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Influence of inorganic fertilizer, vermicompost and biofertilizer on yield & economic of sweet corn and nutrient status in soil

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Abstract
A field experiment was carried out during *rab*i season 2015-16 at college farm, N.M college of Agriculture, Navsari Agricultural University, Navsari, India. The experiment laid out in factorial randomized block design having three factors with two levels of inorganic fertilizer @ 75% RDF, 100 % RDF, three levels of vermicompost @ 0 t/ha, 2.0 t/ha, 4.00 t/ha and tow levels bio fertilizers control and *Azospirillum* + PSB, each replicated three times. The result shows an available nutrient in soil was significantly influenced due to various level of inorganic fertilizers. The maximum N, P_2O_5 and K_2O were recorded in 100% RDF (F_2) which was found significantly differ from the 75% RDF treatments. Significantly the maximum net return (Rs. 203987/ha) was recorded with 100% RDF (F_2) with BCR of 7.61 followed by 75% RDF (Rs. 177326/ha) with BCR of 6.91. An available nutrient in soil was significantly influenced due to various level of vermicompost. The maximum N, P_2O_5 and K_2O were recorded in vermicompost @ 4.0 t/ha (V_2). Significantly the maximum net return (Rs. 202755/ha) was recorded with vermicompost @ 4.0 t/ha (V_2) with BCR of 5.10 followed by vermicompost @ 2.0 t/ha (V_1) (Rs. 186502/ha) with BCR of 5.85. Application of biofertilizer had non-significant effect on most of the crop growth parameter, yield attributes.

Keywords: Yield, Economic, Sweet corn, Vermicompost and Biofertilizers

1. Introduction
Among the cereals, maize (*Zea mays* L.) ranks third in total world production after wheat and rice and it is a staple food in many countries, particularly in the tropics and sub-tropics. Maize is considered as the "Queen of Cereals". In Gujarat maize is one of the important traditionally grown crops of tribal areas. Comprising the districts of Panchmahals, Sabarkantha, Banaskantha and Part of Baroda and Kheda districts, now recently this crop may be introducing in south Gujarat. Among the various agronomic practices for increasing productivity of crop, nutrient management plays an important role. Nitrogen is considered to be a vitally imported plant nutrient. In addition of nitrogen, its play main role for proteins formation, photosynthesis of plant and vegetative growth of plant. Phosphorous fertilization improves the metabolic and physiological process of plant. Application of organic materials along with inorganic fertilizers in the soil leads to sustained productivity and also vermicomposting technology involves the bio-conversion of organic waste into vermicasts and vermiwash utilizing earthworms (Palanichamy *et al.*, 2011) [5]. Vermicompost is a nutrient rich organic fertilizer and soil conditioner, by addition of vermicompost in soil it increases the soil physical, chemical as well as bio logical properties. (Ashokan, 2008) [1]. Bio fertilizers play an important role in the increasing availability of nitrogen and phosphorus. Among several bio agent *Azospirillum* is known to fix atmospheric nitrogen and increased about 10-15 % grain yield in maize (Patil *et al.*, 2001) [6].

2. Materials and Methods
A field experiment was conducted on college farm of N.M. college of Agriculture, Navsari Agricultural University, Navsari during *rabi* season of 2015-16. The soil is characterized by medium to poor drainage and good water holding capacity. The present investigation was carried out with "win orange" variety of sweet corn which has medium plant type,

higher sugar content (14-20%) and mature in about 95 days. Present investigation was carried out in Factorial Randomized Block Design (FRBD) with three factors and total twelve treatment combinations consisting two levels of inorganic fertilizers @ 75% RDF and 100% RDF, three levels of vermicompost 0, 2.0 and 4.0 t/ha and two levels of bio fertilizers (control and *Azospirillum* + PSB) with replicated three time. The source of inorganic nutrients sources as Urea, SSP and organic nutrients sources as vermicompost respectively. Basal dose of fertilizer was applied in respective plots according to treatment allocation. Plant population maintained by 45 x 20 cm spacing, observations were recorded as mean values of the data. The cobs were harvested during 90-95 DAS. In all, there were three pickings at an interval of 1-2 days for complete removal of cobs. Picking was usually done in the morning when moisture per cent was high and temperature was low. Before picking border rows were harvested and removed from experimental field. After picking, the husk was removed carefully and fresh sweet corns were packed in polythene bags and weighed for individual plots. After final picking the total yield was computed by summing up the yield of individual picking. After last picking, green fodder from net plots was harvested and weighed for individual plots and final green fodder yield was expressed in t/ha. In order to evaluate effect of treatments on growth parameters, yield attributes, yield and soil fertility status.

3. Results and Discussions

Effect of inorganic fertilizers: Significantly the highest green cob (13138.72 kg/ha) and green fodder (188.87 q/ha) yield (Table-1) were recoded with application of 100 % RDF (F_2) over 75% RDF (F_1). The increase in cob yield might be due to remarkable improvement in yield attributes such number of cob per plant, cob length, cob girth, cob weight and number of grains per cob (Table -1). Inorganic fertilizer levels had also pronounced effect on green fodder yield. The treatment (F_2) increased the green fodder yield over (F_1), respectively. This might be due to better growth of crop resulting from higher nutrient supply. These finding are in close conformity with those of Kar *et al.* (2006) [2], Khadtare *et al.* (2006) [3] and Singh *et al.* (2007) [10] on sweet corn while Verma *et al.* (2006) [11] on maize. An available nutrient in soil was significantly influenced due to various level of inorganic fertilizers. Significantly the highest N, P_2O_5 and K_2O were recorded in 100% RDF (F_2) which was found significantly differ from the 75% RDF treatments (Table -2 and figure 3). This could be due to the highest amount of inorganic fertilizers applied under same treatment. Kumar *et al.* (2002) [4] was also reported the similar type result. Economics of sweet corn under various levels of inorganic fertilizer (Table -1) revealed that the treatment receiving of 100% RDF (F_2) recorded maximum net return of Rs. 203987/ha with BCR of 7.61 which was followed by Rs. 177326/ha with BCR of 6.91 with 75% RDF (F_1). This was attributed to higher cob yield with these levels, ultimately reflected into higher net return and BCR. These results are in partially conformity with those reported by Zende (2007) [12].

Effect of Vermicompost: Green cob yield and green fodder yield (Table-1 and figure 1 & 2) of sweet corn were significantly influenced by various levels of vermicompost. Significantly the highest green cob (14151.75 kg/ha) and green fodder (199.79 q/ha) yields were recorded with the application of vermicompost @ 4.00 t/ha (V_2) followed by application of vermicompost @ 2.00 t/ha (V_1). The increase in green cob yield might be due to remarkable improvement in yield attributes. Vermicompost had also pronounced effect green fodder yield. This might be due to better growth with higher nutrient supply by vermicompost and also provided nutrients for longer period and readily to use form with growth promoting substances which improve overall growth and reflected in yield. These was in close confirmation with those of Patil and Bhilare, (2000) [7] in wheat. An available nutrient in soil was significantly influenced due to various level of vermicompost. From the economics point of view, the maximum net return of Rs. 202755/ha) with BCR of 5.10 was observed in vermicompost @ 4.0 t/ha (V_2) which was closely followed by Rs. 186502/ha net return with BCR of 5.85 with vermicompost @ 2.0 t/ha (V_1). This was attributed to higher cob yield with these levels, ultimately reflected into higher net return and BCR. The reason is self-explanatory as cost of cultivation was reported higher with more quantity of vermicompost required to supply recommended quality of nutrients which increase the total cost of sweet corn production. Almost similar finding was reported by singh *et al.*, (2009) [9]. Significantly the highest N, P_2O_5 and K_2O were recorded in vermicompost @ 4.0 t/ha (V_2). The significant build up of available N, P_2O_5 and K_2O status under various level of vermicompost could be due to organic matter added with addition of vermicompost which remain longer period in the soil as residual nutrients and inpresense of organic matter there might be more activity of microbes in soil. These were supported by Pawar and Patil (2007) [8].

Effect of biofertilizer: Application of biofertilizer fails to create significant impact on green cob and green fodder yield of sweet corn. An available N, P_2O_5 and K_2O in soil were non significantly influenced due to application of bio fertilizer. The maximum net return (Rs. 196779/ha) was recorded with vermicompost @ 4.0 t/ha (V_2) with BCR of 8.15 followed by *Azospirillum* + PSB (B_1) (Rs. 190412/ha) with BCR of 7.93.

Table 1: Effect of various levels of inorganic fertilizer and vermicompost with and without biofertilizers on yield and economic of sweet corn.

Treatments	Green Cob yield (kg/ha)	Green fodder yield (q/ha)	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	Benefit cost ratio
Inorganic fertilizer levels						
F_1- 75% RDF	11604.67	166.38	30020	207346	177326	6.91
F_2-100% RDF	13138.72	188.87	30867	234854	203987	7.61
S.Em (±)	304.70	4.24	No subjected to statistical analysis			
C.D. at 5%	893.72	12.43				
Vermicompost levels						

V_0- control	10341.08	154.84	27479	186084	158605	6.77
V_1-2.0 (t/ha)	12622.25	178.24	38479	224981	186502	5.85
V_2- 4.0 (t/ha)	14151.75	199.79	49479	252234	202755	5.10
S.Em (±)	373.18	5.19	No subjected to statistical analysis			
C.D. at 5%	1094.58	15.22				
Bio-fertilizers						
B_0- Control	12186.67	175.46	27479	217891	190412	7.93
B_1-*Azospirillum* + PSB	12556.72	179.79	27529	224308	196779	8.15
S.Em (±)	304.70	4.24	No subjected to statistical analysis			
C.D. at 5%	NS	NS				
Interactions	NS	NS				
C.V. %	10.45	10.12				

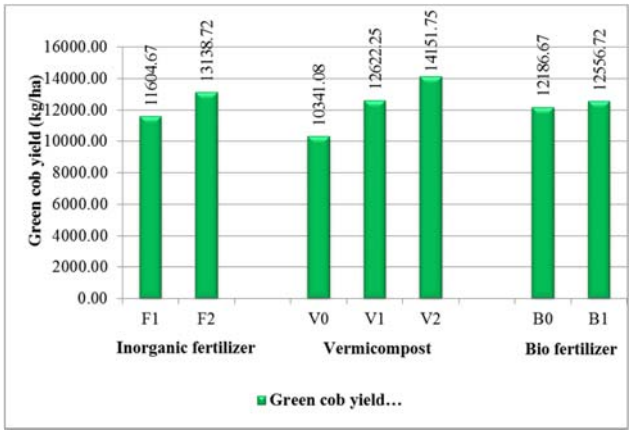

Fig 1: Green cob yield of sweet corn as influenced by various levels of inorganic fertilizers, vermicompost and bio fertilizer

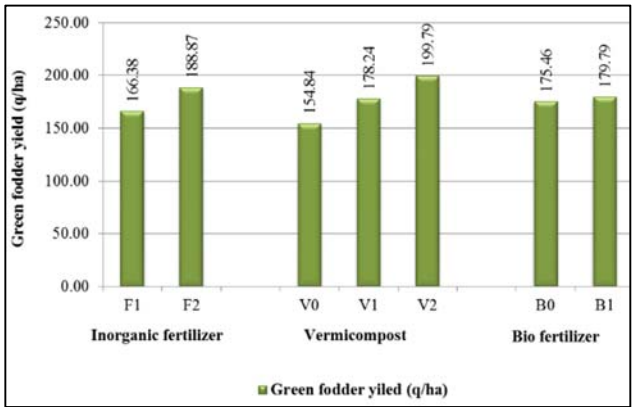

Fig 2: Green fodder yield of sweet corn as influenced by various levels of inorganic fertilizers, vermicompost and bio fertilizer

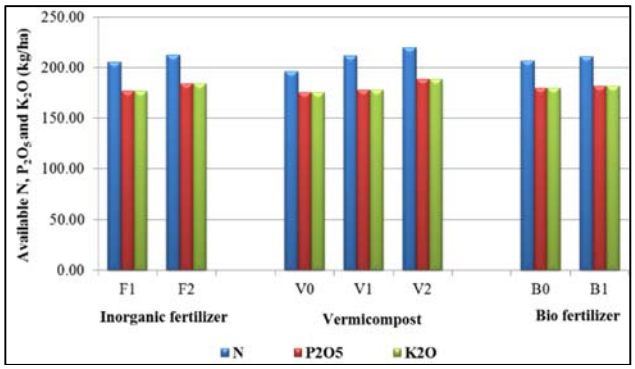

Fig 3: Available N, P_2O_5 and K_2O in soil as influenced by various levels of inorganic fertilizers, vermicompost and bio fertilizer

Table 2: Effect of various levels of inorganic fertilizer and vermicompost with and without biofertilizer on nutrient status of soil.

Treatments	Available nutrients in soil (kg/ha)		
	N	P_2O_5	K_2O
Inorganic fertilizer levels			
F_1- 75% RDF	205.61	32.27	361.48
F_2-100% RDF	212.33	33.89	367.67
S.Em (±)	2.28	0.37	2.11
C.D. at 5%	6.70	1.08	6.18
Vermicompost levels			
V_0- control	196.00	29.51	346.23
V_1-2.0 (t/ha)	211.42	32.58	367.25
V_2- 4.0 (t/ha)	219.50	37.16	380.25
S.Em (±)	2.80	0.45	2.58
C.D. at 5%	8.21	1.33	7.57
Bio-fertilizers			
B_0- Control	207.00	32.53	362.68
B_1-*Azospirillum* + PSB	210.94	33.63	366.47
S.Em (±)	2.28	0.37	2.11
C.D. at 5%	NS	1.08	NS
Interactions	NS	NS	NS
C.V.%	4.64	4.73	2.45
Initial	206.52	38.20	372.18

NS: Non significant

4. Conclusion

On the basis of one-year field experimentation, it seems quite logical to conclude that application of 100% RDF and vermicompost @ 4.00 t/ha produce higher green cob yield (13138.72 & 14151.75 kg/ha), green fodder yield (188.87 & 199.79 q/ha), net returns (203987 & 202755 Rs./ha) and B:C ratio (7.61 & 5.10) respectively. It also improve nutrients status in soil of sweet corn under Gujarat condition.

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