	183.20	26.77	289.44	350.55
N2	14.50	11.65	230.77	28.76	292.00	347.00
N3	17.61	14.11	255.08	30.11	294.00	370.22
N4	18.45	15.43	259.06	31.88	303.87	375.65
N5	19.51	16.00	283.54	40.76	308.11	385.55
SEm±	0.23	0.24	1.01	0.49	1.46	2.01
CD (P=0.5)	0.69	0.67	2.96	1.45	4.28	5.92

Effect of sowing methods and Nitrogen Levels on Yield of maize

Grain Yield

The data pertaining to grain yield of maize is given in table-1. The highest grain yield was reported in Ridge sowing (S1) of 51.75 q ha^{-1}. Among the nitrogen levels, the treatment N5 was found to be superior among all the treatments attaining the grain yield of 57.76 q ha^{-1}. However, grain yield was comparatively higher with the sole application of granular urea than to nano-urea. Similar types of results were also reported by **Naik et al., 2022; Manwar and Mankar, 2015.**

Biological Yield and Harvest Index

The data for biological yield is given under table 2. It is reported that, the sole application of granular urea was found to be better than nano urea. Biological yield was significantly higher in ridge method of sowing along with the application of 25% N through granular urea + 75% N through Nano-urea.

Harvest Index was found to be non-significant, which is expressed in terms of percentage as given under table-2. Highest harvest index was found in the S1 and N5 treatment. Similar types of results were also obtained by **Naik et al., 2022; Manwar and Mankar, 2015; Thakur et al., 2011.**

Table-2: Grain yield, biological yield and Harvest Index

Treatments	**Grain yield (q/ha)**	**BiologicalYield (q/ha)**	**HarvestIndex (%)**
Method of sowing			
S1	51.75	144.89	42.7
S2	48.16	134.85	41.78
S3	44.85	125.58	41.61
SEm±	0.48	1.35	0.51
CD (P=0.5)	1.94	5.47	NS
Nitrogen levels			
N1	44	123.2	41.72
N2	40.14	112.4	41.69
N3	47.54	133.12	41.85
N4	51.81	145.07	42.03
N5	57.76	161.75	43.27
SEm±	1.58	4.43	0.71
CD (P=0.5)	4.65	13.01	NS

CONCLUSION

Data from research revealed that sole application of urea was found to be better than nano-urea. While application of urea along with nano urea was found be most effective in maize under plains zone of Uttar Pradesh region. Application of Nano-urea alone did not give

good results. Hence, it is advised to grow maize under ridge sowing planting method along with the application of 25% N through granular urea + 75% N through Nano-urea.

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