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Research Paper

Effect of integrated nutrient management on growth, yield and economics of Sweet corn (*Zea mays* L.)

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ABSTRACT

Field experiment was conducted at Agronomy farm B.A.College of Agriculture, Anand Campus, Anand during *Kharif* season of the year 2004-05.The main objective of the study was to find out the effect of organic and inorganic fertilizer on seed yield of sweet corn (*Zea mays* L.). The experiment was studied with split plot design having two levels of biofetilizer, FYM and phosphorus as main plot treatments along with five levels of nitrogen as sub plot treatments. Application of organic matter had significantly increased height and all crop growth parameters and 5.75% more grain yield with application of FYM@10 $ha^{-1.}$ Seed inoculation with *Pseudomonas* gave significant increase in growth and yield parameters and grain yield increased to the tune of 8.24 per cent. Application of phosphorus significantly increased plant height at all crop growth stages and higher grain yield recorded by 6.74 per cent than control. Seed yield of sweet corn as well as growth and yield attributes were significantly increased due to varying lends of nitrogen. The higher grain yield (1633 kg ha^{-1}) and strawer yield (5783 kg ha^{-1}) was recorded with 120 and 160 kg N ha^{-1} respectively. The net realization of Rs. 30525 and 29255 ha^{-1} was recorded with 10 t FYM ha^{-1}. Seed inoculation gave 31485 Rs. ha^{-1} and application of P_2O_5 at 0 and 50 lg. P_2O_5 ha^{-1} gave 6.70% and 4.43% higher grain and straw yield, respectively. The significant higher strawer yield were recorded with varying levels of Nitrogen, but highest net return was obtained with 120kg nitrogen per hectare, The strawer yield were increased significantly with increasing levels of nitrogen from 0 to 160 kg per hectare.

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Key words : Sweet corn, Integrated nutrient management, Biofertilizer, F.Y.M.

INTRODUCTION

Maize (*Zea mays* L.) popularity known as corn is one of the most important cereal of the world, ranking third amongst the food crops, next to rice and wheat both in respect of area and production.India occupied and area of 10.58 lakh hectares with the production of 14.32 lakh tones during the year 1993 correspondingly the Gujarat state had an area of 3.68 lakh ha with the production of 5.29 lakh tones.In Gujarat Maize is one of the important traditionally grown crop of tribal areas. Comprising the districts of Panchmahals, Sabarkantha, Banaskantha and Part of Baroda and Kheda districts, now recently this crop may be introduce in South Gujarat districts like Surat, Tapi. Among these districts Panchmahals is a leading district which accounts for area of 2.62 lakh hectares and production of 2.15 lakh tones.

Among various types of maize, sweet corn is very popular for the use of its green cobs in the United States of America. It differs from the field corn due to its higher sweetness, as it has high amount of sugar and alcoholic material. Besides, its consumption as vegetable purpose, it is also utilized for extracting sucrose as an industrial purpose.The role of O.M. for increasing crop production has been universally established, as it plays significant role in improving physical and chemical properties of the soil application of 12-15 tonner of FYM helps in increasing the yield of maize crop to the tune of 1.5 to 5.6 a / ha. Sweet corn is one of the heavy consumers of plant nutrients. It remains about 72 kg N_2, 25 kg P_2O_5 and 220 kg K_2O / ha. Nitrogen is the key element in crop growth and is the most limiting nutrient in Indian soils. The importance of nitrogen for increasing the yield has been

widely accepted.

Maize is one of the crop that responses well to phosphoric fertilizer in almost all the soil types. It plays vital role in plant nutrition. The deficiency of phosphorus in soil severely limits root and shoot growth and thereby affecting the yield. The availability of phosphorus is also low as compared to that of N and K under such situation, the phosphate solubilizing micro organism plays significant role in making the phosphorus available to plants by secretion of organic acids and enzyme phosphatase which solubilizes the insoluble phosphate and thereby it helps in increasing the crop production.

MATERIALS AND METHODS

The field experiment was conducted during the *Kharif* season of years 2004-05 at Agronomy farm of B.A.College of Agriculture, AAU, Anand. The experiment was laid out on sandy loam soil, locally known as Goradu soil with very deep, well drained and fairly moisture retentive but low as compared to black soil. The experiment was laid out in forty treatments comprising all possible combinations of two levels of O.M. (FYM), two levels of *Pseudomonas*, two levels of phosphorus along with five lends of nitrogen .The study was carried out with split plot design (SPD). Combinations of FYM×inoculations x phosphorus were taken as main plot treatments while levels of nitrogen were taken as subplot treatments with three replications having 5.4 m x 3.6 m gross plot size, 60 cm x 20 cm spacing and dibbling method of sowing. Application of well decomposed FYM as basal at 10 t ha^{-1} as per treatment 20 a. of total nitrogen of respective levels of N compiled with full dose of phosphrus in form of SSP in a previously open furrow at the depth of 8-10 cm. Remaining 80% of nitrogen was applied in two installments UBC 50% of the total quantity at knew height stage and remaining 30 N of total amount at milking stage, The observations were recorded from five randomly selected plants from net plot (Pl. height, no.of barren plants) on growth and yield attributing character and also economics of (length of cob, number of cobs per plant, kernels row per cob, no. of kernels per cob, grain and stover yield) of sweet corn.

RESULTS AND DISCUSSION

The results obtained from the present investigation have been duscussed below:

Growth and yield:

With a view to study the effects of organic matter, inoculation of phosphate solubilizing microorganism along with levels of phosphorus and nitrogen on the growth and grain yield of sweet corn (*Zea mays* L.).The findings on the yields of growth and yield attributed characters and economics as influenced by different treatments are showed in Table 1 and 2. Effect of seed innculation with *Pseudomonas* was found significant in respect to plant height at all growth stages. Seed treated with *Pseudomonas* gave significant taller plants as compared to un inoculated seed measured at 21 days interval, *i.e.* 21,42.63 and 84 DAS at all growth (16.44, 46.72, 137.33, 143.09) and grain (1340 kg ha^{-1}) stages this might be due to the ability of phosphobacteria to bring soluble / insoluble inorganic and organic phosphates into soluble forms by secretion of organic acids. Similar results were also noted by Kataraki *et al*. (2004). Application of FYM on sweet corn was found non significant effect of FYM on plant height measured periodically at 21, 63 and 84 DAS. However, the application of FYM gave numerically higher values of plant height at each period of crop growth stage

Table 1: Effect of integrated nutrient management of growth of sweet corn as influenced by levels of inoculation, FYM, phosphorus and nitrogen

Treatments	Plant height (cm)			
	21 DAS	42 DAS	63 DAS	84 DAS
Inoculation				
C_0 uninoculated	15.36	40.88	129.35	142.13
C_1 Inoculated	16.44	46.72	137.33	143.63
S.E. ±	0.07	0.26	0.34	0.41
C.D. (P=0.05)	0.21	0.80	1.02	1.24
FYM t ha^{-1}				
F_0 0	15.81	42.57	133.18	142.45
F_1 10	15.99	45.03	133.50	143.32
S.E. ±	0.07	0.26	0.37	0.41
C.D. (P=0.05)	NS	0.80	NS	NS
Phosphorus kg ha^{-1}				
P_0 0	15.55	43.02	131.00	141.02
P_1 50	16.25	44.58	135.68	144.75
S.E. ±	0.07	0.26	0.34	0.41
C.D. (P=0.05)	0.21	0.80	1.02	1.29
C.V. %	3.38	4.63	1.95	2.22
Nitrogen kg ha^{-1}				
N_0 0	14.89	37.88	122.75	135.92
N_1 40	15.30	40.04	129.96	139.17
N_2 80	16.12	44.50	135.63	142.80
N_3 120	16.24	47.00	188.33	146.63
N_4 160	16.93	49.58	140.04	149.92
S.E. ±	0.10	0.48	0.65	0.53
C.D. (P=0.05)	0.28	1.36	1.84	1.51

Table 2: Grain, strover yield and economics of sweet corn as influenced by inoculation, FYM, phosphorus and nitrogen levels

Treatments	Grain yield (kg ha^{-1})	Strover yield (kg ha^{-1})	Gross realization (Rs./ha)	Total cost of cultivation (Rs./ha)	Net realization (Rs./ha)	BCR
Inoculation						
C_0	1238	4481	32745	3900	28845	7.39
C_1	1340	4838	35435	3950	31485	7.97
S.E. ±	20.14	62.51				
C.D. (P=0.05)	61.08	189.61				
FYM (t ha^{-1})						
F_0	1253	4575	33155	3900	29255	7.50
F_1	1325	4752	35025	4500	30525	6.78
S.E. ±	20.14	62.51				
C.D. (P=0.05)	61.08	NS				
Phosphorus						
P_0	1247	4550	32995	3900	29095	7.46
P_1	1331	4777	35185	4540	30645	6.75
S.E. ±	20.14	62.51				
C.D. (P=0.05)	61.08	189.61				
C.V. %	12.10	10.38				
Nitrogen						
N_0	1013	3447	26703	3900	22803	5.84
N_1	1128	3935	29774	4272	25502	5.96
N_2	1341	4671	35371	4543	30828	6.78
N_3	1633	5481	43017	4815	38202	7.93
N_4	1331	5783	35588	5087	30501	5.99
S.E. ±	23.82	78.69				
C.D. (P=0.05)	67.38	222.25				
Interaction						
CXP						
C.V.%	9.05	8.27				

and higher grain yield 1325 kg $ha^{-1,}$ but straw yield had non significant effect. This could be attributed to the lower mineralization of organic nitrogen. Such observation was also made by Sahoo and Mahapatra (2004).

Application of phosphorus @ 50 kg P_2O_5 ha^{-1} was found significant on the plant height measured at all growth stages, grain yield (1331), strawer yield 4777 kg ha^{-1} (*i.e.* 21,42.03 and 84 DAS) significant increase pl. height (16.25,44.58,135.68,144.75) due to the phosphorus as a key element influences different physiological process such as cell division and elongation, Pandey *et al*. (2000)

Significant linear increase in plant height and strover yield was observed with each successive increase in N_2 levels from 0 to 160 kg ha^{-1}. Significantly increased the grain yield (1331 kg ha^{-1}) and strover yield (5783 kg ha^{-1}) with 160 kg ha^{-1} and also showed the maximum plant height (16.93, 49.58, 140.04, and 149.92) at all the crop growth stages. The higher availability of nitrogen might have increased its uptake as a results of which increased cell size and enhanced cell division, seems to have played an important role in increasing the plant height and yield, this findings Confirms to those reported by Sharma and Gupta (1998). Interaction effect between inoculation and phosphorus, FYM with phosphorus and nitrogen levels all the interaction effect were significantly gave higher growth and grain and strover yield of sweet corn.

Economics:

The data on gross and net realization for different treatments of FYM, inoculation, Phosphorus and nitrogen presented in Table 2 revealed that the higher net returns of Rs. 30525 / ha were received with treatment F_1 (FYM 50kg/ha) of the seed treatment with *Pseudomonas* sp. gave a higher net returns and Rs. 31485 / ha as compared to uninoculated control. Application as 50 kg P_2O_5 /ha gave a higher net return of Rs. 30645 / ha as compared with no application of phosphorus.

Among the nitrogen levels, the maximum net returns

of Rs. 38202/ha was realized with the application of 120 kg ha^{-1}. The results confirm the findings of Adhikari *et al*.(2005).

Conclusion:

On the basis of study the results obtained from the investigation the conclusion can be draw for getting maximum seed and thereby net monetary realization the sweet corn should be fertilized with 10 t FYM + 120 kg N ha^{-1} + 50 kg P_2O_5 besides, seed inoculation with *Pseudomonas* sp. raised on sandy seats of middle Gujarat.

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