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Growth and Quality Analysis of Baby Corn (*Zea mays* L.) and Fodder as Influenced by NPK and Zn Fertility under Varying Spatial Geometry in Indo-Gangetic Plain Zone of Bihar

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Abstract

A field experiment was conducted during the *kharif* season (June–August, 2018) at Bihar Agricultural University, Sabour, Bihar, India, to assess the growth and quality of baby corn as influenced by NPK and zinc fertility approaches under varying spatial geometries in Indo-gangetic plain zone of Bihar. The experiment was laid out in split-split-plot design with three levels of spatial geometry, viz. 40×20 cm^2 spacing, 50×15 cm^2 spacing and paired row planting (30 cm spacing in between two lines in a paired-row; 50 cm between the two paired-rows and 10 cm between plants within a row) in main plot; three levels of fertility viz. 120:60:60, 150:75:75 and 180:90:90 kg N:P_2O_5:K_2O ha^{-1} in sub- plots; and two levels of zinc viz., 2.5 and 5.0 kg Zn ha^{-1} in sub-sub plots, replicated thrice. Paired row planting recorded enhanced and significant increase in growth attributes, thereby registering highest baby corn yield (1.43 t ha^{-1}), green fodder yield (26.78 t ha^{-1}) and dry fodder yield (11.46 t ha^{-1}), as compared to conventional planting. 180:90:90 kg N:P_2O_5:K_2O ha^{-1} and 5.0 kg Zn ha^{-1} enhanced the growth parameters as well as baby corn, green fodder and dry fodder yield. Paired row planting, NPK fertility @180:90:90 kg N:P_2O_5:K_2O ha^{-1} and Zn fertility levels @5.0 kg Zn ha^{-1} also recorded improvement in reducing sugar, protein and zinc content of baby corn as well as nutritional quality of fodder.

Keywords: Baby corn, fodder, quality, Spatial geometry, soil fertility

1. Introduction

Agricultural production systems in India are based upon mixed farming consisting mainly of crops and livestock (Chaudhary et al., 2012). Livestock sector is an important sub-sector of agriculture, contributing approximately 4.11% to national GDP and 25.4% to agricultural GDP (Anonymous, 2022), which depend directly on the availability of good quality green fodder (Roy et al., 2020). Increasing cultivation of cereal and cash crops has contributed towards a decline in availability of total feed and fodder (Chaudhary et al., 2012). Presently, India faces a net deficit of 35.6% green fodder, 10.95% dry crop residues and 44% concentrate feed ingredients (Shilpashree et al., 2023, Singh et al., 2022). The area under fodder accounts for only 4% of the total cultivated land of the country (Dagar, 2017, Meena et al., 2018). Baby corn (*Zea mays* L.) provides a good option as a dual purpose food cum fodder crop to fulfill the demand of fodder to burgeoning livestock population of the country (Dar et al., 2014).

Baby corn is an unfertilized young cob harvested 2 or 3 days after silk emergence and is a quality palatable green fodder, used for high-quality silage which helps to improve body weight and milk quality in cattle (Iqbal et al., 2006, Rana et al., 2001). In India, maize is cultivated in 10.04 mha, with a production of 33.62 mt and productivity of 3349 kg ha^{-1} of grains (Anonymous, 2022). Indo-gangetic plain zone of Bihar is one of the largest maize growing state in the country and the crop is being grown primarily as a subsistence crop to meet food and fodder need for the livestock for a long time (Joshi et al., 2005).

Crop spatial geometry is an important factor in maize cultivation that determines the optimum plant population of a crop so as to utilize underground resources efficiently (Testa et al., 2016, Aravinth et al., 2011, Gozobenli et al., 2004) and harness maximum solar radiation for enhanced photosynthesis (Yang et al., 2021, Hou et. al., 2021, Monneveux et al., 2005). Highest growth parameters and yield of corn as well as fodder of baby corn with a spacing of 60×20 cm^2 or 45×30 cm^2 has been reported by various researchers (Kar et al., 2006, Bairagi et al., 2015). The technique of paired row planting without reduction in plant population can be utilized for baby corn for effective and efficient utilization of resources.

Nitrogen (N) plays an important role in plant growth, development, photosynthesis, physiological and biochemical reactions in plant metabolism of baby corn (Singh et al., 2019). Phosphorus (P) is considered a primary nutrient for plant growth and is essential for cell division, reproduction, plant metabolism, storage and use of energy (Zapata and Zaharah, 2002). Potassium (K) plays an important role in the biophysical and biochemical cellular functions involved in osmoregulation, photosynthesis, electrical neutralization, transport of metabolites and enzyme activation in living plant cells (Amtmann et al., 2005, Pettigrew et al., 2008).

Zinc (Zn) is an essential nutrient that has particular physiological functions, such as protein synthesis, gene expression, enzymes structure, energy production, Krebs cycle, carbohydrate metabolism, photosynthesis, auxin metabolism, pollen formation, and resistance to infection by certain pathogen (Suganya et al., 2020, Jabri et al., 2022). It affects plants by stunting its growth and providing inferior quality of harvested products affecting the health of the livestock.

With this background, a field experiment was conducted with the objective to assess the growth and quality of baby corn as influenced by NPK and Zn fertility approaches under varying spatial geometry in Indo-gangetic plain zone of Bihar.

2. Materials and Methods

2.1. Site and climate

A field experiment was carried out at Bihar Agricultural University, Sabour, Bhagalpur, Bihar, which is located in the Indo-gangetic plain zone of Bihar, India, situated at 25°50' N latitude, 87°19' E longitude and at an altitude of 52.73 m above mean sea level, during *kharif* season of 2018 (June–August) under rainfed condition. The soil of the experimental field was sandy-loam in texture with low in organic carbon (0.50%) and available N (182.3 kg ha^{-1}), medium in available P (37.7 kg ha^{-1}) and K (190.7 kg ha^{-1}) with pH 7.5. The weekly maximum temperature during the cropping period ranged from 30.6 ºC in 31st standard meteorological week (SMW) to 37.2 ºC in 25th meteorological week, whereas, the weekly minimum temperature during the cropping period ranged from 23.9 ºC in 22nd SMW to 26.0 ºC in 25th SMW. The maximum relative humidity ranged between 82.4% and 90.9%, whereas, the minimum relative humidity ranged between 64.1% and 83.0%, during the cropping period. The crop received a rainfall of 341.2 mm during the baby corn growing period.

2.2. Experimental design

The experiment was laid out in split-split-plot design with three levels of spatial geometry, viz. 40×20 cm^2 spacing, 50×15 cm^2 spacing and paired row planting (30 cm spacing in between two lines in a paired-row; 50 cm between the two paired-rows and 10 cm between plants within a row) in main plot; three levels of fertility viz. 120:60:60 kg N:P_2O_5:K_2O ha^{-1}, 150:75:75 kg N:P_2O_5:K_2O ha^{-1} and 180:90:90 kg N:P_2O_5:K_2O ha^{-1} in sub-plots; and two levels of zinc viz., 2.5 kg Zn ha^{-1} and 5.0 kg ha^{-1} in sub-sub plots, replicated thrice.

2.3. *Crop management practices*

The crop was sown on 2nd June, 2018 on levelled soil by opening 5 cm deep furrow as per spacing of treatments. Full amount of P_2O_5 and K_2O, Zn and half amount of N, as per treatments, were applied before sowing. The rest half N was applied as top dressing during the time of earthing up. Harvesting of baby corn was done at 2–3 days of silk emergence stage by leaving border rows.

2.4. Observations recorded and methods

The growth parameters were recorded at 15, 30, 45 days after sowing (DAS) and at harvest. After plucking of all the baby cobs, the baby corn plant was harvested and weighed, treatment wise. Baby corns and plant samples were collected treatment wise, at the time of plant harvesting, dried and ground and the chemical analysis of baby corn as well as fodder was carried out in the laboratory with their respective analysis methods. N content in the corn plant was estimated by Kjeldahl method and multiplied by 5.95 (Lu and Luh, 1991) to get crude protein content, whereas, P content was estimated by Vandomolybdo-phosphoric acid yellow colour method using the Barton’s reagent (Jackson, 1973). The potassium was determined with the help of flame photometer (Jackson, 1973). The Zn content was determined through atomic absorption spectrophotometer.

2.5. Statistical analysis

The data on various observations were statistically analyzed by the procedure of analysis of variance for split-plot design given by Panse and Sukhatme (1985), taking critical difference (CD) at 5% level of significance.

3. Results and Discussion

3.1. Analysis of growth attributes of baby corn

3.1.1. Effect of spatial geometry on growth attributes

The growth attributes viz., plant height, LAI, dry matter accumulation (DMA) and SPAD values increased as growth of plants progressed from 15 DAS to harvest, irrespective of experimental treatments (Table 1). The spatial geometry exerted a significant influence on crop growth in terms of plant height, LAI, dry matter accumulation and SPAD values at all the stages of observations, except at 15 DAS. Plant height and LAI at 30 DAS, 45 DAS and at harvesting were found highest with dense planting at 50×15 cm^2 spacing, being at par with paired row planting, but differed significantly with 40×20 cm^2 spacing. The higher plant height with closer spacing might be attributed to increase in competition for sunlight, nutrients, space and water by the plants which coupled with favorable climatic conditions. The results were in conformity with the findings of Kunjir et al. (2007), who also reported the result of higher plant height with closer spacing as

Table 1: Effect of spatial geometry and fertility on growth attributes of baby corn

Treatments	Plant height (cm)				LAI				DMA (g plant^{-1})				SPAD Value			
	15 DAS	30 DAS	45 DAS	At harvest	15 DAS	30 DAS	45 DAS	At harvest	15 DAS	30 DAS	45 DAS	At harvest	15 DAS	30 DAS	45 DAS	At harvest
Spatial geometry																
Spacing 40×20 cm^2	32.2	78.7	157.3	203.6	0.26	1.26	2.46	3.75	10.7	38.9	82.7	101.2	29.8	38.4	44.1	45.5
Spacing 50×15 cm^2	34.3	87.0	169.2	212.0	0.27	1.39	2.88	4.26	10.6	36.5	80.6	97.8	31.8	37.9	43.3	44.7
Paired row planting	33.3	83.5	165.4	205.6	0.27	1.28	2.58	4.12	11.0	42.3	88.7	103.3	32.3	40.8	45.9	47.5
SEm±	0.86	1.40	2.10	1.59	0.01	0.02	0.06	0.08	0.25	1.10	1.28	1.04	0.69	1.66	0.5	0.52
CD (*p*=0.05)	NS	5.4	8.3	6.26	NS	0.07	0.25	0.30	NS	4.31	5.03	4.09	NS	NS	1.98	2.03
NPK fertility level (kg N:P_2O_5:K_2O ha^{-1})																
120: 60: 60	32.5	79.1	159.0	201.8	0.18	0.92	2.36	3.61	10.5	34.1	79.4	98.7	29.3	36.7	41.8	42.9
150:75: 75	33.2	84.7	164.1	208.0	0.27	1.33	2.66	4.01	10.8	38.6	84.8	100.6	31.7	39.3	45.0	46.2
180:90: 90	34.1	85.6	168.7	211.4	0.35	1.69	2.89	4.50	11.0	44.9	87.8	103.0	32.8	41.1	46.6	48.5
SEm±	0.97	1.24	1.73	1.96	0.00	0.03	0.04	0.05	0.29	0.90	0.50	0.78	0.64	0.71	0.75	0.80
CD (*p*=0.05)	NS	3.83	5.32	6.04	0.01	0.08	0.11	0.16	NS	2.76	1.55	2.42	1.97	2.19	2.31	2.45
Zn fertility level (kg Zn ha)																
2.5	32.6	81.9	162.3	205.6	0.25	1.25	2.57	3.94	10.7	39.1	82.5	99.9	31.2	38.6	43.9	44.9
5.0	33.9	84.3	165.5	208.5	0.28	1.38	2.70	4.14	10.8	39.3	85.5	101.7	31.3	39.4	45.0	46.9
SEm±	0.32	0.68	1.31	1.59	0.00	0.01	0.02	0.02	0.18	0.82	0.37	0.40	0.51	0.24	0.20	0.31
CD (*p*=0.05)	0.94	2.04	NS	NS	0.01	0.04	0.07	0.06	NS	NS	1.10	1.19	NS	0.72	0.59	0.93

compared with wider spacing. Higher leaf area index in closer spacing was observed due to increased plant density which accommodated more number of plants and could also be ascribed to lesser value of spacing (Wasnik et al., 2012). Like plant height and LAI, the DMA at 15 DAS was not influenced by spatial geometry significantly, whereas, at other stages of observations, it reflected significant influence, with highest values recorded with paired row planting, being at par with that of 40×20 cm^2 spacing, but differed significantly with 50×15 cm^2 spacing. Though the SPAD values at 15 and 30 DAS were found non-significant, it exerted significant influence at later stages, with highest values with paired row planting, being at par with that of 40×20 cm^2 spacing, but differed significantly with 50×15 cm^2 spacing. This might be due to the fact that lesser competition between the plants under paired row spacing which might have provided sufficient space to the crop for harnessing the solar energy and effective utilization of nutrients and moisture.

3.1.2. Effect of fertility levels on growth attributes

Plant height and DMA were significantly influenced by NPK fertility levels at all the growth stages, except at 15 DAS, with the highest values recorded at 180:90:90 kg N:P_2O_5: K_2O ha^{-1}, followed by 150:75:75 kg N:P_2O_5:K_2O ha^{-1} and 120:60:60 kg N:P_2O_5:K_2O ha^{-1}. However, the maximum plant height recorded for 180:90:90 kg N:P_2O_5: K_2O ha^{-1} was found at par with 150:75:75 kg N:P_2O_5:K_2O ha^{-1}, but differed significantly with 120:60:60 kg N:P_2O_5:K_2O ha^{-1}, at 30 DAS, 45 DAS and at harvesting. The maximum DMA recorded at 30 and 60 DAS, with 180:90:90 kg N:P_2O_5:K_2O ha^{-1} differed significantly with other NPK fertility levels, but at harvesting, it remained at par with 150:75:75 kg N:P_2O_5:K_2O ha^{-1}. NPK fertility levels significantly influenced the LAI and SPAD values with the maximum value recorded with 180:90:90 kg N:P_2O_5:K_2O ha^{-1} at all the growth stages. The LAI values differed significantly at all the growth stages with the highest value recorded for 180:90:90 kg N:P_2O_5:K_2O ha^{-1}, differing significantly with other NPK fertility levels, whereas, the SPAD values were found maximum with 180:90:90 kg N:P_2O_5: K_2O ha^{-1}, being at par with 150:75:75 kg N:P_2O_5:K_2O ha^{-1}. This might be due to continuous availability of nutrients from soil to the plant, thereby increasing the growth parameters of baby corn. The results were in line with Dadarwal et al. (2009). The higher fertility level enabled the crop to produce taller plants and more number of active leaves which ultimately caused more dry matter accumulation. The dry matter accumulation was found initially less responsive because of slow growth rate during early stages. The lower assimilating surface rendered the lower rate of photosynthesis and resulted less dry matter production during the initial stage of crop growth (Sahoo and Mahapatra, 2007, Singh and Choudhary, 2008). The application of 5.0 kg Zn ha^{-1} recorded significant increase in plant height at 15 and 30 DAS, compared to 2.5 kg Zn ha^{-1}, but at later stages, it became at par with 2.5 kg Zn ha^{-1}. The LAI values at all stages were found significantly higher with 5.0 kg Zn ha^{-1}, whereas, the DMA with 5.0 kg Zn ha^{-1} was found significantly higher at 45 DAS and at harvesting. All the growth attributes like plant height, LAI, DMA and SPAD values at harvesting were found significantly higher with application of 5.0 kg Zn ha^{-1}. This might be due to fulfilling the zinc requirement of the crop through fertilization, thereby having beneficial effects on physiological process, plant metabolism and plant growth in maize (Kumar and Bohra, 2014). N and Zn also helped in manufacturing more leaf area as a consequence of which more assimilates were produced (Asif et al., 2013).

3.2. Analysis of yield of baby corn and fodder

3.2.1. Effect of spatial geometry on yield of baby corn and fodder

Data recorded on days to 50, 75 and 100% of cob harvest was affected by spatial geometry, fertility levels revealed that paired row planting showed significantly lower number of days to 75% of cob harvest (Table 2), whereas, it was non-significant for 50 and 100% of cob harvest. This might be due to the fact that there was lesser competition between the plants under paired row spacing which might have provided sufficient space to the crop for harnessing the solar energy and effective utilization of nutrients and moisture which resulted

Table 2: Effect of spatial geometry and fertility on yield of baby corn and fodder

Treatments	Days to cob harvest (days)			Yield (t ha^{-1})		
	50% cob harvest	75% cob harvest	100% cob harvest	Baby corn	Green fodder	Dry fodder
Spatial geometry						
Spacing 40×20 cm^2	55.28	57.67	59.72	1.31	26.52	11.30
Spacing 50×15 cm^2	55.61	57.94	59.39	1.21	28.42	12.02
Paired row planting	54.72	57.00	60.67	1.43	26.78	11.46
SEm±	0.32	0.12	0.39	0.021	3.58	0.138
CD (*p*=0.05)	NS	0.45	NS	0.083	14.05	0.542
NPK fertility level (kg N:P_2O_5:K_2O ha^{-1})						
120: 60: 60	55.83	57.78	59.33	1.21	26.61	11.35
150:75: 75	55.22	57.28	60.00	1.35	27.22	11.58
180:90: 90	54.56	57.56	60.44	1.39	27.89	11.84
SEm±	0.16	0.08	0.10	0.017	0.134	0.056
CD (*p*=0.05)	NS	NS	0.30	0.052	0.414	0.173
Zn fertility level (kg Zn ha)						
2.5	55.26	57.52	59.81	1.29	26.71	11.36
5.0	55.15	57.56	60.04	1.34	27.77	11.83
SEm±	0.09	0.07	0.08	0.013	0.094	0.039
CD (*p*=0.05)	NS	NS	NS	NS	0.278	0.115

early emergence of cobs. The paired row planting recorded significantly higher baby corn yield (1.43 t ha^{-1}) than 40×20 cm^2 spacing and 50×15 cm^2 spacing. The crop under the wider inter row spacing has utilized the available resources more efficiently and hence, producing more yield attributes helped to higher baby corn yield. The crop under closer geometry at 50×15 cm^2 of plant geometry exhibited highest green fodder yield (28.42 t ha^{-1}) as compared to the wider geometry. The closer spaced geometry might have high fodder yield due to the more number of plants ha^{-1} (Mathukia et al., 2014).

3.2.2. *Effect of fertility levels on yield of baby corn and fodder*

Fertility levels exhibited significant influence on days to 100% of harvest of baby cobs. 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1} recorded early cob formation, followed by 150:75:75 kg $N:P_2O_5:K_2O$ ha^{-1} and 120:60:60 kg $N:P_2O_5:K_2O$ ha^{-1} (Table 2). 150:75:75 kg $N:P_2O_5:K_2O$ ha^{-1} and 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1} fertility level reduced span of day to harvest over 120:60:60 kg $N:P_2O_5:K_2O$ ha^{-1} at 50% and 75% cob harvest but increased number of days to 100% cob harvest. Increasing fertility level reduced the span of time to the harvestable stage of baby cobs on 50% cob harvest and due to better nutrition second cob initiation took place which influenced more number of days to 100% cob harvest. This might be due to the more availability of nutrients in soil and luxury consumption by plants. Zinc application with 5.0 kg Zn ha^{-1} had increased the number of days to cob harvest at 75 and 100% cob harvest stage. This was might be the facts that zinc fertilization had significant effect on physiological process, plant metabolism and plant growth. Among the fertility levels, 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1} had significantly improved baby corn yield (1.39 t ha^{-1}) and green fodder yield (27.89 t ha^{-1}), than others. However, medium and high fertility level recorded statistically similar results in case of baby corn yield. Fertility levels improved yield attributes and green fodder yield with successive increase in fertility level upto maximum level of fertility, i.e., 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1}. This might be due to better supply of nutrients which led to the better plant height, more number of green leaves, high value of LAI, increment in SPAD values and significant dry matter accumulation (Sahoo and Mahapatra, 2007). All such improvement in growth parameter reflected profound growth and development and finely resulted in significant increase in yield attributes of baby corn along with fodder yield. Singh and Choudhary (2008) and Panwar (2008) further advocated that the higher the fertility level provides better plant growth, as maize is considered as a heavy feeder crop. Though baby corn yield (1.34 t ha^{-1}) could not vary significantly with application of 5.0 kg Zn ha^{-1}, yet Zn application significantly improved green fodder yield (27.77 t ha^{-1}) with successive increase in Zn level upto 5.0 kg Zn ha^{-1}. This might be due to the fact that Zn is involved in various metabolic functions and enhances synthesis of growth hormones and protein (Meena et al., 2013, Shivay and Prasad 2014, Kumar and Bohra, 2014). The similar trend was noticed in case of dry fodder yield as in green fodder.

3.3. Quality analysis of baby corn and fodder

3.3.1. Quality analysis of baby corn

3.3.1.1. Reducing sugar

Data recorded on reducing sugar content in baby corn revealed that the paired row planting showed significant improvement in the reducing sugar content over 50×15 cm^2 and 40×20 cm^2 planting geometry (Table 3). Fertility levels also caused significant improvement in reducing sugar content in baby corn during the experimentation. Application of 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1} resulted in significant improvement in reducing sugar in baby corn over 150:75:75 kg $N:P_2O_5:K_2O$ ha^{-1} and 120:60:60 kg $N:P_2O_5:K_2O$ ha^{-1} levels, during the period of experimentation. Zn levels also had effect on reducing sugar content in baby corn, with the highest reducing sugar content observed with 5.0 kg Zn ha^{-1} which was statistically at par with 2.5 kg Zn ha^{-1}.

3.3.1.2. Protein content

The protein content in baby corn was significantly influenced by spatial geometries, with the highest value recorded with paired row planting, being at par with 40×20 cm^2 spacing but differed significantly with 50×15 cm^2 spacing. Fertility levels also influenced the protein content in baby corn significantly, with the highest protein content recorded with 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1}, differing significantly with other fertility treatments. Zn levels also had significant effect on protein content in baby corn, with the highest protein content observed with 5.0 kg Zn ha^{-1} which was significantly superior over 2.5 kg Zn ha^{-1}.

3.3.1.3. Zinc content

Like protein content, the zinc content in baby corn was significantly influenced by spatial geometries, with the highest value recorded with paired row planting, being at par with 40×20 cm^2 spacing but differed significantly with 50×15 cm^2 spacing. Fertility levels also influenced the zinc content in baby corn significantly, with the highest zinc content recorded with 120:60:60 kg $N:P_2O_5:K_2O$ ha^{-1}, differing significantly with other fertility treatments. Zn levels also had significant effect on Zn content in baby corn, with the highest zinc content recorded with 5 kg Zn ha^{-1} which was significantly superior over 2.5 kg Zn ha^{-1}. Kar et al. (2006) and Muthukumar et al. (2007) also elucidated the facts on the basis of the results obtained in their studies wherein, the quality characters (nutrient content, protein and sugar) got improved due to increase in the levels of N, P, K and Zn fertilization.

3.3.2. Quality analysis of fodder

Among the spatial geometries, the highest protein, N, P, K and Zn content of fodder of baby corn was found in paired row planting geometry. With respect to protein, N and P content of fodder, the maximum value recorded with paired row planting differed significantly with 40×20 cm^2 spacing, whereas, the K and Zn content recorded with paired row planting was found at par with 40×20 cm^2 spacing but differed significantly

Table 3: Effect of spatial geometry and fertility on quality attributes of baby corn and fodder

Treatments	Quality of baby corn			Quality of fodder				
	Reducing sugar (%)	Protein content (%)	Zn (ppm)	Protein (%)	N (%)	P (%)	K (%)	Zn (ppm)
Spatial geometry								
Spacing 40×20 cm^2	5.83	15.76	29.65	8.76	1.405	0.264	1.893	25.94
Spacing 50×15 cm^2	5.76	14.99	24.98	8.65	1.385	0.212	1.711	21.89
Paired row planting	5.93	16.59	30.92	9.50	1.522	0.282	1.959	26.89
SEm±	0.02	0.30	1.13	0.14	0.023	0.002	0.028	0.52
CD (p=0.05)	0.09	1.17	4.45	0.57	0.090	0.010	0.110	2.04
NPK fertility level (kg $N:P_2O_5:K_2O$ ha^{-1})								
120: 60: 60	5.69	13.59	32.02	8.26	1.324	0.223	1.668	27.89
150:75: 75	5.88	15.72	27.57	8.94	1.433	0.251	1.914	24.17
180:90: 90	5.95	18.03	25.97	9.70	1.556	0.284	1.981	22.67
SEm±	0.02	0.16	0.46	0.07	0.012	0.003	0.015	0.38
CD (p=0.05)	0.06	0.49	1.40	0.22	0.037	0.010	0.046	1.19
Zn fertility level (kg Zn ha)								
2.5	5.81	15.27	27.41	8.72	1.397	0.254	1.812	23.85
5.0	5.87	16.29	29.63	9.22	1.478	0.251	1.897	25.96
SEm±	0.02	0.03	0.31	0.03	0.004	0.003	0.009	0.24
CD (p=0.05)	0.06	0.10	0.91	0.08	0.013	0.008	0.026	0.72

with 50×15 cm^2 spacing. The paired row planting with wider crop geometry had helped the individual plants to make better spatial utilization of available moisture, nutrients and higher interception of solar radiation. The lesser competition contributed towards more dry matter production per plant and ultimately enhancement of the quality parameter of baby corn fodder. Protein, N, P and K content of fodder was found highest with 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1}, differing significantly with other fertility levels, whereas, 120:60:60 kg $N:P_2O_5:K_2O$ ha^{-1} level of fertility resulted in significantly highest zinc content, followed by 150:75:75 kg $N:P_2O_5:K_2O$ ha^{-1} and 180:90:90 kg $N:P_2O_5:K_2O$ ha^{-1}. Kar et al. (2006), Pandey et al. (2000) and Muthukumar et al. (2007) also elucidated the facts on the basis of the results obtained in their studies where in, these qualities characters got improved due to increase in the levels of N, P, K and Zn fertilization. Application of zinc significantly influenced the quality parameters of baby corn fodder. Zn level had improved the percentage of protein, N, P and Zn content of fodder of baby corn with successive increase in zinc level up to 5.0 kg Zn ha^{-1}. The increase in quality parameters owing to zinc application may take part in metabolism of plant as an activator of several enzymes and in turn may directly or indirectly influenced the synthesis of carbohydrate and protein. These results were in conformity with the results of Arya and Singh (2000) and Sangoi et al. (2006), who had reported the vital role of zinc in synthesis of protein and indole acetic acid, chlorophyll formation and carbohydrate metabolism, thereby increasing the carbohydrate and protein content in maize.

4. Conclusion

The paired row planting geometry (30 cm spacing in between two lines in a paired-row; 60 cm between the two paired-rows and 10 cm between plants within a row) was highly effective for baby corn production and may yield higher over conventional planting geometry.

5. References

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