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Research Communication

Growth, yield and economic returns from the dual purpose baby corn (*Zea mays*) under different planting geometry and nitrogen levels

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ABSTRACT

A field experiment was conducted during rainy season of 2012 at Karnal, Haryana to evaluate the effect of 6 planting geometry viz. 40 cm × 15 cm, 40 cm × 20 cm, 50 cm × 15 cm, 50 cm × 20 cm, 60 cm × 15 cm and 60 cm × 20 cm and 4 levels of nitrogen (0, 60, 120 and 180 kg/ha) on dual purpose baby corn (*Zea mays* L.). The plant height, leaf area index (LAI), baby corn yield (1.88 t/ha), total green fodder yield (30.8 t/ha) as well as dry fodder yield (6.52 t/ha) were higher in 50 cm × 15 cm planting geometry than all other planting geometry, however, plant girth and fresh weight per plant were significantly higher in 60 cm × 20 cm planting geometry. Net returns (₹162.4 × 10^3/ha) and benefit: cost ratio (2.31) were higher in 50 cm × 15 cm geometry than all other planting geometry. Most of the growth and yield attributes of baby corn were significantly improved by nitrogen application up to 120 kg N/ha. However, green (32.3 t/ha) as well as dry fodder yield (6.66 t/ha) increased significantly with increase in the level of nitrogen application up to 180 kg/ha. Highest net returns (₹155.9 × 10^3/ha) and benefit: cost ratio (2.21) were recorded with the application of 180 kg N/ha.

Key words : Baby corn, Nitrogen, Planting geometry

The latest livestock census has placed the total livestock population at 529.7 million (GOI, 2012). Livestock sector contributes approximately 4% to GDP and 27% to agriculture GDP (BIEC, Bangaluru, 2013). To feed this huge livestock population, the country must have continuous supply of green as well as dry fodder. At present, the country faces a net deficit of 63% of green fodder and 23% of dry crop residues and 64% feeds and it is expected to increase in near future (ICAR, 2010), due to increasing growth of livestock particularly that of genetically upgraded animals. These animals need supply of high quality fresh fodder. Under this situation, baby corn can be a good option as a dual purpose food cum fodder crop that can maintain the supply of fodder to the burgeoning livestock population of the country. Baby corn refers to the whole, entirely edible cobs of immature corn, harvested just before fertilization at silk emergence stage. It is a dual purpose crop which provides green cobs for human consumption and fodder for livestock within 65–75 days after sowing. It is a low calorie vegetable having higher fibre content without cholesterol, rich in vitamin B and C, potassium, fibres and carotenoids. Among the different agronomic practices, plant density is one of the most important factor determining grain yield and other agronomic attributes of maize. There is an optimum plant density for each crop. Under low plant density, although single-plant production increases, yield per unit area decreases. On the other hand, excessive density can increase the competition and decrease the yield. Regarding nutrient requirement, nitrogen is the most important for the growth and yield of corn. Ideal nitrogen management optimizes grain yield, farm profit and nitrogen use efficiency, while it minimizes the potential for leaching of nitrogen, thus preventing environmental pollution. Keeping all this in view the present experiment was conducted to standardise the planting geometry and nitrogen requirement for maximising growth, yield and economic returns of baby corn.

A field experiment was conducted during rainy (*kharif*) season of 2012 at the Research Farm of Forage Research and Management Centre, National Dairy Research Institute, Karnal, India, situated at 29^0 43' N latitude and 76^0 58'

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E longitudes and at an altitude of 245 meter above mean sea level. The soil of the experimental field was clay loam in texture. Chemical analysis of the soil (top 15 cm) showed a neutral pH (7.3), 0.52% organic carbon, 202.8 kg/ha permanganate extractable nitrogen, 35 kg/ha Olsen's (0.5 M $NaHCO_3$ extractable) phosphorus and 290.5 kg/ha exchangeable potassium. Total rainfall and evaporation received during the crop season was 403.2 mm and 324.1 mm respectively. The field experiment was laid out in split plot design with six treatments of planting geometry (40 cm × 15 cm (166,666 plants/ha), 40 cm × 20 cm (1,25,000 plants/ha), 50 cm × 15 cm (133,333 plants/ha), 50 cm × 20 cm (100,000 plants/ha), 60 cm × 15 cm (111,111 plants/ha) and 60 cm × 20 cm (83,333 plants/ha) in main plots and four levels of nitrogen (0, 60, 120 and 180 kg/ha) in sub plots with four replications. The variety 'HM 4' of baby corn was selected as a test crop. Nitrogen as per the treatments was applied in three splits. Half dose of nitrogen along with 60 kg P_2O_5 and 40 kg K_2O was applied at the time of sowing. The remaining dose of nitrogen was applied equally in two splits at 30 and 45 DAS. Ten plants were tagged randomly from each plot for recording of growth and yield attributes. Five pickings of baby corn were taken at an interval of 3–4 days. Fresh weight per plant was recorded from ten plants of each plot. The cob and baby corn yield were calculated by adding the yield from all the five pickings and fodder yield was calculated from the weight of plants per plot at the time of harvest and added with tassel (regular detasseling was done just after tassel emergence and weighed each time) and husk yield (obtained by subtracting baby corn yield from cob yield). Net monetary returns and benefit: cost ratios were calculated on the basis of prevailing market price of inputs and outputs. Statistical analysis of the recorded data for each character was done using the standard procedures of analysis of variance in split plot design with the help of statistical software IRRISTAT (IRRI, 1999) and statistical mean differences were found by Fisher's protected least significant difference test at $P < 0.05$.

Planting geometry of 50 cm × 15 cm recorded higher plant height and leaf area index as compared to other planting geometry, however highest plant girth was recorded in 60 cm × 20 cm planting geometry (Table 1). The increase in plant height may be attributed to increase in the inter-plant competition over light, whereas, higher leaf area index in closer spacing may be the reflection of proper exploitation of ground area. The reduction in stem diameter with increased plant density could be due to the intensified inter-plant competition for environmental parameters (light, water, space) (Moosavi *et al.*, 2012). The highest plant height, plant girth, as well as leaf area index were recorded with the application of 180 kg N/ha. Higher plant height and girth may be attributed to better availability of nitrogen at higher levels of its application, while as, increase in LAI might be due to more number of leaves and leaf area per plant.

The planting geometry of 60 cm × 20 cm recorded significantly higher fresh weight per plant as compared to all other planting geometries (Table 1). The increase in fresh weight per plant may be due to reduction in competition among plants for growth factors in wider spacing. However highest cob and baby corn yield as well as total green

Table 1. Effect of planting geometry and nitrogen levels on growth attributes of baby corn, fresh weight per plant (g), cob yield and baby corn yield at harvest.

Treatment	Plant height (cm)	Plant girth (cm)	Leaf area index	Fresh weight per plant (g)	Cob yield (t/ha)	Baby corn yield (t/ha)
	At harvest					
Planting geometry						
40 cm × 15 cm	142	6.4	6.78	333	6.70	1.45
40 cm × 20 cm	144	6.7	5.88	365	6.99	1.63
50 cm × 15 cm	147	6.5	7.67	354	7.36	1.88
50 cm × 20 cm	138	7.3	5.32	403	6.28	1.22
60 cm × 15 cm	146	7.1	5.67	384	6.56	1.34
60 cm × 20 cm	135	7.5	4.70	428	5.95	1.08
SEm±	1.4	0.1	0.09	5.1	0.18	0.05
CD (P=0.05)	4.3	0.4	0.26	15.1	0.54	0.15
Nitrogen (kg/ha)						
0	108	4.6	5.74	253	4.86	0.90
60	138	7.4	5.86	371	6.84	1.39
120	159	7.8	6.16	440	7.33	1.67
180	163	7.9	6.25	448	7.52	1.77
SEm±	1.2	0.1	0.08	3.2	0.10	0.04
CD (P=0.05)	3.6	0.2	0.25	9.5	0.30	0.13

Table 2. Effect of planting geometry and nitrogen levels on green fodder yield, dry fodder yield (t/ha) and economics of baby corn production

Treatment	Green fodder yield (t/ha)				Total dry fodder yield (t/ha)	Cost of cultivation (×10^3 ₹/ha)	Net returns (×10^3 ₹/ha)	Benefit: cost ratio
	Fodder yield (without cob and tassel)	Tassel yield	Cob husk yield	Total green fodder yield				
Crop geometry								
40 cm × 15 cm	22.1	1.47	5.26	28.8	5.84	72.3	114.2	1.58
40 cm × 20 cm	22.7	1.59	5.37	29.6	6.24	69.9	135.7	1.94
50 cm × 15 cm	23.7	1.70	5.48	30.8	6.52	70.4	162.4	2.31
50 cm × 20 cm	21.2	1.44	5.06	27.7	5.63	68.1	93.6	1.37
60 cm × 15 cm	20.7	1.37	5.22	27.3	5.54	68.9	104.1	1.51
60 cm × 20 cm	20.1	1.30	4.86	26.3	5.37	66.8	79.7	1.19
SEm±	0.5	0.07	0.25	0.7	0.13			
CD (P=0.05)	1.6	0.21	0.74	2.1	0.37			
Nitrogen (kg/ha)								
0	14.3	0.83	3.97	19.1	4.00	67.9	49.5	0.73
60	21.3	1.37	5.46	28.2	5.83	69.1	110.2	1.59
120	24.9	1.76	5.66	32.3	6.66	69.9	144.2	2.06
180	26.4	1.96	5.75	34.1	6.94	70.7	155.9	2.21
SEm±	8.8	0.65	1.92	11.4	2.31			
CD (P=0.05)	0.6	0.04	0.20	0.7	0.16			

and dry fodder yield was found in 50 cm × 15 cm planting geometry. The higher plant population resulted in higher number of cobs and plants per hectare, resulting in higher cob and fodder yield. Increase in biological yield at higher plant population might be due to increase in number of plants as well as in plant height of individual plants at denser populations. Both fresh weight/plant as well as cob and baby corn yield increased significantly with increase in level of nitrogen application up to 120 kg N/ha, however, total green and dry fodder yield increased significantly up to180 kg N/ha. This may be attributed to better availability of nitrogen at higher levels of its application, resulting in higher plant height, weight/plant and ultimately higher yield (Singh *et al.*, 2012).

Highest net income (₹162.4 × 10^3/ha) and benefit: cost ratio (2.31) was recorded in planting geometry of 50 cm × 15 cm as compared to other planting geometries (Table 2). This may be attributed to higher yield of baby corn as well as fodder in closer geometries. There was an increase in net income from ₹49.4 × 10^3/ha to ₹155.9 × 10^3/ha and benefit: cost ratio from 0.73 to 2.21 with increase in the level of nitrogen application from 0 to 180 kg N/ha. The higher economic returns and benefit:cost ratio at higher levels of nitrogen application was due to higher baby corn as well as fodder yield.

The findings of the present study elucidates that planting of baby corn at 50 cm x 15 cm resulted in higher growth and yield attributes and finally yield and economics of baby corn production. Most of the growth attributes as well as cob and baby corn yield increased with increase in the level of N application upto 120 kg N/ha. However, green fodder yield, dry fodder yield, net returns (₹155.9 × 10^3/ha) and benefit: cost ratio were significantly improved up to 180 kg N/ha.

REFERENCES

BIEC, Bangaluru. 2013. International Poultry and Livestock Expo. Held during 23–25 August, 2013, BIEC, Bangaluru, India.

GOI. 2012. *Agricultural Statistics at a Glance*. Ministry of Agriculture, Department of Agriculture and cooperation, Directorate of Economics and Statistics, Government of India, pp. 80.

ICAR. 2010. *Handbook of Agriculture 6th Edition*, Directorate of Knowledge Management in Agriculture, Indian Council of Agricultural Research, New Delhi, India.

IRRI. 1999. *IRRISTAT for windows version 4.0*. Biometrics unit, IRRI, Los Banos, Phillippines.

Moosavi, S.G., Seghatoleslami, M.J. and Moazeni, A. 2012. Effect of planting date and plant density on morphological traits, LAI and forage corn (Sc. 370) yield in second cultivation. *International Research Journal of Applied and Basic Sciences* **3**(1): 57–63.

Singh, U., Saad, A.A., Ram, T., Chand, L., Mir, S.A. and Aga, F.A. 2012. Productivity, economics and nitrogen-use efficiency of sweet corn (*Zea mays saccharata)* as influenced by planting geometry and nitrogen fertilization. *Indian Journal of Agronomy* **57**(1) : 43–48.