

Effect of Inorganic Fertilizer, Vermicompost and Bio-Fertilizer on Quality, Content and Uptake of Nutrients in Sweet Corn (*Zea mays* L. var. *saccharata*)

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Abstract: The field experiment was carried out at college farm, Department of Agronomy, N. M. College of Agriculture, Navsari Agricultural University, Navsari, India during rabi season (November- February) of 2015- 2016. The experiment was laid out in factorial randomized block design with 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 two levels bio fertilizers control and Azospirillum + PSB respectively. The quality parameter viz., protein content in grain and fodder as well as total sugar content were significantly affected due to various levels of inorganic fertilizers. The maximum protein content in grain and fodder as well as total sugar content were recorded with 100% RDF (F₂) which was found significantly differ from the 75% RDF treatments. Nutrient content was significantly influenced due to various level of inorganic fertilizers. The maximum N, P and K content in grain and fodder were recorded in 100% RDF (F₂) which was found significantly differ from the 75% RDF treatments. The quality parameter viz., protein content in grain and fodder as well as total sugar content were significantly affected due to various levels of vermicompost. The maximum protein content in grain and fodder as well as total sugar content were recorded in vermicompost @ 4.0 t/ha (V₂). Nutrient content was significantly influenced due to various level of vermicompost. The maximum N, P and K content in grain and fodder were recorded in vermicompost @ 4.0 t/ha (V₂). Application of biofertilizer had non-significant effect on most of the crop growth parameter, yield attributes.

Keywords: Sweet corn, Content, Uptake, Quality, Inorganic fertilizer, 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). 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). 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)

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

3.1 Effect of inorganic fertilizers

The quality parameter viz., protein content in grain and fodder as well as total sugar content were significantly affected due to various levels of inorganic fertilizers. Significantly the highest protein content in grain and fodder as well as total sugar content (Table-1 & figure 1,2) were recorded in 100% RDF (F₂) which was found significantly differ from the 75% RDF treatments. This might be due to application of inorganic fertilizer helps in development of better environment in soil to produced effective root formation, proliferation and their functional activates and thus plant uptake more nutrients from the soil, which directly influenced the protein content of grain and fodder. The higher metabolic activity improves the quality of crop product. This statement is supported by Arunkumar *et al.* (2007) and Suthar *et al.* (2012). Nutrient content was significantly influenced due to various level of inorganic fertilizers. Significantly the highest N, P and K content in grain and fodder were recorded in 100% RDF (F₂) which was found significantly differ from the 75% RDF treatments. The higher removal of N, P and K (Table- 1 & figure 3,4) with this level might be due to better development of root and shoot resulted in higher N, P and K uptake. These were supported by Kumar *et al.* (2002)

3.2 Effect of Vermicompost

The quality parameter viz., protein content in grain and fodder as well as total sugar content were significantly affected due to various levels of vermicompost. Significantly the highest protein content in grain and fodder as well as total sugar content were recorded in vermicompost @ 4.0 t/ha (V₂). This might be due to application of vermicompost which leads to supply of major and micro nutrient there by increased in total sugar and protein content. These were supported by Meena *et al.* (2007) in maize and Keerthi *et al.* (2013) on sweet corn. N, P and K content and uptake (Table- 2 & figure 5,6) by grain and fodder were significantly influenced by various level of vermicompost. Significantly the highest N, P and K content in grain and fodder were recorded in vermicompost @ 4.0 t/ha (V₂). The higher nutrient content in treatment of vermicompost is attributed to more availability of N, P and K under favorable soil environment whereas, higher uptake attributed to higher yields along with higher nutrient content absorbed in these treatment. Almost, similar results were also reported by Kannan *et al.* (2005) and verma *et al.* (2006).

3.3 Effect of biofertilizer

The quality parameter viz., protein content in grain and fodder as well as total sugar content were non significantly affected due to application of bio fertilizer. The present study revealed that N, P and K content and uptake in grain and fodder non –significant except N content and uptake in grain and P in fodder with the application of bio fertilizers (*Azospirillum* + PSB).

Table 1: Effect of various levels of inorganic fertilizer and vermicompost with and without biofertilizers on quality, content and uptake of nutrients in sweet corn

Treatments	Protein content (%)		Total Sugar content (%)	Nutrient content (%)					
	Grain	Fodder		N		P		K	
				Grain	Fodder	Grain	Fodder	Grain	Fodder
Inorganic fertilizer levels									
F ₁ - 75% RDF	9.09	3.82	17.80	1.45	0.61	0.37	0.28	0.22	0.74
F ₂ -100% RDF	9.66	3.93	19.41	1.55	0.63	0.41	0.31	0.24	0.80
S.Em (±)	0.18	0.06	0.41	0.03	0.01	0.01	0.00	0.00	0.02
C.D. at 5%	0.53	NS	1.20	0.08	NS	0.03	0.01	0.01	0.05
Vermicompost levels									
V ₀ - control	7.63	3.67	16.50	1.22	0.59	0.34	0.26	0.20	0.67
V ₁ -2.0 (t/ha)	9.80	3.88	19.28	1.57	0.62	0.39	0.29	0.23	0.79
V ₂ - 4.0 (t/ha)	10.70	4.07	20.03	1.71	0.65	0.44	0.35	0.26	0.85
.Em (±)	0.22	0.07	0.50	0.04	0.01	0.01	0.01	0.00	0.02
C.D. at 5%	0.65	0.22	1.47	0.10	0.03	0.03	0.02	0.01	0.06
Bio-fertilizers									
B ₀ - Control	9.24	3.85	18.46	1.48	0.62	0.38	0.29	0.23	0.76
B ₁ <i>Azospirillum</i> + PSB	9.51	3.90	18.75	1.52	0.62	0.40	0.31	0.23	0.78
S.Em (±)	0.18	0.06	0.41	0.03	0.01	0.01	0.00	0.00	0.02
C.D. at 5%	NS	NS	NS	NS	NS	NS	0.01	NS	NS
Interactions	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	8.20	6.67	9.36	8.20	6.67	9.65	6.64	5.75	9.67

NS: Non significant

Table 2: Effect of various levels of inorganic fertilizer and vermicompost with and without biofertilizers on nutrient uptake of sweet corn

Treatments	Nutrient uptake (kg/ha)					
	N		P		K	
	Grain	Fodder	Grain	Fodder	Grain	Fodder
Inorganic fertilizer levels						
F ₁ - 75% RDF	31.85	66.74	6.24	66.74	10.05	78.54
F ₂ -100% RDF	36.81	74.39	6.50	74.39	10.63	82.65
S.Em (±)	0.41	1.93	0.19	1.93	0.32	2.36
C.D. at 5%	1.20	5.66	NS	5.66	NS	NS
Vermicompost levels						
V ₀ - control	29.13	53.68	5.85	11.74	9.19	72.40
V ₁ -2.0 (t/ha)	35.57	69.69	6.33	12.50	10.31	80.89
V ₂ - 4.0 (t/ha)	38.29	88.33	6.95	13.30	11.52	88.49
S.Em (±)	0.50	2.36	0.23	0.42	0.40	2.89
C.D. at 5%	1.47	6.94	0.69	1.23	1.16	8.47
Bio-fertilizers						
B ₀ - Control	33.55	68.21	6.31	12.44	10.21	79.94
B ₁ -Azospirillum + PSB	35.11	72.92	6.44	12.59	10.47	81.25
S.Em (±)	0.41	1.93	0.19	0.34	0.32	2.36
C.D. at 5%	1.20	NS	NS	NS	NS	NS
Interactions						
F X V	2.08	NS	NS	NS	NS	NS
F X B	NS	NS	NS	NS	NS	NS
V X B	NS	NS	NS	NS	NS	NS
F X V X B	NS	NS	NS	NS	NS	NS
C.V. %	5.07	11.61	12.71	11.59	13.26	12.41

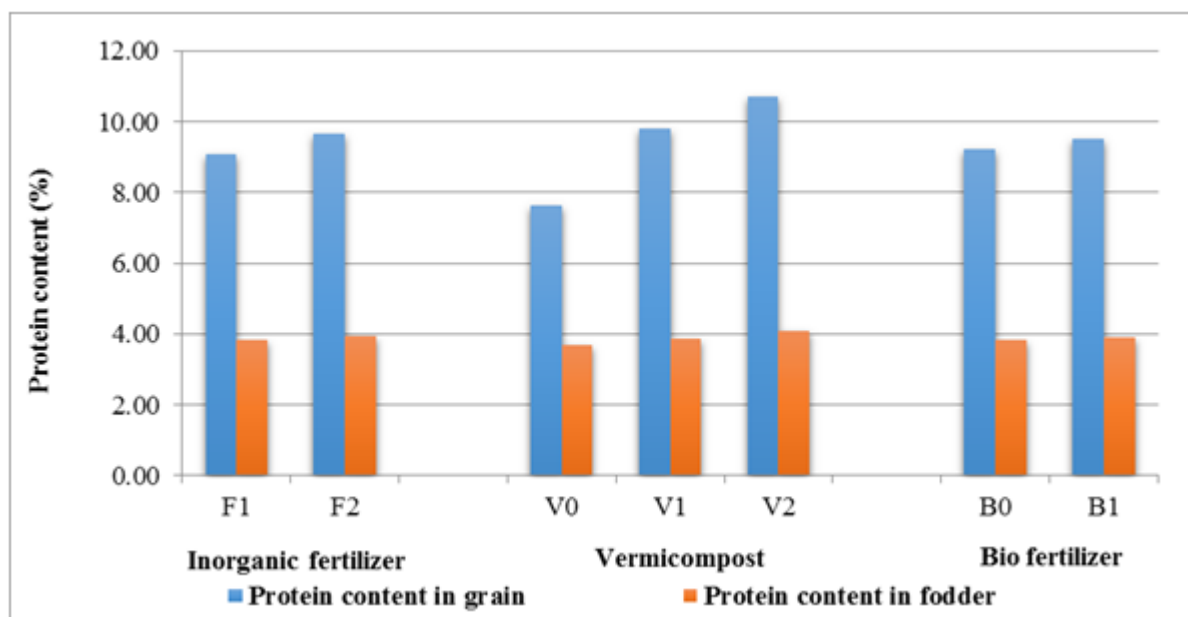


Figure 1: Protein content in grain and fodder of sweet corn as influenced by various levels of inorganic fertilizers, vermicompost and bio-fertilizer

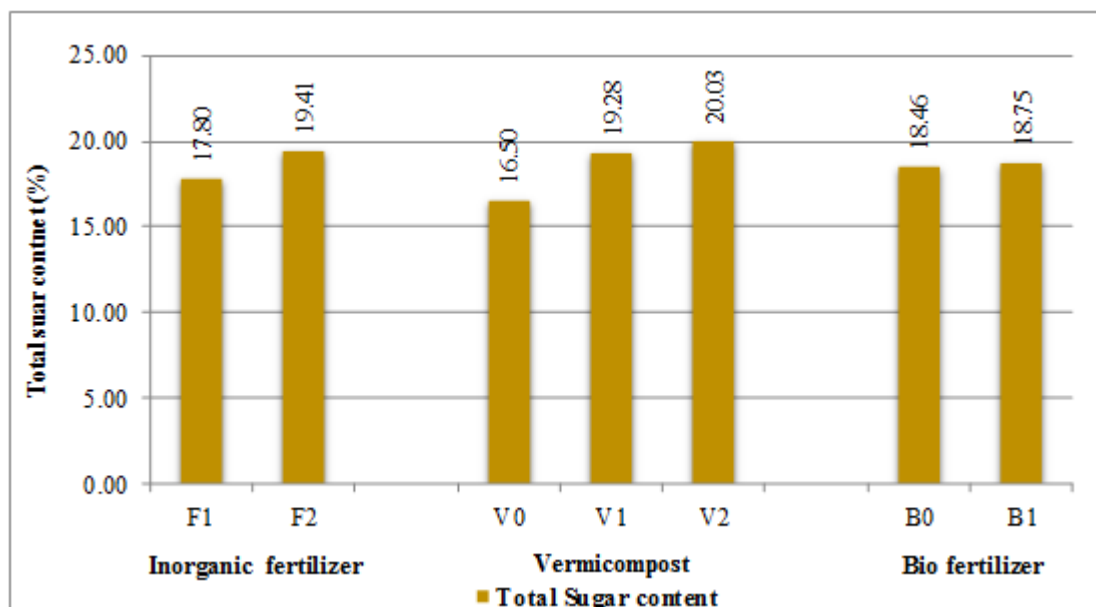


Figure 2: Total sugar content in of sweet corn as influenced by various levels of inorganic fertilizers, vermicompost and biofertilizer.

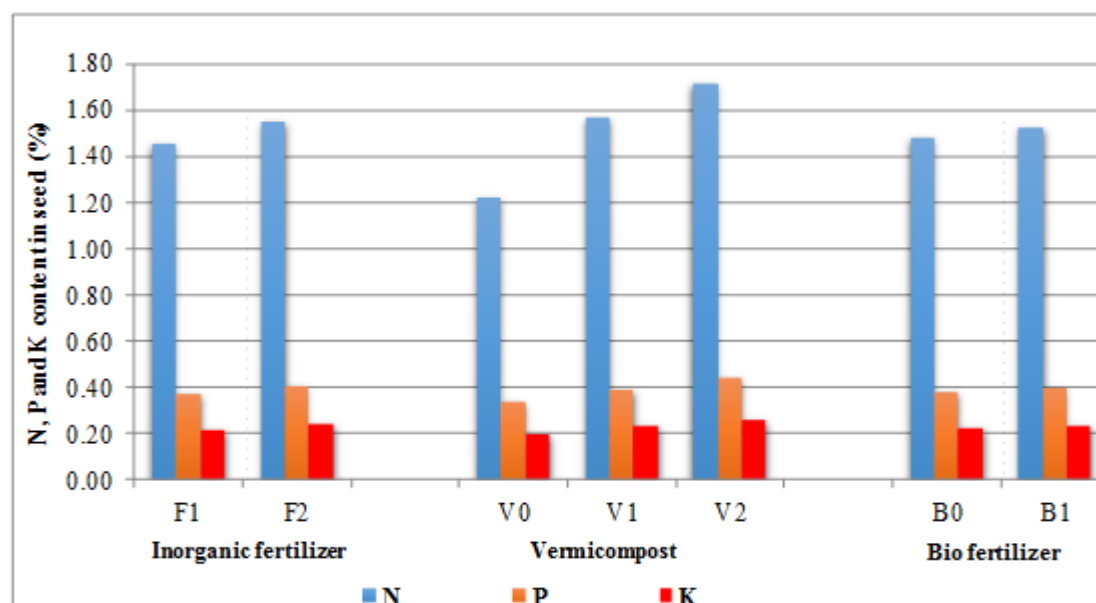


Figure 3: N, P and K content in grain of sweet corn as influenced by various levels of inorganic fertilizer and vermicompost with and without biofertilizer.

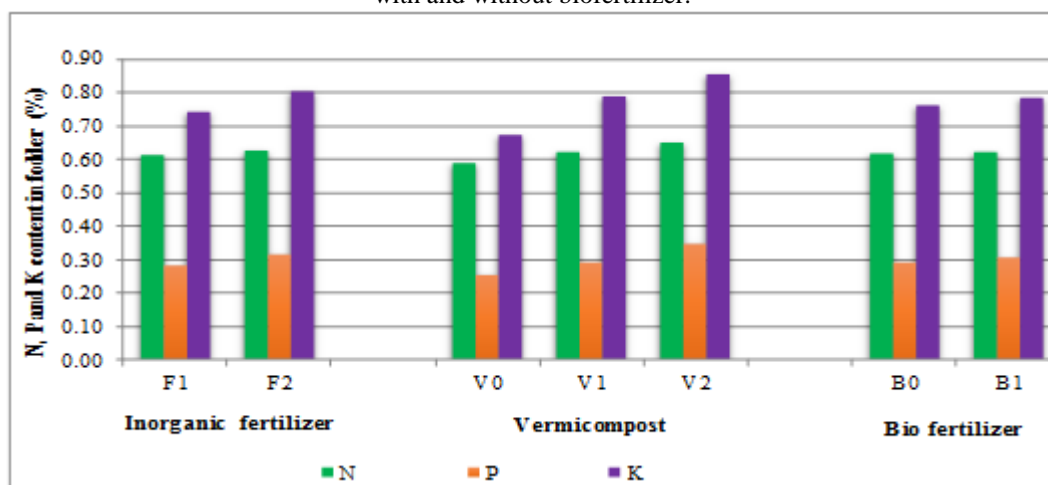


Figure 4: N, P and K content in fodder of sweet corn as influenced by various levels of inorganic fertilizer and vermicompost with and without biofertilizer.

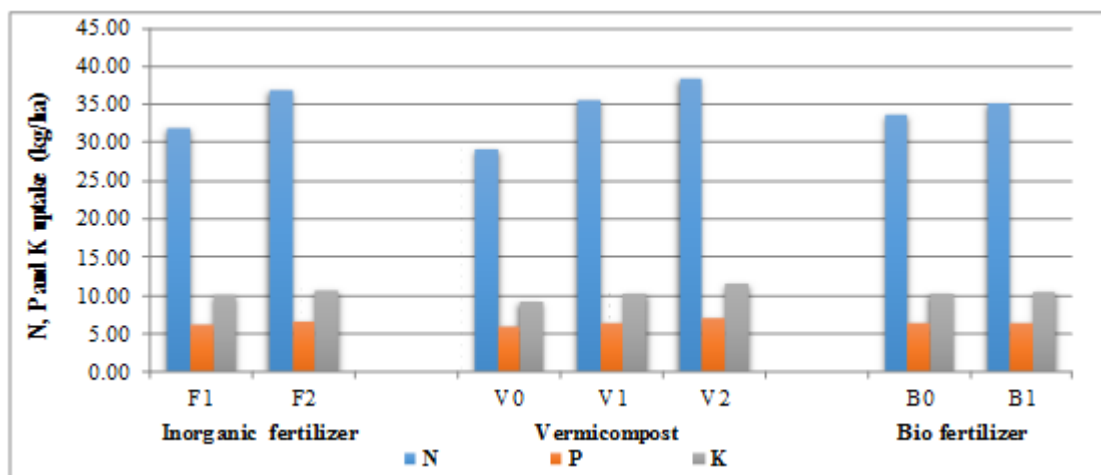


Figure 5: N, P and K uptake by grain of sweet corn as influenced by various levels of inorganic fertilizer and vermicompost with and without biofertilizer.

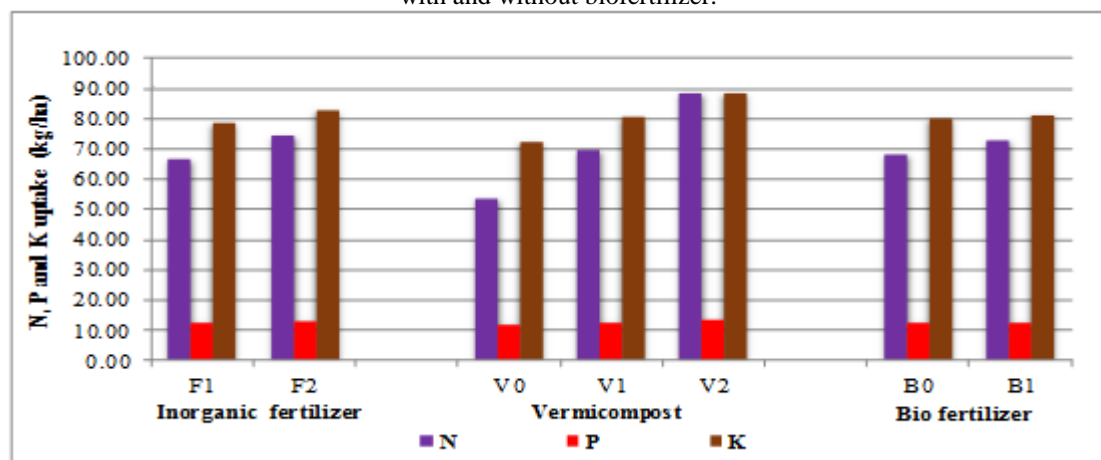


Figure 6: N, P and K uptake by fodder of sweet corn as influenced by various levels of inorganic fertilizer and vermicompost with and without biofertilizer.

4. Conclusion

On the basis of one-year field experimentation, it can be concluded that application of 100% RDF and vermicompost @ 4.00 t/ha produce higher production along with higher protein content in grain (9.66 & 10.70%) and fodder (3.93 & 4.07%), total sugar content (9.41 & 20.03%) respectively. It also improve nutrient content and uptake by grain and fodder of sweet corn under south Gujarat condition.

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