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Growth attributes of maize sowing to harvesting in a coarse loamy Punjab soil

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Abstract

The experimental farm is located at latitude at 31°14'30.5''N and longitude 75°41'52.1" E. During the *kharif* season, a field experiment was conducted at the Lovely Professional University's soil science research farm in Jalandhar, Punjab. researching the effect of nitrogen addition on maize growth, yield, nutrient absorption, and economics in India during the 2022 and 2023 *kharif* season using organic and inorganic fertilizer solutions. It was done using a randomized block design and included two treatments, three replications. The PMH-13 hybrid PAU variety of maize was used in the experiments. Phosphorus and potassium are both completely supplied by basal application. Plant height at 30, 60 days of sowing and maturity, cob length, dry matter yield, cobs weight, grains weight were recorded. The plant height at 60 days was maximum in the T_2 treatment and it significantly higher in all treatments because of the 100%RDF (3applications), there was marginal reduction in plant height with the advancement of crop growth. Similar plant height in all the dates of sowing was due to assured germination, manual sowing of seed by dibbling method at proper soil environment and assured irrigation facilities throughout the crop growth period. more growth as a result of application of higher doses of nitrogen. Plant height is an important indicator of plant growth and development and results revealed that different nitrogen levels had a significant effect on the plant height of maize.

Keyword: Cob length, Cob weight, yield, grain

Introduction

Maize (Zea mays L.) is the third important cereal crop in India after rice and wheat. It is sensitive to water-logging that results in reduced yields of those grown in tropical and subtropical regions (Rathore et al., 1998). Total maize production of over 18 per cent is often affected by floods and water-logging problems in South and Southeast Asia (Zaidi et al., 2001) thereby causing substantial production losses. However average yield losses of up to 30 per cent are reported each year in maize production in India. The early growth phase of maize development from second leaf stage to seventh leaf stage is the most susceptible phase during water-logging condition (Zhang et al., 2013). Maize (Zea mays L.) belongs to family poaceae, it originated in Mexico where its oldest known ears could be traced back to about 7000 years ago (Mangeisdorf et al., 1964). The crop has a wider range of uses. These include the following: human food, industrial processed food production of starch and used as forage to feed animals. Maize with its large number of cultivars and different maturity periods has wider range of tolerance to different environmental conditions (Purseglove,1972). Maize is a raw material for a number of products viz., starch, glucose,

dextrose, sorbitol, dextrin, high fructose syrup, molto dextrin, germ oil, germ meal, fiber rand gluten products which have application in industries such as alcohol, textile, paper, pharmaceuticals, organic chemicals, cosmetics and edible oil. Maize has got very high yield potentiality and wide adaptability under various agro climatic conditions than any other cereal crops (Singh et al., 2013).

Material and methods

During the kharif season of the years 2022 and 2023, a field experiments was conducted at the Lovely Professional University's soil science research farm in Phagwara, Punjab, to meet the objectives of investigation entitled, 'Growth attributes of maize sowing to harvesting in a coarse loamy Punjab soil' Soil of the experimental site is alkaline in reaction and sandy loam in texture. Sand 45.22(%), silt 35.65(%), clay 19.13(%), soil pH 7.6, soil EC 0.37(dSm^{-1}), organic carbon 3.68(g/kg), cation exchange capacity 4.19($meq100g^{-1}$), available nitrogen 178 ($kgha^{-1}$), available phosphorus 7.60 ($kgha^{-1}$) and available potassium 110.5 ($kgha^{-1}$). It is classified as coarse loamy mixed hyper-thermic family of Typic Haplustept as per Soil Taxonomy. After 30, 60 days of sowing still harvesting all growth attributes data recorded in experimental field. Each plot size is 3m x 5m.

Figure-1 Location of experimental field

Result and discussion

Different fertilizer treatments using organic and inorganic materials were used in an experimental field. On 30, 60 days, as well as during harvest, data showed the highest plant height. Following
35.29,82.22,175.00 and on 30, 60 days, as well as during harvest, data showed the lowest plant height. Following 30.34, 72.56, 169.58. In an experimental field, different fertilizer treatments using both organic and inorganic factors were applied. Nitrogen (N) was applied urea from in 125 kg ha^{-1}, phosphorus (P) was applied single super phosphate from in 60 $kgha^{-1}$, potassium (K) was applied muriate of potash from in 30 $kgha^{-1}$. Only neem-coated urea was used in all recommended dosage fertilizer applications.

30 days of sowing after plant height

30 days of sowing after plant height data were recorded. during kharif growing season 2022 and 2023.

Table-1 30 days after plant height in experimental field

Sr. no	Treatments	2022	2023	Mean
1	T_1 Absolute control	30.34	33.56	31.95
2	T_2 100%RDF (3applications)	35.29	34.13	34.71

C.D.(P=0.05)	1.41	1.37	1.39
S.E.m. (±)	0.67	0.65	0.66

30 days after plant height data were recorded. during *kharif* growing season 2022 and 2023. The treatment wise details of data are presented in table no 1, in 2022 the highest height was observed T_2 treatments in 2023 the highest height was observed in T_2 treatments, and in 2022 the lowest height was observed T_1 treatments in 2023 the lowest height was observed in T_1 treatments.

60 days of sowing after plant height

60 days of sowing after plant height data were recorded. during kharif growing season 2022 and 2023.

Table-2 60 days after plant height in experimental field

Sr. no	Treatments	2022	2023	Mean
1	T_1 Absolute control	86.33	72.56	79.45
2	T_2 100%RDF (3applications)	76.05	82.22	79.14
C.D.(P=0.05)		3.45	3.29	3.18
S.E.m. (±)		1.64	1.57	1.51

60 days after plant height data were recorded. during *kharif* growing season 2022 and 2023. The treatment wise details of data are presented in table no 2, in 2022 the highest height was observed T_1 treatments in 2023 the highest height was observed in T_2 treatments, and in 2022 the lowest height was observed T_2 treatments in 2023 the lowest height was observed in T_1 treatments.

Plant height after harvest

after harvest plant height data were recorded. during kharif growing season 2022 and 2023.

Table-3 plant height after harvest in experimental field

Sr. no	Treatments	2022	2023	Mean
1	T_1 Absolute control	170.54	169.58	170.06
2	T_2 100%RDF (3applications)	175.00	172.45	173.73
C.D.(P=0.05)		7.00	6.90	6.95
S.E.m. (±)		3.33	3.28	3.31

After harvest plant height data were recorded. during *kharif* growing season 2022 and 2023. The treatment wise details of data are presented in table no 3, in 2022 the highest height was observed T_2 treatments in 2023 the highest height was observed in T_2 treatments, and in 2022 the lowest height was observed T_1 treatments in 2023 the lowest height was observed in T_1 treatments.

Length of cobs at maize harvest

After harvesting maize cobs length data were recorded. during kharif growing season 2022 and 2023.

Table-4 Length (cm) of cobs at maize harvest in experimental field

Sr. no	Treatments	2022	2023	Mean
1	T_1 Absolute control	17.3	17.93	17.62
2	T_2 100%RDF (3applications)	21.23	20.9	21.07
C.D.(P=0.05)		0.86	0.84	0.82
S.E.m. (±)		0.38	0.36	0.35

After harvest maize cobs length data were recorded. during *kharif* growing season 2022 and 2023. The treatment wise details of data are presented in table no 4, in 2022 the highest length was observed T_2 treatments in 2023 the highest length was observed in T_2 treatments, and in 2022 the lowest length was observed T_1 treatments in 2023 the lowest length was observed in T_1 treatments. cob length decreased with increase in plant population due to severe competition for nutrients and increased plant population produced smaller cob due to shading effect (Gaire R *et al*., 2020)

Weight of maize cobs after harvest

After harvest maize cobs weight data were recorded. during kharif growing season 2022 and 2023.

Table-5 Weight of maize cobs after harvest (q ha^{-1}) in experimental field

Sr. no	Treatments	2022	2023	Mean
1	T_1 Absolute control	69.7	70.6	70.15
2	T_2 100%RDF (3applications)	75.9	78.63	77.27
C.D.(P=0.05)		3.04	3.15	3.09
S.E.m. (±)		1.45	1.50	1.47

After harvest maize cobs weight data were recorded. during kharif growing season 2022 and 2023. The treatment wise details of data are presented in table no 5, in 2022 the highest weight of maize cobs was observed T_2 treatments in 2023 the highest weight of maize cobs was observed in T_2 treatments, and in 2022 the lowest weight of maize cobs was observed T_1 treatments in 2023 the lowest weight of maize cobs was observed in T_1 treatments The weight of cob with cornhusk illustrates the amount of photosynthetic results that are transplanted to cobs Wibowo A S *et al.*, (2017)

Dry matter yield of maize (q ha^{-1})

Dry matter yield of maize data was recorded. during kharif growing season 2022 and 2023.

Table-6 Dry matter yield of maize (q ha^{-1})

Sr. no	Treatments	2022	2023	Mean
1	T_1 Absolute control	105.80	99.12	102.46
2	T_2 100%RDF (3applications)	110.22	118.31	114.27
C.D.(P=0.05)		4.23	4.73	4.57
S.E.m. (±)		2.02	2.25	2.18

Dry matter yield data were recorded. during *kharif* growing season 2022 and 2023. The treatment wise details of data are presented in table no 6, in 2022 the highest height was observed T_2 treatments in 2023 the highest height was observed in T_2 treatments, and in 2022 the lowest height was observed T_1 treatments in 2023 the lowest height was observed in T_1 treatments.

weight of the maize grains (air dry) (q ha^{-1})

maize grain cobs weight data were recorded. during kharif growing season 2022 and 2023.

Table-7 weight of the maize grains (air dry) (q ha^{-1})

Sr. no	Treatments	2022	2023	Mean
1	T_1 Absolute control	23.69	20.00	21.85
2	T_2 100%RDF (3applications)	39.36	34.28	36.82
C.D.(P=0.05)		1.57	1.37	1.47
S.E.m. (±)		0.75	0.65	0.70

Grain yield data were recorded. during *kharif* growing season 2022 and 2023. The treatment wise details of data are presented in table no 7, in 2022 the highest height was observed T_2 treatments in 2023 the highest height was observed in T_2 treatments, and in 2022 the lowest height was observed T_1 treatments in 2023 the lowest height was observed in T_1 treatments.

Conclusion

The timing of nitrogen applications is a vital management choice for the production of maize (*Zea mays L.*). Reducing loss and increasing crop absorption are the two main objectives of nitrogen management. Maize can be grown in any soil type and under any agro-climatic conditions. Maize has been grown in many seasons and regions.

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