

Effect of various levels of inorganic fertilizer and vermicompost with and without bio-fertilizer on growth, yield attributes and yield of sweet corn (*Zea mays* L. *Saccharata*)

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Abstract

A field experiment was conducted during November, 2015- February, 2016 *rabi* season at college farm, N.M college of Agriculture, Navsari Agricultural University, Navsari, India to study the Effect of various levels of inorganic fertilizer and vermicompost with and without bio-fertilizer on growth, yield attributes and yield of sweet corn (*Zea mays* L. *Saccharata*). The design applied was factorial randomized block design having three factors with two levels of inorganic fertilizer @ 75% RDF, 100 % RDF, three levels of vermicompost 0, 2.0 and 4.0 t/ha and two levels bio fertilizers control and *Azospirillum* + PSB respectively. The result shows growth parameters *viz.*; plant height was influenced significantly by the impose of various levels of inorganic fertilizers. Significantly the highest plant height (85.43 and 184.40 cm) was recorded with 100% RDF (F₂) during 45 DAS and at harvest respectively. The days to 50 % silking of sweet corn was non-significantly influenced by various levels of inorganic fertilizers. The yield attributes *viz.*, number of cobs per plant, cob length, cob girth, test weight, green cob yield and green fodder yield were influenced significantly by the impose of various levels of inorganic fertilizers. Significantly the maximum number of cobs per plant (2.11), cob length (18.98 cm), cob girth (16.03 cm), test weight of 100 grains (16.72), green cob yield (13138.72 kg/ha) and green fodder yield (188.87 q/ha) were recorded with 100% RDF (F₂) which was found significantly differ from the 75% RDF (F₁) treatment. The different level of vermicompost had significant effect on plant height and day to 50% silking. Significantly the maximum plant height and minimum days to 50% silking was recorded with vermicompost @ 4.0 t/ha (V₂) followed by vermicompost @ 2.0 t/ha (V₁). The yield attributes *viz.*, number of cobs per plant (2.29), cob length (19.28 cm), cob girth (16.65 cm), test weight of 100 grains (18.13), green cob yield (14151.75 kg/ha) and green fodder yield (199.79 q/ha) were influenced significantly by different level of vermicompost. The vermicompost @ 4.0 t/ha (V₂) recorded the maximum number of cobs per plant, cob length, cob girth, test weight of 100 grains, green cob yield and green fodder yield. Application of biofertilizer had non-significant effect on most of the growth parameter, yield attributes and yield.

Keywords: growth parameters, yield attributes, yield, sweet corn, inorganic fertilizer, vermicompost and bio fertilizer

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 vermishash utilizing earthworms (Palanichamy *et al.*, 2011) [8]. 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 agents, *Azospirillum* and *Azotobacter* 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.

Table 1: Effect of various levels of inorganic fertilizer and vermicompost with and without Bio-fertilizers on growth parameters of sweet corn.

Treatments	Plant height (cm)		Days to 50 % silking
	45 DAS	Harvest	
Inorganic fertilizer levels			
F ₁ - 75% RDF	81.08	176.82	87.67
F ₂ -100% RDF	85.43	184.40	85.72
S.Em (±)	1.43	2.56	1.20
C.D. at 5%	4.20	7.50	NS
Vermicompost levels			
V ₀ - control	77.48	175.40	89.17
V ₁ -2.0 (t/ha)	81.35	178.02	87.17
V ₂ - 4.0 (t/ha)	90.93	188.42	83.75
S.Em (±)	1.75	3.13	1.47
C.D. at 5%	5.15	9.18	4.30
Bio-fertilizers			
B ₀ - Control	82.13	179.78	87.17
B ₁ -Azospirillum + PSB	84.38	181.44	86.22
S.Em (±)	1.43	2.56	1.20
C.D. at 5%	NS	NS	NS
Interactions	NS	NS	NS
C.V.%	7.30	6.01	5.86

Table 2: Effect of various levels of inorganic fertilizer and vermicompost with and without bio fertilizers on yield Attribute and yield of sweet corn.

Treatments	Length of cob (cm)	Cob girth (cm)	Number of cob per plant	Test weight (g/100 grins)	Green cob yield (kg/ha)	Green fodder yield (q/ha)	Harvest index (%)
Inorganic fertilizer levels							
F ₁ - 75% RDF	18.16	14.93	1.94	15.71	11604.67	166.38	40.76
F ₂ -100% RDF	18.98	16.03	2.11	16.72	13138.72	188.87	41.32
S.Em (±)	0.28	0.27	0.06	0.34	304.70	4.24	0.69
C.D. at 5%	0.82	0.81	0.17	1.00	893.72	12.43	NS
Vermicompost levels							
V ₀ - control	17.90	14.18	1.77	14.63	10341.08	154.84	40.13
V ₁ -2.0 (t/ha)	18.53	15.31	2.00	15.88	12622.25	178.24	41.26
V ₂ - 4.0 (t/ha)	19.28	16.95	2.29	18.13	14151.75	199.79	41.72
S.Em (±)	0.34	0.34	0.07	0.42	373.18	5.19	0.85
C.D. at 5%	1.01	0.99	0.21	1.22	1094.58	15.22	NS
Bio-fertilizers							
B ₀ - Control	18.48	15.24	1.99	16.01	12186.67	175.46	40.87
B ₁ -Azospirillum + PSB	18.66	15.73	2.05	16.42	12556.72	179.79	41.20
S.Em (±)	0.28	0.27	0.06	0.34	304.70	4.24	0.69
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS
Interactions	NS	NS	NS	NS	NS	NS	NS
C.V.%	6.42	7.52	12.01	8.88	10.45	10.12	7.18

NS: Non-significant

3. Results and Discussions

Effect of inorganic fertilizers

Growth parameters viz., plant height was influenced significantly by the impose of various levels of inorganic fertilizers. Significantly the highest plant height (85.43 and 184.40 cm) was recorded with 100% RDF (F₂) during 45 DAS and at harvest respectively, which was found significantly differ from the 75% RDF treatments which had the lowest

plant height (81.08, 176.82 cm at 45 DAS and at harvest respectively). The days to 50 % silking (Table-1) of sweet corn was non-significantly influenced by various levels of inorganic fertilizers. The yield attributes viz., number of cob per plant, cob length, cob girth, test weight of 100 grains, green cob yield and green fodder yield were influenced significantly by the impose of various levels of inorganic fertilizers. Significantly the maximum number of cob per

plant, cob length, cob girth, test weight of 100 grains, green cob yield and green fodder yield were recorded with 100% RDF (F_2) which was found significantly differ from the 75% RDF treatments. The improvement in growth parameter with the application of 100 % RDF might have resulted in better and timely availability of nitrogen and phosphorous for their utilization by plant as judged from nitrogen and phosphorous content of cob and fodder. Nitrogen is considered to be a vitally imported plant nutrient. In addition to its role in formation of proteins, nitrogen is an internal part of chlorophyll which is the primary absorber of light energy needed for photosynthesis. Besides these, it is also a constituents of certain organic compounds of physiological importance. Further, Phosphorous fertilization also improves the metabolic and physiological processes and thus known as “energy currency” which is subsequently used for vegetative and reproductive growth through phosphorylation. In addition to vital metabolic role, P is an important structural component of nucleic acid, phyteins, phospholipids and enzymes. An adequate supply of phosphorous early in the life cycle of plant is important in laying down the preordia of its reproductive part. The present findings are in close confirmation with those of Raja. (2001) ^[9]. On sweet corn Pathak *et al.* (2002) ^[5] on winter maize and Kar *et al.* (2006) ^[3]. On sweet corn. The significant improvement in overall growth parameter resulting in higher photosynthesis activity indirectly cause for higher yield. Cob yield and green fodder yield of sweet corn were significantly influenced by various levels of inorganic fertilizers. Significantly the highest green cob (13138.72 kg/ha) and green fodder (188.87 q/ha) yield of 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 cobs per plant, cob length, and cob girth and test weight of 100 grains (Table 2). 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) ^[3]; Khadtare *et al.* (2006) ^[4] and Singh *et al.* (2007) ^[10] on sweet corn while Verma *et al.* (2006) ^[11] on maize.

Effect of Vermicompost

The different level of vermicompost had significant effect on plant height and day to 50% silking. Significantly the highest plant height and minimum days to 50% silking was recorded with vermicompost @ 4.0 t/ha (V_2) followed by vermicompost @ 2.0 t/ha (V_1). The yield attributes *viz.*, number of cobs per plant, cob length, cob girth and test weight of 100 grains were influenced significantly by different level of vermicompost. The vermicompost @ 4.0 t/ha (V_2) recorded the maximum number of cobs per plant, cob length, cob girth and test weight of 100 grains. The favorable effect of vermicompost on growth might be attributed to presence of relatively readily available plant nutrients, growth enhancing substances and number of beneficial organisms like nitrogen fixing, phosphate solubilizing, cellulose decomposing and other beneficial microbes as well as antibiotics, vitamins and hormones etc. These was in close confirmation with those of Patil and Bhilare, (2000) ^[7] in wheat, and Jayaprakash *et al.* (2002) ^[2] in maize.

Green cob yield and green fodder yield (Table- 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.

Effect of biofertilizer

Application of biofertilizer had non-significant effect on crop growth parameter *viz.*, plant height and day to 50% silking. The yield attributes *viz.*, number of cobs per plant, cob length, cob girth, test weight of 100 grains and green cob were none significantly influenced by bio fertilizer. Application of biofertilizer fails to create significant impact on green cob and fodder yield of sweet corn.

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 to sweet corn, improve plant height at harvest (184.40 and 188.42 cm), length of cob (18.98 & 19.28 cm), cob girth (16.03 & 16.95 cm), number of cobs per plant (2.11 & 2.29), test weight of 100 grains (16.72 & 18.13 gm), green cob yield (13138.72 & 14151.75 kg/ha) and green fodder yield (188.87 & 199.79 q/ha) respectively, under Gujarat condition.

5. References

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