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Influence of organic and inorganic nutrient management on growth and yield of baby corn (*Zea mays* L.) under high density planting system

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Abstract
The field experiment was conducted at Central Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, (U.P.) during *Zaid*-2020. The soil of experimental site was sandy loam in texture, nearly neutral in soil reaction (pH 7.3), EC (dS m^{-1}), available N (kg ha^{-1}), available P (kg ha^{-1}) and available K (kg ha^{-1}). The experiment was laid out in Randomized Block Design and having ten treatment consisted of Different sources of Nitrogen levels 100% Nitrogen through urea (N1), 75% Nitrogen through Urea + 25% Nitrogen through FYM (N2), 50% Nitrogen through Urea +50% Nitrogen through FYM (N3) and different row spacing 25 cm x 15 cm (S1), 35 cm x 15 cm (S2) and 45 cm x 15 cm (S3) which are replicated thrice and effect was observed on G-5414 variety of Baby corn. The result shown application of 50% Nitrogen through Urea + 50% Nitrogen through FYM +45 x 15 cm significantly maximum plant height (186.5 cm), application of 50% Nitrogen through Urea + 50% Nitrogen through FYM +35 x 15 cm, Dry Weight (106.08 g), CGR (0.0107 g m^{-2}/day) in application of 50% Nitrogen through Urea + 50% Nitrogen through FYM +25 x 15 cm, RGR (0.135 g $g^{-1}day^{-1}$) was found maximum value of application of 50% Nitrogen through Urea + 50% Nitrogen through FYM +25 x 15 cm and Number of cobs/plant (1.67), Cobs Length of with husk (44.41 cm) and without husk (22.31 cm), Weight of cobs yield (t/ha) with husk (239.1 kg/ha) and without husk (46.9 kg/ha), Stover yield (22.53 t/ha), 50% Nitrogen through Urea + 50% Nitrogen through FYM +35 x 15 cm. Gross return (INR 4,03,710), Net return (INR 2,86,306), and B:C ratio (3.4) was recorded in N3S3 - 50% Nitrogen through Urea + 50% Nitrogen through FYM + 35 x 15cm.

Keywords: Nitrogen levels, spacing, baby corn

Introduction
Pearl millet (*Pennisetum glaucum* L.) is the most important crop in the drier parts of the semi-arid tropics and accounts for almost half of the global production of millet species among the various cultivated millet species (Singh *et al*. 2017; Vinoth and Ravindran, 2017).
Maize (*Zea mays* L.) is the most versatile crop with the greatest adaptability to different agro-ecological conditions. It is an annual C4 plant from the Poaceae family, originating in Central America. Corn is one of the most important grain crops in world agriculture, it is grown worldwide as it has the highest genetic yield potential of any other grain crop and there is no grain on earth that has such immense potential and hence is known as the "Queen of the Grains" or Miracle Harvest (Ratuarary *et al*. 2013). Baby corn (also known as baby corn, mini corn, or candle corn) is the corn cob plant (*Zea mays* L.), a plant that is harvested young when the stigmas have not yet grown or are just beginning to grow and fertilization has not occurred. Baby corn is one of the most important dual-purpose perennial crops in India (Singh *et al*. 2015) [15].
Maximum yield in baby corn cannot be acquired only by application of inorganic or organic means of nutrient source. Plant density plays an important role in maintaining plant population, yield of crop, incidence to pest and diseases, etc. In agronomy only nutrient application without following proper planting density cannot lead to better yield of crop. So, an integrated approach of both organic and inorganic mean along with proper agronomic practice like maintaining proper plant density can lead to maximum yield of baby corn in a sustainable way (Babu *et al.* 2020) [3].

Nutritional Value Even with a low calorie count, baby corn is no slouch when it comes to nutritional value. It is a nutrient dense vegetable that is packed with essential vitamins and minerals. for your body. Here is the nutritional information for corn on the cob according to Dr. Arushi: Baby corn (100 g) calories: 96, proteins: 3.4 grams, carbohydrates: 21 grams, fiber: 2.4 grams, fat: 1.5 grams. Baby corn is a short-lived crop, allowing the farmer to get the maximum harvest from his field, doubling the farmer's income. Ecological value Compared to conventional farming, organic farming uses fewer pesticides, reduces soil erosion, reduces nitrogen leaching into ground and surface water, and recycles animal waste back to the farm. These benefits are offset by higher food costs for consumers and lower yields in general. The high cost of fertilizers and the instability of crop production necessitate the replacement of part of the inorganic fertilizers with locally available, low-cost organic sources such as FYM, Green Manure and vermin-compost in an integrated manner for sustainable production and to maintain soil health. Integrated nutrient management with sharing of organic, inorganic and plant residues can improve soil productivity.

Materials and Methods

The experiment was conducted during the *Zaid* season of 2021 at the Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Science (SHUATS), Prayagraj (Allahabad) (U.P.). The Crop Research Farm is situated at 25.57º N latitude, 87.19º E longitude and at an altitude of 98m above mean sea level. This area is situated on the right side of the river *Yamuna* and by the opposite side of Prayagraj City. All the facilities for crop cultivation were available.

Soil of the experimental field:-

The soil of the experimental field constituting a part of central Gangetic alluvium and is neutral and deep. In order to evaluate the physio-chemical properties, soil samples from 0-30 cm depth were taken from five spots of the layout of experimental field and mixed all the composite sample thoroughly and processing of all soil samples together. The sample was subjected to analysis the mechanical, physical and chemical analysis.

The experimental site was uniform in topography and sandy loam in texture, nearly neutral in soil reaction (pH 7.2), medium in Organic carbon (0.72%), Available nitrogen (203.7 kg ha^{-1}), Available phosphorus (17.2 kg ha^{-1}), and Available potassium (208.8 kg ha^{-1}). Nutrient sources were Urea, SSP, MOP to fulfill the necessity of Nitrogen, phosphorous and potassium. The application of fertilizers was applied as basal at the time of sowing. Nitrogen applied as split dose half as basal dose remaining as top dressing.

In the period from germination to harvest several plant growth parameters were recorded at frequent intervals along with it after harvest several yield parameters were recorded those parameters are growth parameters, plant height, Length of cob and plant dry weight are recorded. The yield parameters like cob weight, grain yield, test weight (1000 seeds), Stover yield and harvest index were recorded and statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Gomez K.A. and Gomez A.A. 1984) [8].

Table 1: Mean weekly weather parameters and total rainfall during the cropping season (*Zaid*, 2021).

Months	Weeks	Temperature (1°C)		Relative humidity (%)		T rainfall (flinch)
		Max.	Ma.	Max.	Min.	
1	2	3	4	5	6	7
	4	37.50	20.80	79.00	34.50	0.00
March,	5	40.05	21.30	76.75	31.75	0.00
	1	40.40	20.13	77.67	33.00	0.00
	2	41.63	18.14	79.86	30.43	0.00
April, 2021	3	42.06	19.66	75.57	29.57	0.00
	4	42.34	21.11	72.57	29.00	0.00
	5	42.73	21.63	69.67	28.50	0.00
	1	42.60	22.60	71.00	31.00	0.00
	2	37.51	23.09	80.71	40.29	1.31
May, 2021	3	39.26	23.60	78.86	35.86	0.17
	4	36.83	22.74	37.00	50.00	17.83
	5	31.20	22.46	86.86	61.00	1.23
	6	33.60	23.30	87.00	49.50	0.00
June,	1	34.60	24.60	86.00	42.00	0.00

Table 2: Cropping history of the experimental field.

Year	Cropping scheme		
	Kharif	Rabi	*Zaid*
2015-2016	Black gram	Wheat	Black gram
2016-2017	Mustard	Sweet corn	Sesame
2017-2018	Groundnut	Mustard	Green gram
2018-2019	Maize	Chickpea	Baby corn
2019-2020	Green gram	Chickpea + Mustard	Pearl millet

Table 3: Details of different pre and post sowing operation of the experimental field

Sl. No	Observation	Frequency	Size of sample (number of plants per plot)	Days after sowing
A	**Soil analysis**			
1	Initial	1	From different part of field	1 days after sowing
2	Final	1	From different part of field	At harvest time
B	**Growth attributes**			
1	Plant height(cm.)	5	5 plants	15,30,45 and 60 days after sowing
2	Dry matters per plant	5	3 plants	15,30,45 and 60 days after sowing
C	**Yield and Yield contributing characters**			
1	No. of cobs plant^{-1}			
2	Length of cobs plant^{-1}			
3	Weight of cobs yield			

Table 4: Effect of Organic and Inorganic Nutrient Management on Growth and Yield of Baby Corn (*Zea mays* L.)

Treatment No.	No. of cobs/plant	Cob length with husk (cm)	Cob yield (q/ha)	Green fodder yield (t/ha)	Gross Return (Rs/ha)	Total cost of cultivation (Rs/ha)	Net Return	Benefit Cost Ratio
1.	1.27	30.66	117.3	09.70	1,95,350	Rs84,004	1,11,346	1.3
2.	1.33	39.45	141.0	19.00	2,49,500	Rs84,004	1,65,496	1.9
3.	1.40	32.60	140.0	15.13	2,40,260	Rs84,004	1,56,256	1.8
4.	1.47	31.53	148.1	15.27	2,52,690	Rs84,004	1,68,686	2.0
5.	1.53	37.53	182.3	19.13	3,11,710	Rs1,00,704	2,11,006	2.0
6.	1.40	34.23	168.2	17.77	2,87,840	Rs1,00,704	1,87,136	1.8
7.	1.47	32.40	159.3	15.63	2,70,210	Rs1,00,704	1,69,506	1.7
8.	1.60	33.01	168.3	16.77	2,85,990	Rs1,17,404	1,68,586	1.4
9.	1.67	44.41	239.1	22.53	4,03,710	Rs1,17,404	2,86,306	3.4
10.	1.20	35.83	175.7	18.57	3,00,690	Rs1,17,404	1,83,286	1.6

Results and Discussion

Cobs yield (q ha^{-1}) with and without husk

The data obtained on Weight of cobs yield (kg ha^{-1}) with and without husk affected by treatments are presented in Table 4.2.2. In general the Weight of cobs yield (kg ha^{-1}) with and without husk differed with the advancement in crop stage, irrespective of the treatment and reached maximum at the time of harvest. The Weight of cobs yield (kg ha^{-1}) with and without husk of Baby corn was recorded at 60 DAS differed significantly with treatment combinations.

At 60 DAS, Weight of cobs yield was found significant and highest Weight of cobs yield (q/ha) with husk (239.1 q ha^{-1}) and without husk (46.9 kg ha^{-1}) was recorded in T_9: 50% Nitrogen through Urea + 50% Nitrogen through FYM + 35 x 15 cm and lowest Weight of cobs/plant (cm) with husk (117.3 q ha^{-1}) was recorded in Farmers practice- urea (120:60:40 kg ha^{-1} N, P and K) + spacing 60 x 25 cm. and without husk (39.3 q ha^{-1}) was recorded in T_{10}: 50% Nitrogen through Urea + 50% Nitrogen through FYM + 45 x 15 cm.

Economics

The highest gross return (INR 403710 ha^{-1}), net return (INR 286306 ha^{-1}) and benefit cost ratio (3.4) were observed by the application of T_9: 50% Nitrogen through Urea + 50% Nitrogen through FYM + 35 x 15 cm. Whereas the lowest value gross return (INR 195350 ha^{-1}) and net return (INR 111346 ha^{-1}) respectively were observed by the application of T1: Farmers practice- urea (120:60:40 kg ha^{-1} N, P and K) spacing 60 x 25 cm.

Conclusion

It may be concluded that application of 50% Nitrogen through Urea + 50% Nitrogen through FYM + 35 x 15 cm was found to be the best treatment for obtaining higher growth and yield parameters like number of cob plant(1.67), cobs length with husk (44.41 cm) and without husk (22.31 cm), cobs yield with husk (239.1 q/ha) and without husk (46.9 q/ha), Fodder yield (22.53 t/ha), Gross return (INR 4,03,710), Net returns (INR 2,86,306) and B:C ratio (3.4) was also obtained in this treatment. Since the results in based on experiment, further trials may be done to confirm the findings.

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