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RESEARCH PAPER

Yield and economics of sweet corn (*Zea mays* L.) cultivars as influenced by plant population and fertility levels on yield attributes and their interaction effect under zone IV a of Rajasthan

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Abstract : A field experiment was conducted during *Kharif* 2001 and 2002 to compare efficacy of three cultivars, three plant population and three fertility levels in sweet corn at the Instructional Farm (Agronomy), RCA, Udaipur (Rajasthan). The test cultivar Madhuri recorded maximum net returns (Rs 56941 ha^{-1}) and B/C ratio (5.99:1) and remained at par to genotypes JKSCH 211. Among plant population, 75 thousands plant population recorded significantly maximum green cob and green fodder yield and fetched maximum net returns and B/C ratio than 55000 plants ha^{-1}. With regards to fertility levels, application of 90:45 kg N: P_2O_5 ha^{-1} and 120:60 kg N: P_2O_5 ha^{-1} levels of fertility remained at par with each other in terms of yield and economics and application of 90:45 kg N: P_2O_5 ha^{-1} recorded 21.13 and 15.72 per cent higher in green cob and green fodder yield and 23.18 and 16.31 per cent higher in net returns and B/C ratio. Combined application of 75000 plant population alongwith 90:45 kg N: P_2O_5 ha^{-1} recorded significantly higher green cob and green fodder yield by 33.59, 28.93 and net returns and B/C ratio by 37.19 and 23.52 per cent higher over 55,000 plants ha-1 alongwith 60:30 kg N: P_2O_5 ha^{-1} level of fertility.

Key Words : Sweet corn, Plant population, Fertility levels, Cultivars, Yield, Economics

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INTRODUCTION

Sweet corn is special type of corn used for table purpose. It is one of the most popular vegetables in USA, Europe and other advanced countries of the world. Approximately 40 per cent of such corn is frozen and the rest is canned while processing. Now-a-days sweet corn is becoming popular and is being cultivated in maize growing areas of India. Being a high value crop, there is growing demand for sweet corn in star hotels for soup making. In addition, the seed of this crop is used for canning purpose and for preparation of different sweet items. The farmers dwelling at the outskirts of the cities can take up this crop for better profits. Added advantage of sweet corn is that after the harvest of green ears, the crop remains at green stage and it is fit for feeding cattle as green fodder. Due to its short duration, it is finding place in different cropping systems. It has been tried in different low canopy crops like groundnut, greengram, blackgram and high canopy crops like redgram of varying durations as intercrop and found most suitable.

Since the production technology is not available for sweet corn in relation to suitable cultivars, optimum plant densities and nutrient management in the state of Rajasthan and in particular Udaipur region of agroclimatic zone IV a

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(Sub-Humid Southern Plain and Aravalli Hills), the trial was conducted.

MATERIAL AND METHODS

The field experiment was conducted at the Instructional Farm (Agronomy), Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan) during the *Kharif*, 2001 and 2002. The soil of experimental site was clay loam in texture and alkaline in reaction (pH 7.8). It was medium in available nitrogen (277.24 kg/ha) and available phosphorus (18.98 kg/ha) and high in available potassium (365.64 kg/ha). The experiment was laid out in Randomized Block Design with four replications. The treatments comprised of three cultivars (Mahi Kanchan, JKSCH-211 and Maduri), three plant population (55, 65 and 75 thousand plants/ha) and three fertility levels (60 : 30, 90 : 45 and 120 : 60 kg N : P_2O_5 / ha). The fertilizer full dose of phosphorus and one-third dose of nitrogen was applied through DAP and urea at sowing by drilling in furrows at 5 cm below the seeding depth. The remaining two-third dose of nitrogen was applied through urea as top dressing in two equal splits, at knee high and initiations of tasseling stages of crop growth. The crop was sown on 5th July, 2001 and 9th July, 2002 during two years. The sweet corn crop was sown for green cobs purpose the crop was harvested about 75 days after sowing during both the years.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Yield:

The test cultivars were observed at par with each other in respect of green cob yield as well as green fodder yield (Table 1).Increasing population density from 55 thousand to 75 thousand plants/ha brought about significant increases in green cob yield and green fodder yield. Population at 75 thousand plants/ha produced the highest green cob yield of 76.98 q/ha and recorded an increase of 5.9 and 14.9 per cent over 65 thousand and 55 thousand plants/ha, respectively. This seems to have compensated more than the improvement in performance of individual plant with regard to various growth and yield components suggesting that at this level inter and intra-plant competition was to such an extent which could be compensated by increased number of plants. The results are in conformity with the findings of Ameta (1993) and Totawat *et al.* (2001)

Varying fertility levels significantly affected green cob and green fodder yield. Application of 90 kg N + 45 kg P_2O_5/ha level produced significantly higher green cob yield over 60 kg N + 30 kg P_2O_5/ha level but was found at par with 120 kg N + 60 kg P_2O_5/ha (Table 2). Application of 120 kg N + 60 kg P_2O_5/ha and 90 kg N + 45 kg P_2O_5/ha levels gave significantly higher green cob yield by 21.5 and 21.1 per cent, respectively over 60 kg N + 30 kg P_2O_5/ha level. The higher yield of sweet corn realization with application of balanced and higher level of plant nutrition could be ascribed to its profound influence on vegetative and reproductive

Table 1 : Effect of plant population and fertility level on yields and economics of sweet corn cultivars (Pooled data of 2 years)

Treatments	Yields (q/ha)						Economics	
	Green cob			Green fodder			Net returns (Rs/ha)	B/C ratio
Cultivar	2001	2002	Pooled	2001	2002	Pooled		
Mahi Kanchan	72.44	74.11	73.27	108.67	111.70	110.18	29265	3.30
JKSCH-211	70.20	72.13	71.16	105.54	109.38	107.46	56045	5.90
Madhuri	71.12	73.27	72.19	106.75	109.98	108.37	56941	5.99
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	1829	0.19
Plant population (plants/ha)								
55000	65.89	68.07	66.98	99.25	102.64	100.95	43490	4.77
65000	71.73	73.60	72.67	107.12	110.55	108.83	47800	5.10
75000	76.13	77.84	76.98	114.59	117.87	116.23	50961	5.31
C.D. (P=0.05)	3.31	2.95	2.20	5.11	4.28	3.31	1829	0.19
Fertility level (N:P_2O_5 kg/ha)								
60 : 30	62.42	64.03	63.22	96.27	100.11	98.19	41155	4.66
90 : 45	75.55	77.60	76.58	112.09	115.17	113.63	50694	5.42
120 : 60	75.79	77.88	76.83	112.62	115.78	114.20	50401	5.11
C.D. (P=0.05)	3.31	2.95	2.20	5.11	4.28	3.31	1829	0.19

NS=Non-significant

growth of the crop. Raja (2001) also reported the positive response of maize crop to balanced fertilization. The results are in close conformity with the findings of Totawat *et.al.* (2001), Joshi (2011), Meena (2012) and Rathor (2012).

Economics:

Cultivars JKSCH-211 and Madhuri were found at par and both these cultivars gave significantly higher net returns and benefit : cost ratio over Mahi Kanchan (check). Madhuri recorded the highest net returns of Rs. 56941/ha and benefit : cost ratio of 5.99. Significant increases in net returns and benefit : cost ratio were obtained with increasing plant population from 55 thousand to 75 thousand plants/ha. The maximum net returns (Rs. 50961/ha) and benefit : cost ratio (5.31) was recorded at density of 75 thousand plants/ha. Application of 90 kg N + 45 kg P_2O_5/ha gave significant and economically highest net returns and benefit: cost ratio over 120 kg N + 60 kg P_2O_5/ha and 60 kg N + 30 kg P_2O_5/ha levels. The results are in accordance with the findings of Joshi (2011), Meena (2012), Rathor (2012) and Golada (2012).

Interaction effect of plant population and fertility levels:

Data presented in Table 2 reveals that plant population 75,000 plants ha^{-1} alongwith 90 kg N + 45 kg $P_2O_5ha^{-1}$ remained at par to same population density under higher level of NP fertilization and significantly recorded 34.05, 33.12 and 33.59: 29.68, 28.61 and 28.93; 37.98, 36.44 and 37.19 and 24.14, 22.71 and 23.52 per cent, respectively higher in green cob and green fodder yield, net profit and B/C ratio over 55000 plants alongwith 60 kg N + 30 kg $P_2O_5ha^{-1}$ during 2001, 2002 as well as on pooled basis. Golada (2012) and Meena (2012) reported the same findings on maize crop.

Correlation studies:

Data (Table 3) revealed that a significant and positive correlation between LAI and LA at 25, 50 DAS and at harvest was seen (0.630**, 0.636** and 0.635** in 2001 and 0.622**, 0.620** and 0.619** in 2002**). The improvement in LAI with increasing plant density is believed to on account of reduced space area $plant^{-1}$ at one hand while on other hand, presumably increased number of plants $unit^{-1}$ area. This might have led to increased number of leaves per unit area. These results are in accordance with the findings of Singh and Srivastava (1991). The correlation analysis is also marked positive inter relationship between green cob yield and yield attributes *viz*., length of cob (0.720** and

Table 2 : Combined effect of plant population and fertility level on green cob yields

Plant population (‘000 plants/ha)	2001 60:30	2001 90:45	2001 120:60	2002 60:30	2002 90:45	2002 120:60	Pooled 60:30	Pooled 90:45	Pooled 120:60
Fertility levels (NP kg/ha)									
55	61.50	67.95	68.24	63.13	70.43	70.65	62.31	69.19	69.45
65	62.50	76.27	76.43	63.84	78.38	78.62	63.17	77.30	77.53
75	63.25	82.44	82.70	65.13	84.04	84.35	64.19	83.24	83.53
C.D. (P=0.05)	5.74			5.11			3.81		
Green fodder yield (q/ha)									
55	94.63	101.21	101.93	97.85	104.72	105.36	96.24	102.96	103.64
65	96.39	112.33	112.65	100.38	115.35	115.91	98.38	113.84	114.28
75	97.78	122.72	123.27	102.10	125.45	126.07	99.94	124.08	124.67
C.D. (P=0.05)	8.86			7.41			5.73		
Net returns (Rs/ha)									
55	39954	44082	43824	41328	46032	45720	40641	45057	44772
65	40561	50371	50006	41806	52166	51892	41183	51269	50949
75	40872	55129	54841	42411	56386	56123	41642	55757	55482
C.D. (P=0.05)	4787			4226			3168		
BC ratio									
55	4.64	4.83	4.55	4.80	5.04	4.74	4.72	4.94	4.65
65	4.59	5.39	5.07	4.73	5.58	5.26	4.66	5.48	5.17
75	4.51	5.76	5.44	4.68	5.89	5.57	4.60	5.83	5.50
C.D. (P=0.05)	0.51			0.45			0.34		

Table 3 : Correlation coefficient (r) and regression equation (Y = a + b X) between various crop parameters

Sr. No.	Dependent variable (Y)	Independent variable (X)	Correlation coefficient (r)		Regression equation (Y=a+bx)	
			2001	2002	2001	2002
1.	Green cob yield (q/ha)	Dry matter at harvest (g $plant^{-1}$)	0.523**	0.613**	Y=24.865+0.445x	Y=19.201+0.505x
2.	Green cob yield (q/ha)	Plant height at harvest (cm)	0.840**	0.851	Y=-6.870+0.409x	Y=-10.233+0.431x
3.	Green cob yield (q/ha)	Length cob (cm)	0.720**	0.716**	Y=5.191+3.537x	Y=5.061+3.595x
4.	Green cob yield (q/ha)	Girth of cob (cm)	0.761**	0.735**	Y=8.401+4.894x	Y=6.884+5.087x
5.	Green cob yield (q/ha)	Grain rows per cob (number)	0.726**	0.728**	Y=7.991+4.396x	Y=9.000+4.425x
6.	Green cob yield (q/ha)	Fresh wt of(g) of cob/plant (with husk)	0.564**	0.606**	Y=17.111+0.384x	Y=12.551+0.420x
7.	Green cob yield (q/ha)	Fresh wt of(g) of cob/plant (without husk)	0.670**	0.660	Y=10.247+0.502x	Y=10.407+0.494x
8.	Green fodder yield (q/ha)	Dry matter at harvest (g $plant^{-1}$)	0.439*	0.491**	Y=55.359+0.495x	Y=55.370+0.515x
9.	Dry matter at 50 DAS (g $plant^{-1}$)	CGR between 25-50 DAS	0.471*	0.455*	Y=45.118+1.470x	Y=47.997+1.435x
10.	Dry matter at harvest (g $plant^{-1}$)	CGR between 50 DAS- at harvest	0.503**	0.531**	Y=68.538+3.386x	Y=71.803+3.363x
11.	Dry matter at harvest (g $plant^{-1}$)	N uptake (kg/ha) at harvest	0.533*	0.530**	Y=70.691+0.350x	Y=73.768+0.321x
12.	Dry matter at harvest (g plant	P uptake (kg/ha) at harvest	0.568**	0.597**	Y=69.118+2.297x	Y=70.455+2.261
13.	Dry matter at harvest (g plant	K uptake (kg/ha) at harvest	0.424*	0.451*	Y=74.474+0.299x	Y=75.473+0.303x
14.	Dry matter at harvest (g plant	Plant height at harvest (cm)	0.768**	0.822**	Y=20.391+0.440x	Y=9.027+0.505x
15.	Dry matter at harvest (g plant	Length cob (cm)	0.889**	0.899**	Y=8.503+5.131x	Y=3.085+5.473x
16.	Dry matter at harvest (g plant	Girth of cob (cm)	0.913**	0.925**	Y=15.767+6.896x	Y=5.655+7.760x
17.	Dry matter at harvest (g plant	Grain rows per cob (number)	0.926**	0.933**	Y=9.490+6.591x	Y=7.025+6.878x
18.	Dry matter at harvest (g plant	Fresh wt of(g) of cob/plant (with husk)	0.949**	0.950**	Y=2.712+0.758x	Y=-8.471+0.798x
19.	Dry matter at harvest (g plant	Fresh wt of(g) of cob/plant (without husk)	0.910**	0.911**	Y=6.924+0.802x	Y=1.715+0.827x
20.	Green cob yield (q/ha)	N uptake (kg/ha) at harvest	0.912**	0.907**	Y=22.272+0.510x	Y=26.642+0.453x
21.	Green cob yield (q/ha)	P uptake (kg/ha) at harvest	0.916**	0.925**	Y=22.906+3.153x	Y=26.747+0.2.891x
22.	Green cob yield (q/ha)	K uptake (kg/ha) at harvest	0.891**	0.882**	Y=17.945+0.534x	Y=22.692+0.490x
23.	Green fodder yield (q/ha)	N uptake (kg/ha) at harvest	0.905**	0.911**	Y=42.526+0.671x	Y=50.836+0.579x
24.	Green fodder yield (q/ha)	P uptake (kg/ha) at harvest	0.903**	0.918**	Y=43.792+4.122x	Y=51.693+3.653x
25.	Green fodder yield (q/ha)	K uptake (kg/ha) at harvest	0.893**	0.901**	Y=36.119+0.710x	Y=44.723+0.637x
26.	Leaf area (cm^2) at 25 DAS	LAI at 25 DAS	0.630**	0.622**	Y=784.324+449.415x	Y=846.885+410.935x
27.	Leaf area (cm^2) at 50 DAS	LAI at 50 DAS	0.636**	0.620**	Y=2668.665+456.272x	Y=2769.783+434.394x
28.	Leaf area (cm^2) at harvest	LAI at harvest	0.635**	0.619**	Y=3545.479+455.761x	Y=3683.879+435.941x

* and ** indicate significance of values at P=0.05 and 0.01, respectively

0.716**), girth of cob (0.761** and 0.735**), number of grain rows per cob (0.726** and 0.728**), fresh weight of cob with and without husk (0.5364** and 0.606** and 0.670 and 0.660**) clearly suggests that green cob yield was dependent on several components which are interrelated to each other. The nutrient uptake by the crop is largely dependent on the total biomass production and concentration of nutrient in plant at celluar level. The correlation studies also indicated a positive inter relationship between dry matter accumulation of maize and total N uptake (0.533** and 0.530**), total P uptake (0.568** and 0.597**) and total K uptake (0.424** and 0.451**). The results confirms the findings of Totawat *et al.* (2001), Joshi (2011), Meena (2012) and Rathor (2012).

REFERENCES

Ameta, G.S. (1993). Response of winter maize (*Zea mays* L.) to nitrogen fertilization in relation to varying population density and row spacing. *Forty fourth Annual Progress Report,* AICMIP, IARI, New Delhi pp. 445-448.

Golada, S.L. (2012). Growth and yield of baby corn (*Zea mays* L) as influenced by spacing, nitrogen fertilization levels and plant growth regulators. Ph.D. thesis, Department of Agronomy, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

Joshi, Ekta (2011). Studies on nutrient management in maize (*Zea mays* L.). M.Sc. Thesis, Department of Agronomy, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

Meena, H.P. (2012). Integrated nitrogen management in sweet corn (*Zea mays* L. Ssp. Saccharata), Ph.D. Thesis, Department of Agronomy, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA.

Raja, V. (2001). Effect of nitrogen and plant population on yield and quality of super sweet corn (*Zea mays* L.). *Indian J. Agron.*, **46**(2) : 246-249.

Rathore, S.P.S. (2012). Effect of site specific nutrient management on productivity of Quality protein maize (*Zea mays* L.). M.Sc. Thesis, Department of Agronomy, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA.

Singh, R.B. and Srivastava, R.K. (1991). Response of maize (*Zea mays* L.) cv. Kiran Composite to different planting density. *New Agriculturist*, **12**(2) : 149-150.

Totawat, K.L., Somani, L.L., Singh, R. and Singh, G. (2001). Integrated nitrogen management in maize-wheat cropping sequence on typic haplustalfs of western India. *Annals Arid Zone*, **40** : 439-444.

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