RESEARCH PAPER

ADVANCE RESEARCH JOURNAL OF CROP IMPROVEMENT
Volume 8 | Issue 2 | December, 2017 | 179-182
e ISSN-2231-640X

DOI : 10.15740/HAS/ARJCI/8.2/179-182
Visit us: *www.researchjournal.co.in*

Effect of different planting methods and nitrogen levels on the quality of *Kharif* maize (*Zea mays* L.)

AMANDEEP KAUR AND MAHESH KUMAR[1]

AUTHORS' INFO
Associated Co-author :
[1]Department of Agronomy, Punjab Agricultural University, LUDHIANA, (PUNJAB) INDIA

Author for correspondence:
AMANDEEP KAUR
Department of Agronomy, Punjab Agricultural University, LUDHIANA, (PUNJAB) INDIA
Email: amugorsina1993@rediffmail.com

ABSTRACT : A field experiment was conducted during *Kharif* 2015at Punjab Agricultural University, Ludhiana, to study the effect of planting methods (flat, ridge and bed) and five nitrogen levels (0, 90, 120, 150 and 180 kg N ha^{-1}) on the quality of maize. Among different planting methods, bed planting produced significantly higher yield of *Kharif* maize as compared to flat sowing method. Maximum grain yield of 58.5 q ha^{-1} was recorded in bed planting methods which was statistically at par with ridge sowing method (57.3 q ha^{-1}) but was significantly higher than that recorded under flat sowing (52.6 q ha^{-1}). Similar trend was recorded in stover yield. Different planting methods did not significantly influence the protein content, total sugars, starch content, oil content, β- carotene, total carotenoids and total minerals in maize grains. Among nitrogen levels, 150 kg N ha^{-1} gave significantly higher grain yield over 120, 90 and control but at par with 180 kg N ha^{-1}. Similar trend was also observed in stover yield. However; application of 180 kg N ha^{-1} recorded significantly higher protein content and total minerals than all the nitrogen levels except 150 kg ha^{-1}. Application of 180 kg N ha^{-1} recorded low total sugars than other nitrogen level but it was at par with 150 kg N ha^{-1}

KEY **W**ORDS : Maize, Planting methods, Nitrogen levels, Yield, Quality

How to cite this paper : Kaur, Amandeep and Kumar, Mahesh (2017). Effect of different planting methods and nitrogen levels on the quality of *Kharif* maize (*Zea mays* L.). *Adv. Res. J. Crop Improv.,* **8** (2) : 179-182, **DOI : 10.15740/HAS/ARJCI/8.2/179-182**.

Paper **H**istory : **Received :** 27.06.2017; **Revised :** 30.10.2017; **Accepted :** 15.11.2017

Maize (*Zea mays* L.) is the most versatile crop with wider adaptability in varied agro-ecologies. It has highest genetic yield potential among the foodgrain crops.It can also be used as human food (25%), poultry feed (49%), animal feed (12%), industrial (starch) products (12%), beverages and seed (1% each).Maize grains are a very good source of starch (72%) and quality proteins (10%), oil (4.8%), fibre (8.5%), sugars (3%) and ash (1.7%) (Chaudhary, 1983). Nitrogen requirement of maize crop may vary with soil types, climatic conditions, genotypes and different agronomic management practices. Nitrogen plays an essential role in the growth and development of the crop. It enhances the yield of the crop. Nitrogen availability to the maize plant not only affects the grain yield but also affects the quality of grains to a great extent. Raja (2001) reported that the grain yield, total sugars, non-reducing sugars, reducing sugars and protein content was significantly higher with the application of 120 kg N ha^{-1}. Parija *et al.* (2013) found that the quality parameters such as oil content, mineral matter, tryptophan, starch and total sugar content remained statistically similar under different nitrogen levels whereas protein content was increased with each increase in nitrogen level. Keeping this view, the present

investigation was carried out to study the effect of different planting methods and nitrogen levels on the quality and yield of *Kharif* maize.

RESEARCH PROCEDURE

The field experiment was conducted during *Kharif* 2015 at the Research Farm of the Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana (30^0 54| N latitude, 75^0 48| E longitude and altitude of 247 metres above the mean sea level). The soil of the experimental field was loamy sand with 0-30 cm. The soil pH, electrical conductivity, organic carbon, available N, P and K were 7.8, 0.21dSm^{-1}, 0.32 %, 130.5, 18.6, 181.5 kg ha^{-1}, respectively. The experiment was laid out in split plot design keeping combinations of methods (flat, ridge and bed) in main plots and nitrogen levels (0, 90, 120, 150 and 180 kg ha^{-1}) in sub plots with four replications. A primary tillage operation was done with tractor drawn disc harrows before applying pre-sowing irrigation. A heavy pre-sowing irrigation was applied to the experimental field. When the field attained proper soil moisture, a fine seedbed was prepared by giving two cultivations with tractor drawn cultivators each followed by planking. The maize hybrid PMH 1 was sown on June 22, 2015 on a well prepared seedbed. The sowing was done by dibbling method using two seeds per hill. The row to row spacing of 60 cm and plant to plant spacing of 20 cm was kept for flat and ridge sowing methods and row to row spacing of 67.5 cm and plant to plant spacing of 18 cm was kept for bed planting method. Full dose of phosphate (60 kg ha^{-1}) and potash (30 kg ha^{-1}) along with one third nitrogen was applied at the time of sowing as per treatment. Remaining two third N was applied in two equal split doses at knee high and tasseling stage, respectively. Others compulsory activities *viz*., interculture, weed control and plant protection measures were applied as need based. The crop was harvested manually on October 7, 2015 when the stalks and leaves were slightly green but the cobs husk cover has dried, turned brown and grains became hard. The data were subjected to analysis of variance (ANOVA) as per CPCS1 software developed by Department of Statistics, Punjab Agricultural University, Ludhiana.

RESEARCH ANALYSIS AND REASONING

The findings of the present study as well as relevant discussion have been presented under following heads :

Protein content :

Protein content is one of the important quality characters of grains. The data on protein content of grains are given in Table 1 which revealed that protein content in maize grains was not significantly influenced by different planting methods.

Application of 180 kg N ha^{-1} resulted in protein content of 10.6 per cent which was at par with 150 kg N ha^{-1} (10.4 %) and significantly better than the lower nitrogen levels of 120, 90 kg N ha^{-1} and control which resulted in 10.2, 10.1 and 9.7 per cent of protein, respectively. This may be attributed to the fact that higher nitrogen content accumulated with higher nitrogen level that increased the protein content. The results are in conformity with those reported by Ullah *et al.* (2015) and Khan *et al.* (2011).

Total sugars :

Total sugar content of maize grains increased numerically under ridge and bed planting methods as compared to flat sowing, though the differences did not reach the level of significance (Table 1). Total sugar content of maize grains also decreased with increase in nitrogen levels. Maximum total sugars (3.01 %) was observed under control treatment which was significantly higher than that recorded under all the nitrogen levels. Minimum total sugars (2.67 %) was recorded under 180 kg N ha^{-1} followed by 150 kg N ha^{-1} (2.75 per cent). The results are in agreement with the findings of Parija *et al.* (2013).

Starch content:

The planting methods did not significantly influence the starch content of maize grains. There was a decreasing trend with respect to starch content by a narrow margin from one nitrogen level to the successive nitrogen level. The starch content in maize grains varied from 68.2 % in control to 67.2 % under 180 kg N ha^{-1}, though the differences did not reach to the level of significance.

Oil content :

Oil content of maize was not significantly affected by different planting methods and nitrogen levels. The oil content varied from 4.97 to 5.12 % under different nitrogen levels.

- carotene and total carotenoids :

Data presented in Table 1 showed that neither the planting methods nor the nitrogen levels either alone or in combination affected the β- carotene and total carotenoids of maize grains. The β- carotene and total carotenoids values varied from 0.40 to 0.46 ppm and 4.0 to 4.6 % under different nitrogen levels.

Total minerals :

The data given in the Table 1 showed that the total minerals were not significantly affected by different planting methods. However, the bed planting (1.70 %) and ridge planting (1.67 %) methods recorded numerically higher values of total minerals as compared to flat sowing (1.57 %). Total minerals in maize grains were increased with increase in nitrogen levels. The highest value of total minerals (1.74 %) was observed with the application of 180 kg N ha^{-1} which was statistically at par with 150 kg N ha^{-1} (1.71 %) and significantly superior to all other nitrogen levels. Parija *et al.* (2013) also reported increasing trend in total mineral of maize grains due to each increase in nitrogen levels upto 150 kg N ha^{-1}, though the differences were not significant.

Grain yield :

The data presented in Table 1 showed that the different sowing methods, bed planting methods produced maximum grain yield of 58.5 q ha^{-1} which was statistically at par with ridge sowing method (57.3 q ha^{-1}) but was significantly higher than that recorded under of flat sowing (52.5 q ha^{-1}). This may be attributed to the fact that the initial crop growth was better in bed and ridge planting as is evident from significantly higher plant height and higher number of leaves per plant. Later stages of plant growth, all the yield attributing parameters such as number of cobs per plant, number of grains per cob and cob length recorded significantly higher values and ultimately higher grain yield was obtained under ridge and bed planting methods as compared to flat sowing. Tanveer *et al.* (2014) reported that maximum grain yield was obtained in bed sowing followed by ridge sowing and flat sowing methods. Singh and Vashist (2015) also reported that the grain yield of ridge sowing method was 13.2 % higher than flat sowing. Similar findings were also reported by Kumar and Chawla (2015).

Different nitrogen levels significantly influenced the grain yield of maize only upto 150 kg N ha^{-1}. However, application of 180 kg N ha^{-1} produced maximum and significantly higher grain yield (66.3 q ha^{-1}) than that recorded under 0, 90 and 120 kg N ha^{-1} but it was at par with 150 kg N ha^{-1} (65.3 q ha^{-1}). The minimum grain yield of 34.2q ha^{-1} was obtained with no nitrogen application. The data showed that application of 180 kg N ha^{-1} resulted in 48.4, 17.6, 8.8 and 1.5 % higher grain yield as compared to 0, 90, 120 and 150 kg N ha^{-1}, respectively. The higher grain yield at higher doses of nitrogen might have increased the chlorophyll content index since nitrogen is an important constituent of chlorophyll. With the shift of plant from vegetative to reproductive phase higher amount of source resulted in better development of sink size as indicated by number of cobs per plant, cob length and cob girth. Better pollination under adequately supply of nitrogen helped to develop the sink capacity *i.e.* higher number of grains per cob which was

Table 1 : Effect of different planting methods and nitrogen levels on quality and yield of maize

Treatments	Protein content (%)	Total sugars (%)	Starch content (%)	Oil content (%)	β-carotene (ppm)	Total carotenoids (%)	Total minerals (%)	Grain yield (q ha^{-1})	Stover yield (q ha^{-1})
Planting methods									
Flat sowing	10.2	2.75	67.2	5.07	0.43	4.30	1.57	52.6	114.7
Ridge sowing	10.2	2.87	68.1	5.03	0.43	4.40	1.67	57.3	122.6
Bed planting	10.2	2.84	67.9	4.98	0.44	4.5	1.70	58.5	124.6
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	4.2	6.4
Nitrogen levels (kg ha^{-1})									
0	9.7	3.01	68.2	4.97	0.40	4.0	1.50	34.2	101.0
90	10.1	2.86	67.9	4.99	0.41	4.1	1.63	54.5	116.4
120	10.2	2.81	67.7	5.01	0.44	4.4	1.65	60.4	124.4
150	10.4	2.75	67.4	5.03	0.45	4.5	1.71	65.3	128.9
180	10.6	2.67	67.2	5.12	0.46	4.6	1.74	66.3	132.5
C.D. (P=0.05)	0.3	0.13	NS	NS	NS	NS	0.08	4.8	9.4

NS=Non-significant

well filled as indicated by higher 1000 grain weight and higher shelling percentage. The increase in grain yield of maize with increase in nitrogen levels was also reported by Joshi *et al.* (2014) and Ullah *et al.* (2015).

Stover yield :

The data given in Table 1 revealed that methods of planting showed significant effect on the stover yield. Bed and ridge plantings methods were found to be significantly superior as compared to flat sowing although both the methods of planting were at par with each other. Enhanced stover yield in bed and ridge may be attributed to better conditions above or below soil surface under bed or ridge planting method as compared to flat sowing. Bed and ridge planting method increased the availability of nutrients and there was better root growth and micro-climate due to light and frequent irrigations which may helped to increase the stover yield due to increase in plant height, number of leaves per plant and higher DMA by the plants in bed and ridge planting as compared to flat sowing. Nitrogen application significantly influenced the stover yield. Maximum stover yield (132.5 q ha^{-1}) was recorded with the application of 180 kg N ha^{-1} which was statistically at par with 120 kg N ha^{-1} (124.4 q ha^{-1}) and 150 kg N ha^{-1} (128.9 q ha^{-1}) and significantly better than 90 kg N ha^{-1} (116.4 q ha^{-1}) and control (101.0 q ha^{-1}), the latter two also differed significantly with each other. Sepat and Kumar (2007) reported higher stover yield under 120 kg N ha^{-1} as compared to 0, 40and 80 kg N ha^{-1}.

LITERATURE CITED

Chaudhary, A.R. (1983). *Maize in Pakistan*.Punjab Agri. Coordination Board, University of Agri. Faisalabad.

Joshi, A., Gupta, J.K., Choudhary, S.K., Mujalde, S. and Garg, M. (2014). Effect of nitrogen sources, doses and split applications on yield and economics of maize (*Zea mays* L.) in the Malwa region of Madhya Pradesh (India). *J. Agric. Vet. Sci.*, **7** : 24-28.

Khan, H.Z., Iqbal, S., Iqbal, A., Akbar, N. and Jones, D. (2011). Response of maize (*Zea mays* L.) varieties to different levels of nitrogen. *Crop Environ.*, **2**: 15-19.

Kumar, M. and Chawla, J.S. (2015). Influence of methods of sowing on productivity of spring maize (*Zea mays* L.) hybrids. *J. Pl. Sci. Res.*, **31**: 97-99.

Parija, B., Kumar, M. and Sharma, S. (2013). Influence of farmyard manure and nitrogen levels on quality parameters and yield of maize. *Eco. Env. Cons.*, **19**: 1045-1048.

Raja, V. (2001). Effect of nitrogen and plant population on yield and quality of super sweet corn (*Zea mays* L.). *Indian J. Agron.*, **46** : 246-249.

Sepat, S. and Kumar, A. (2007). Influenced of irrigation and nitrogen management on yield and economics of maize (*Zea mays* L.).*Crop Res.*, **33** : 50-52.

Singh, J. and Vashist, K.K. (2015). Effect of planting methods, mulching and irrigation regimes on maize productivity. *Agric. Res. J.*, **52** : 23-27.

Tanveer, M., Ehsanullah, Anjum, S.A., Zahid, H., Rehman, A. and Sajjad (2014). Growth and development of maize (*Zea mays* L.) in response to different planting methods. *J. Agric. Res.*, **52** : 511-522.

Ullah, M.I., Khakwani, A.A., Sadiq, M., Awan, I. and Ghazanfarullah, M. (2015). Effect of nitrogen fertilization rates on growth, quality and economic return of fodder maize (*Zea mays* L.). *Sarhad J. Agric.*, **31**: 45-52.