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Effect of organic nutrient management on performance of sweet corn (*Zea mays* L. var. *saccharata*) variety- Sugar 75

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Abstract

A field experiment was conducted during *Rabi* 2022-2023 at Agricultural Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). The experiment was laid out in Randomized Block Design with seven treatments each replicated thrice on the basis of one year experimentation. The treatment consisted of recommended nutrient dose of 100:60:40, using organic sources i.e. FYM and Vermicompost, of different concentrations (100% RDN & 75% RDN), Acetobacter, PSB, and 4 foliar spray of 20% cow urine at 15 DAS interval, and 60 × 20 cm spacing was designated. The result showed that treatment 4 (100% RDN + Acetobacter + PSB + 4 foliar spray of 20% cow urine at 15 days interval) was recorded significantly higher plant height (188.13 cm), maximum number of leaves/plant (11.80). Whereas the maximum number of rows/cob (16.00), number of grains/row (34.47), number of grains/cob (541.60), cob length with husk (27.67 cm) and without husk (26.47 cm), cob weight with husk (363.89 g) and without husk (327.34 g), cob girth with husk (18.57 cm), cob girth without husk (15 cm), Green cob yield (13.36 t/ha) and green fodder yield (19.82 t/ha) as compared to other organic treatments.

Keywords: Sweet corn, farm yard manure, vermicompost, Acetobacter, PSB, spacing, growth and yield

Introduction

Sweet corn (*Zea mays* L. *saccharata*) is the most important popular vegetable in countries like USA and Canada. It is widely used as a fresh or processed and frozen kernel as vegetable which indicates its popularity. Sweet corn, also known as sugar corn and pole corn is a type of corn cultivated for human use that has a high sugar content. Sweet corn (*Zea mays* L. *saccharata*), a diploid species with 2n = 20 chromosomes, belongs to the poaceae grass family (Wolfe *et al.* 1997) [10]. The origin of sweet corn is relatively recent. The "su" gene, located at the "sugary" locus on chromosome 1, inhibits a portion of sugars from conversion into starch in sweet corn. Sweet corn produces and stores a lot of sugar in each kernel, and it is given the term "sweet."

In Chhattisgarh, corn is cultivated on an area of 93.20 thousand ha. with an annual yield of 185.80 million tonnes and an average productivity of 3364 kg ha⁻¹. (Anonymous, 2022) [1]. The climatic condition of Chhattisgarh is particularly suitable for high quality sweet corn.

The corn is harvested and consumed as a vegetable rather than a grain during its milky stage. It is a good source of energy with 46% total sugars, 18% starch, 14.5% protein, moisture (72.7%), carbohydrate (81%), lipids (3.5%) and 17% oil (Johari and Kaushik 2016). The oil content is primarily more abundant and is significantly rich in linolenic (50%) and oleic (30%) acids. Vitamin A, Vitamin B6, Thiamine, Niacin, and Riboflavin are all present in sweet corn.

Since corn is regarded as an exhausting crop and needs more nutrients, organic nutrient management strategies are crucial to maintaining sweet corn yield. It is possible to reach sustainable production levels by applying the right balance of organic fertilisers (Sujatha *et al.* 2008) [8]. Organic manures, especially vermicompost and FYM, not only provide macronutrients but also fulfil their need for micronutrients. The role of organic manures and organic nutrients is crucial for maintaining and improving soil fertility and crop productivity (Rathod *et al.* 2018) [5]. Vermicompost is an organic fertiliser and soil conditioner that is rich in nutrients. Therefore, the objective of current study was to study the effect of different organic manures on growth and yield of sweet corn using multivariate statistical techniques, such as RBD.

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Materials and Methods

A field experiment was conducted during Rabi season of 2022-23, at Agricultural Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) India. which is located at 21° 16' N latitude, 81° 36' E longitude and an altitude of 314.14 m above the mean sea level (MSL). The crop was sown on 13 December 2022. The experiment was laid out in

Randomized Block Design comprising of 7 treatments which are replicated thrice. Each treatment net plot size is 22.04 m². Organic manures were applied using different concentrations of RDN with a spacing of 60×20 cm. The treatment details in combination are as follows: T₁: 100% RDN, T₂: 75% RDN, T₃: 100% RDN + Acetobacter + PSB, T₄: 100% RDN + Acetobacter + PSB + 4 foliar spray of 20% cow urine at 15 DAS interval, T₅: 75% RDN + Acetobacter + PSB, T₆: 75% RDN + Acetobacter + PSB + 4 foliar spray of 20% cow urine at 15 DAS interval, T₇: Control.

Seed treatment

The seeds of sweet corn variety "Sugar 75" were treated with Phosphorus solubilising bacteria (PSB) @ 2 g/kg seeds in T₃, T₄, T₅, T₆, for converting insoluble form of phosphates into available forms and promoting root growth and higher crop yields.

Agronomic practices

Six irrigations were given at a depth of five cm. The gap filling was done within 7 DAS and thinning was carried out at

12 DAS by keeping only one healthy and disease free plant hill⁻¹ for ensuring a desired plant population. Hand weeding was employed two times in the entire experimental field.

Results and Discussion

1. Plant height (cm)

It is evident from Table 1 that significantly highest plant height (188.13 cm) was recorded in the T₄ 100% RDN + Acetobacter + PSB + 4 foliar spray of 20% cow urine at 15 DAS interval. However, the treatment T₇ has the lowest plant height (125.49 cm).

Significant increase in plant height was due to the application of organic manures through FYM and V.C which leads to the development of shoot apical meristem. This may be a reason to gain better height. The optimal height of the plants improves the acquisition of solar energy, which will help maintain photosynthesis (Asfaw (2022) [2]).

2. Number of green leaves plant/plant

The number of green and fully opened leaves was counted. It was observed that with the application of 100% RDN + Acetobacter + PSB + 4 foliar spray of 20% cow urine at 15 days interval (T₄) produced significantly maximum number of leaves plant/plant i.e. (11.80) at 60 DAS.

The organic manure and cow urine has high nutrition which promotes plant growth and makes nutrients available to the plant and FYM & V.C was found to improve leaf quality by providing an adequate amount of nutrients that accelerate leaf growth. Similar findings were reported by Asfaw (2022) [2].

Table 1: Effect of organic nutrient management on growth parameters of sweet corn

S. No	Treatment	Plant height (cm)	Number of leaves/plant
1.	100% RDN	173.87	10.20
2.	75% RDN	160.40	9.93
3.	100% RDN + Acetobacter + PSB	178.67	10.40
4.	100% RDN+Acetobacter+PSB+4 spray of 20% cow urine at 15 days interval foliar	188.13	11.80
5.	75% RDN + Acetobacter + PSB	167.40	10.07
6.	75%RDN+Acetobacter+PSB+ 4 foliar spray of 20% cow urine at 15 days interval	174.40	10.33
7.	Control	125.49	7.67
	SEm±	2.36	0.61
	CD(p=0.05)	7.26	1.87

Number of rows/cob, Number of grains/row, Number of grains/cob

Significantly more number of rows/cob (16.00) was recorded under 100% RDN + Acetobacter + PSB + foliar spray of 20% cow urine at 15 days interval at (T₄) over all the other organic nutrient operations. It was followed by the treatment (T₃) with number of rows/cob (15.20). Significantly number of grains/row & number of grains cob⁻¹ follows the same trend highest in T₄ & lowest in control plot.

These findings are in close proximity with the results of (Ganai and Singh, 1988) [3] who reported that the days to reach various physiological stages were significantly and consistently enhanced with the increase in FYM application up to 30 t/ha. Cob length, number of cobs/plant, number of grain rows per cob, number 43 of grains per row increased significantly and consistently with the increased application of application of FYM & V.C.

Cob length with and without husk (cm)

T₄ recorded significantly the highest length of cobs with husk

(26.67 cm) over all the other organic nutrient options, but it was comparable with (T₆) with a cob length of (26.40 cm). Similarly cob length without husk was highest in T₄ with (26.47 cm).

Significant and maximum length of cob/plant is increased due to increased number of leaves, leading to higher photosynthetic rate and accumulation of more assimilates which in turn increased the sink size. Uwah (2014) [9].

Sabur *et al.* (2021) [6] recorded significant increase in cob length with and without husk with the use of organic fertilizers and biofertilizers as compared to control.

Cob girth with and without husk (cm)

T₄ recorded the maximum cob girth with husk (18.57 cm) as compared to all other treatments. It was significantly at par with 100% RDN + Acetobacter + PSB (T₃) with mean value (18.00 cm). The treatment 100% RDN along with acetobacter, PSB and 4 foliar sprays of 20% cow urine at 15 days interval at 20, 40 and 60 DAS through organic nutrient management (T₄) recorded the significantly maximum cob girth without

husk (15.00 cm) than other treatments. It was followed by the treatment (T₃), (T₆), (T₁), (T₅) and (T₂) respectively, and also at par with (T₃), (T₆), (T₁), (T₅) and (T₂).

Cob weight with and without husk (g)

The highest cob weight (363.89 g) with husk & without husk (327.34 g) was recorded under treatment with 100% RDN + Acetobacter + PSB + 4 foliar spray of 20% cow urine at 15 days interval at 20, 40 and 60 DAS (T₄).

Significant and maximum cob weight is increased due to the lesser competition for radiation and nutrients that allowed the plants to accumulate more biomass with higher capability to convert more photosynthates into sink resulting in higher values for the mentioned attributes. Uwah (2014) [9].

Green cob and green fodder yield (t/ha)

Organic nutrient management options significantly increased

green cob yield of sweet corn. Significantly the highest cob yield of sweet corn was (13.36t/ha). The highest green cob yield in (T₄) was obtained since, the growth and yield parameter like plant height, Number of green leaves/plant, number of grain/ row, number of grains/cob and cob weight with and without husk were found highest in this treatment. Significantly the lowest cob yield was recorded in (T₇) with (70.36 q/ha). The highest green fodder yield (19.82 t/ha) so obtained in T₄ was mainly due to the increased vegetative growth in treatment as compared with other organic nutrient options. The lowest green fodder yield was recorded in T₇ (8.24 t/ha).

Similar findings were reported by Springett and Syres (1978) [7] who found that using vermicompost at levels alone or in conjunction with farmyard manure enhanced green cob yield due to the useful indole substances that might be secreted into the cast.

Table 2: Effect of organic nutrient management on yield of sweet corn

Treatment	Green cob yield (t/ha)	Green fodder yield (t/ha)
100% RDN	9.42	13.81
75% RDN	7.41	10.66
100% RDN + Acetobacter + PSB	10.93	16.79
100% RDN+Acetobacter+PSB+4 foliar spray of 20% cow urine at 15 days interval	13.36	19.82
75% RDN + Acetobacter + PSB	8.67	12.93
75% RDN+Acetobacter+PSB+4 foliar spray of 20% cow urine at 15 days interval	10.53	16.65
Control	5.61	8.24
SE±	0.50	0.68
CD(P=0.05)	1.55	2.11

Table 3: Effect of organic nutrient management on yield attributes of sweet corn

Treatments	Number of rows/cob	Number of grains/cob	Number of grains/cob	Cob length		Cob girth		Cob weight	
				With husk(cm)	Without husk(cm)	With husk(cm)	Without husk(cm)	With husk(g)	Without husk(g)
100% RDN	14.40	30.49	439.80	26.13	24.73	17.43	14.67	337.33	309.00
75% RDN	13.60	29.27	406.20	25.73	24.40	16.93	14.40	326.66	300.66
100% RDN + Acetobacter + PSB	15.20	32.20	477.80	26.93	25.20	18.00	14.93	347.00	312.33
100% RDN+Acetobacter+PSB+4 foliar spray of 20% cow urine at 15 days interval	16.00	34.47	541.60	27.67	26.47	18.57	15.00	363.89	327.34
75% RDN + Acetobacter + PSB	14.40	32.20	435.20	26.07	24.61	17.33	14.47	331.00	305.00
75% RDN+Acetobacter+PSB+ 4 foliar spray of 20% cow urine at 15 days interval	14.60	32.20	472.13	26.40	25.00	17.63	14.75	338.33	309.33
Control	11.47	23.70	364.80	19.20	17.93	14.03	12.73	249.67	224.00
SE±	0.13	0.48	0.25	0.13	0.35	0.24	0.37	5.76	3.60
CD(p=0.05)	0.39	1.49	0.78	0.39	1.07	0.75	1.14	17.76	11.09

Conclusion

Based on the results of this studies, it could be concluded that the combination of organic manures 100% RDN + Acetobacter + PSB + 4 foliar of cow urine at 20 days interval (T₄) to sweet corn holds a viable growth and yield combinations for improved crop production and also for maintenance of soil fertility.

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