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Research Article

Assessment of Organic Nutrient Management Strategies in Sweet Corn (*Zea mays var. saccharata* L.)

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Abstract

A field experiment was conducted during the Kharif season to evaluate the effect of organic nutrient management practices on growth, physiological parameters, yield attributes, yield and economics of sweet corn (*Zea mays saccharata* L.) under organic farming conditions. The experiment comprised nine treatments involving farmyard manure (FYM), vermicompost and Jeevamrit applied individually and in combination. The results revealed that integrated application of vermicompost @ 5 t ha^{-1} at sowing along with Jeevamrit application at 30 DAS (T9) significantly improved plant height, dry matter accumulation, leaf area index (LAI), crop growth rate (CGR), relative growth rate (RGR), chlorophyll content, carotenoid content, yield attributes and yield of sweet corn. Treatment T9 recorded maximum plant height at harvest (180.73 cm), dry matter accumulation (421.46 g m^{-2}), chlorophyll content (42.14 SPAD units), cob length (21.64 cm), grain yield (61.18 q ha^{-1}), straw yield (75.42 q ha^{-1}) and biological yield (136.60 q ha^{-1}). The highest net return (Rs. 120651 ha^{-1}) and B:C ratio (2.63) were recorded under Jeevamrit application at 30 DAS (T5), while T9 also recorded substantially higher economic returns. The study concluded that integrated application of vermicompost and Jeevamrit significantly improved productivity and profitability of sweet corn under organic farming conditions.

Keywords: Sweet corn, Organic farming, Vermicompost, Jeevamrit, Growth, Yield, Economics

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Introduction

Sweet corn (*Zea mays saccharata* L.) is an important specialty corn cultivated for its high sugar content, nutritional value and increasing market demand. It is widely consumed as fresh cobs, processed products and value-added foods. In recent years, demand for organically produced sweet corn has increased substantially due to growing consumer awareness regarding food safety and environmental sustainability. Organic farming emphasizes the use of natural nutrient sources and biological processes for maintaining soil fertility and crop productivity. Continuous use of chemical fertilizers often leads to soil degradation, nutrient imbalance and decline in soil microbial activity. Therefore, integration of organic nutrient sources such as farmyard manure (FYM), vermicompost and Jeevamrit has become an important strategy for sustainable crop production. FYM improves soil physical properties, water holding capacity and microbial activity, whereas vermicompost supplies readily available nutrients along with beneficial microorganisms and growth-promoting substances [1]. Jeevamrit, a fermented organic formulation prepared from cow dung, cow urine, jaggery and pulse flour, enhances microbial population and nutrient mineralization in soil [2].

Application of organic manures and liquid organic formulations improves physiological efficiency, photosynthetic activity and nutrient uptake in maize crops. Several studies have reported that integrated organic nutrient management significantly enhances growth, yield attributes and productivity of sweet corn under organic farming conditions [3, 4].

Keeping these facts in view, the present investigation was undertaken to evaluate the effect of organic nutrient management practices on growth, physiology, yield and economics of sweet corn under organic farming conditions.

Materials and Methods

A field experiment was conducted during the Kharif season of 2025 at the Agricultural Research Farm, Vivekananda Global University, Jaipur, Rajasthan, India. The experimental site falls under Agro-climatic Zone IIIA (Semi-Arid Eastern Plain Zone) of Rajasthan. The climate of the region is semi-arid with hot summers and cool winters. During the crop season, temperature ranged from 1°C to 48°C. Most of the rainfall is received from June to September. The experimental field soil was sandy loam in texture with pH 6.89, EC 0.19 dS m^{-1}, organic carbon 0.25%, available nitrogen 174.65 kg ha^{-1}, available phosphorus 14.8 kg ha^{-1}, available potassium 23.32 kg ha^{-1}, and available sulphur 6.8 kg ha^{-1}.

The experiment was laid out in a Randomized Block Design (RBD) with nine treatments and three replications. The treatments comprised different combinations of farmyard manure (FYM), vermicompost, and Jeevamrut application. The treatments were: T_1–Control, T_2–FYM @ 10 t ha^{-1}, T_3–Vermicompost @ 5 t ha^{-1}, T_4–Jeevamrut at 15 DAS, T_5–Jeevamrut at 30 DAS, T_6–FYM @ 10 t ha^{-1} + Jeevamrut at 15 DAS, T_7–FYM @ 10 t ha^{-1} + Jeevamrut at 30 DAS, T_8–Vermicompost @ 5 t ha^{-1} + Jeevamrut at 15 DAS, and T_9–Vermicompost @ 5 t ha^{-1} + Jeevamrut at 30 DAS. Each treatment was replicated thrice, resulting in 27 plots. The gross plot size was 4.0 m × 5.0 m and the net plot size was 3.1 m × 5.0 m.

Sweet corn variety 'Madhuri' was used for the study. Seeds were sown during the second week of July using dibbling method at a spacing of 45 cm × 20 cm with a seed rate of 20 kg ha^{-1}. FYM and vermicompost were incorporated into the soil seven days before sowing as per treatment requirements. Jeevamrut was applied through irrigation water at 15 and 30 days after sowing (DAS). Seeds were inoculated with Azotobacter and phosphate-solubilizing bacteria (PSB) @ 250 g each per 10 kg seed before sowing. The experimental field was prepared by one deep ploughing followed by harrowing and planking to achieve fine tilth. Standard agronomic practices including irrigation, weeding, thinning, earthing up, and plant protection measures were followed uniformly for all treatments.

Observations on growth parameters such as plant height, dry matter accumulation, and plant population were recorded at different growth stages. Growth indices including leaf area index (LAI), crop growth rate (CGR), and relative growth rate (RGR) were computed using standard formulas. Physiological parameters including chlorophyll content and carotenoid content were also estimated. Yield attributes such as cob length, cob girth, number of cobs $plant^{-1}$, number of seeds cob^{-1}, and 100-grain weight were recorded from randomly selected plants. Grain yield, straw yield, biological yield, and harvest index were calculated at harvest.

Economic analysis including cost of cultivation, gross returns, net returns, and benefit:cost ratio was worked out based on prevailing market prices. The experimental data were statistically analyzed using analysis of variance (ANOVA) appropriate for Randomized Block Design as described by Cochran and Cox (1963). The significance of treatment differences was tested at 5% probability level and critical difference (CD) values were calculated wherever the F-test was found significant.

Results and Discussion

Effect on Plant Height and Dry Matter Accumulation

Plant height increased progressively with advancement in crop growth stages under all treatments (**Table 1**). Among the treatments, T9 (Vermicompost @ 5 t ha^{-1} at sowing + Jeevamrit at 30 DAS) recorded significantly higher plant height at 30 DAS (41.65 cm), 60 DAS (95.00 cm), 90 DAS (161.79 cm) and harvest (180.73 cm). This treatment remained superior over all other treatments and was followed by T5. The increase in plant height under integrated organic nutrient management may be attributed to improved nutrient availability, enhanced microbial activity and better root proliferation. Vermicompost supplies macro and micronutrients in readily available form, while Jeevamrit enhances microbial population and nutrient mineralization, thereby improving vegetative growth. Dry matter accumulation also increased significantly due to different nutrient management treatments. Maximum dry matter accumulation at harvest (421.46 g m^{-2}) was recorded under T9, followed by T5 (401.30 g m^{-2}). Higher dry matter production might be due to enhanced photosynthetic activity and efficient translocation of assimilates under integrated nutrient management practices. The lowest plant height and dry matter accumulation were observed under control treatment due to inadequate nutrient availability and poor microbial activity. Similar findings were reported by [2], [3] and [4].

Effect on Leaf Area Index and Crop Growth Rate

Leaf area index (LAI) and crop growth rate (CGR) were significantly influenced by different treatments (**Table 2**). Treatment T9 recorded maximum LAI at 30 DAS (1.62), 60 DAS (2.59) and 90 DAS (3.09). The same treatment also recorded highest CGR during 30–60 DAS (3.63 g m^{-2} day^{-1}), 60–90 DAS (4.35 g m^{-2} day^{-1}) and 90 DAS to harvest (2.39 g m^{-2} day^{-1}). Improved LAI under integrated nutrient management might be due to better leaf expansion, enhanced chlorophyll synthesis and increased photosynthetic activity. Vermicompost and Jeevamrit supply nutrients gradually throughout crop growth stages and improve soil biological activity, resulting in higher leaf area development. Higher CGR values indicated efficient biomass accumulation and greater assimilate production during active crop growth stages. Similar observations were also reported by [5].

Table 1 Effect of organic nutrient management on plant height and dry matter accumulation of sweet corn under organic farming

Treatments	Plant height (cm)				Dry Matter Accumulation (g/m²)			
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
T_1-Control	27.14	71.28	121.86	140.2	76.7	141.85	221.59	277.07
T_2- FYM @ 10 t ha⁻¹ applied at sowing	29.53	77.11	131.71	154.68	86.59	157.15	251.36	311.65
T_3- Vermicompost @ 5 t ha⁻¹ applied at sowing	33.35	84.12	139.09	164.85	96.45	181.86	282.17	351.84
T_4- Jeevamrit application at 15 DAS	32.61	82.72	137.42	161.31	93.97	177.04	276.88	346.5
T_5- Jeevamrit application at 30 DAS	39.18	92.45	154.63	174.91	116.85	221.4	342.07	401.3
T_6- FYM @ 10 t ha⁻¹ at sowing + Jeevamrit at 15 DAS	37.06	89.83	149.34	170.99	111.62	211.69	331.52	391.38
T_7- FYM @ 10 t ha⁻¹ at sowing + Jeevamrit at 30 DAS	35.74	86.26	144.25	167.48	107.08	196.96	311.67	372.12
T_8- Vermicompost @ 5 t ha⁻¹ at sowing + Jeevamrit at 15 DAS	34.4	84.89	142.88	166.45	103.9	191.64	306.6	366.54
T_9- Vermicompost @ 5 t ha⁻¹ at sowing + Jeevamrit at 30 DAS	41.65	95	161.79	180.73	121.41	231.77	362.15	421.46
SEm±	1.45	1.85	5.25	4.06	1.42	10.24	10.84	16.18
C.D. (5%	4.35	5.56	15.73	12.19	4.26	30.70	32.50	48.50

Table 2 Effect of organic nutrient management on leaf area index and crop growth rate of sweet corn under organic farming

Treatments	Leaf Area Index (LAI)			Crop Growth Rate (CGR, g/m²/day)		
	30DAS	30DAS	30DAS	30DAS	60DAS	90DAS
T_1-Control	0.94	1.56	2.21	2.19	2.69	1.95
T_2- FYM @ 10 t ha⁻¹ applied at sowing	1.08	1.72	2.43	2.35	3.13	2.00
T_3- Vermicompost @ 5 t ha⁻¹ applied at sowing	1.24	2.03	2.61	2.86	3.35	2.06
T_4- Jeevamrit application at 15 DAS	1.16	1.95	2.57	2.74	3.31	2.04
T_5- Jeevamrit application at 30 DAS	1.54	2.49	3.01	3.52	4.29	2.34
T_6- FYM @ 10 t ha⁻¹ at sowing + Jeevamrit at 15 DAS	1.42	2.41	2.95	3.36	3.97	2.26
T_7- FYM @ 10 t ha⁻¹ at sowing + Jeevamrit at 30 DAS	1.33	2.25	2.85	3.03	3.87	2.16
T_8- Vermicompost @ 5 t ha⁻¹ at sowing + Jeevamrit at 15 DAS	1.31	2.14	2.73	2.95	3.81	2.11
T_9- Vermicompost @ 5 t ha⁻¹ at sowing + Jeevamrit at 30 DAS	1.62	2.59	3.09	3.63	4.35	2.39
SEm±	0.05	0.07	0.05	0.05	0.17	0.06
C.D. (5%	0.14	0.21	0.15	0.14	0.51	0.19

Effect on Relative Growth Rate, Chlorophyll and Carotenoid Content

Relative growth rate (RGR), chlorophyll content and carotenoid content were significantly enhanced by organic nutrient management practices (**Table 3**). Treatment T9 recorded highest RGR at 30 DAS (0.046 g g⁻¹ day⁻¹), 60 DAS (0.042 g g⁻¹ day⁻¹) and 90 DAS (0.033 g g⁻¹ day⁻¹). Similarly, chlorophyll content was highest under T9 with SPAD values of 42.14 and 39.85 at 30 and 60 DAS, respectively. Increased chlorophyll content under integrated nutrient management may be attributed to improved nitrogen availability and enhanced physiological efficiency. Carotenoid content was also significantly higher under T9 (0.38 and 0.35 mg g⁻¹ fresh weight at 30 and 60 DAS, respectively). Organic nutrient sources improve antioxidant metabolism and pigment synthesis, thereby enhancing carotenoid accumulation. These findings corroborate the reports of [1] and [3].

Table 3 Effect of nutrient management on Relative Growth Rate, Chlorophyll Content and Carotenoids Content of sweet corn under organic farming

Treatments	Relative Growth Rate (RGR, g/g/day)			Chlorophyll Content (SPAD units)		Carotenoids Content (mg/g fresh weight)	
	30DAS	60DAS	90DAS	30DAS	60DAS	30DAS	60DAS
T_1-Control	0.034	0.028	0.017	31.55	29.44	0.22	0.18
T_2- FYM @ 10 t ha^{-1} applied at sowing	0.037	0.031	0.020	33.59	32.07	0.26	0.23
T_3- Vermicompost @ 5 t ha^{-1} applied at sowing	0.040	0.034	0.024	36.1	34.45	0.29	0.27
T_4- Jeevamrit application at 15 DAS	0.039	0.032	0.021	35.51	34.16	0.28	0.26
T_5- Jeevamrit application at 30 DAS	0.044	0.040	0.032	39.46	38.25	0.32	0.30
T_6- FYM @ 10 t ha^{-1} at sowing + Jeevamrit at 15 DAS	0.042	0.038	0.030	41.01	38.93	0.35	0.33
T_7- FYM @ 10 t ha^{-1} at sowing + Jeevamrit at 30 DAS	0.041	0.037	0.027	38.16	36.59	0.31	0.29
T_8- Vermicompost @ 5 t ha^{-1} at sowing + Jeevamrit at 15 DAS	0.041	0.036	0.026	37.53	36.06	0.30	0.28
T_9- Vermicompost @ 5 t ha^{-1} at sowing + Jeevamrit at 30 DAS	0.046	0.042	0.033	42.14	39.85	0.38	0.35
SEm±	0.002	0.002	0.001	1.24	0.84	0.02	0.01
C.D. (5%	0.006	0.005	0.004	3.73	2.53	0.05	0.04

Table 4 Effect of nutrient management on yield attributes and yield of sweet corn under organic farming

Treatment	Cob Length (cm)	No. of Cob/ Plant	No. of Seeds/ Cob	Cob Girth (cm)	100 Grain Weight (g)	Grain Yield (q/ha)	Straw Yield (q/ha)	Biological Yield (q/ha)	Harvest Index (%)
T_1-Control	15.08	1.04	400.67	12.09	20.19	27.42	45.35	72.77	37.68
T_2- FYM @ 10 t ha^{-1} applied at sowing	16.11	1.13	420.89	12.54	21.48	35.36	55.74	91.10	38.81
T_3- Vermicompost @ 5 t ha^{-1} applied at sowing	18.05	1.24	450.84	13.04	23.08	46.22	63.09	109.31	42.28
T_4- Jeevamrit application at 15 DAS	17.57	1.22	445.12	12.82	22.53	45.34	62.23	107.57	42.15
T_5- Jeevamrit application at 30 DAS	19.47	1.35	480.39	13.52	24.48	55.41	72.38	127.79	43.36
T_6- FYM @ 10 t ha^{-1} at sowing + Jeevamrit at 15 DAS	20.53	1.39	485.74	13.96	25.02	58.39	74.19	132.58	44.04
T_7- FYM @ 10 t ha^{-1} at sowing + Jeevamrit at 30 DAS	18.84	1.27	460.11	13.18	24.07	49.42	69.13	118.55	41.69
T_8- Vermicompost @ 5 t ha^{-1} at sowing + Jeevamrit at 15 DAS	18.53	1.25	455.78	13.07	23.84	47.51	68.27	115.78	41.03
T_9- Vermicompost @ 5 t ha^{-1} at sowing + Jeevamrit at 30 DAS	21.64	1.51	500.85	14.48	26.01	61.18	75.42	136.60	44.79
SEm±	0.85	0.08	6.92	0.39	0.55	1.49	1.14	2.08	0.76
C.D. (5%	2.54	0.23	20.73	1.16	1.64	4.47	3.42	6.25	2.29

Effect on Yield Attributes and Yield

Yield attributes and yield of sweet corn were significantly influenced by nutrient management practices (**Table 4**). Treatment T9 recorded significantly higher cob length (21.64 cm), number of cobs plant^{-1} (1.51), seeds cob^{-1} (500.85), cob girth (14.48 cm) and 100-grain weight (26.01 g). The increase in yield attributes may be attributed to better source-sink relationship, efficient assimilate translocation and improved reproductive growth under integrated organic nutrient management. Treatment T9 also produced maximum grain yield (61.18 q ha^{-1}), straw yield (75.42 q ha^{-1}) and biological yield (136.60 q ha^{-1}). Enhanced yield under integrated nutrient management may be due to sustained nutrient release, improved soil microbial activity and higher photosynthetic efficiency throughout crop growth stages. The lowest grain yield (27.42 q ha^{-1}) was recorded under control treatment due to poor nutrient availability and lower growth performance. Similar findings were reported by [2], [4] and [6].

Effect on Economics

Economic analysis revealed considerable variation among treatments (**Table 5**). Treatment T5 (Jeevamrit application at 30 DAS) recorded the highest B:C ratio (2.63) and net returns (Rs. 120651 ha^{-1}), mainly because of comparatively lower cultivation cost and higher yield realization. Treatment T9 recorded maximum gross returns (Rs. 180660 ha^{-1}) and substantially higher net returns (Rs. 112538 ha^{-1}). Although T9 recorded the highest grain yield and gross returns, its cost of cultivation was substantially higher due to the application of vermicompost at 5 t ha^{-1}. Treatment T5 involved only Jeevamrit application at 30 DAS and therefore incurred considerably lower production costs. Consequently, T5 generated the highest net returns and benefit-cost ratio despite slightly lower productivity. The lowest economic returns were recorded under control treatment. These findings are in close conformity with those reported by [5].

Table 5 Effect of nutrient management on cost of cultivation, gross return, net return and B: C ratio of sweet corn cultivation under organic farming

Treatment	**Cost of cultivation (Rs,\. /ha)**	**Gross return (Rs./ha)**	**Net return (Rs./ha)**	**B:C ratio**
T_1-Control	38072	89053	50981	1.34
T_2- FYM @ 10 t ha^{-1} applied at sowing	41572	112920	71348	1.72
T_3- Vermicompost @ 5 t ha^{-1} applied at sowing	63072	140763	77691	1.23
T_4- Jeevamrit application at 15 DAS	68072	138322	70250	1.03
T_5- Jeevamrit application at 30 DAS	45822	166473	120651	2.63
T_6- FYM @ 10 t ha^{-1} at sowing + Jeevamrit at 15 DAS	65572	173968	108396	1.65
T_7- FYM @ 10 t ha^{-1} at sowing + Jeevamrit at 30 DAS	54822	151679	96857	1.77
T_8- Vermicompost @ 5 t ha^{-1} at sowing + Jeevamrit at 15 DAS	57322	147085	89763	1.57
T_9- Vermicompost @ 5 t ha^{-1} at sowing + Jeevamrit at 30 DAS	68122	180660	112538	1.65

Conclusion

The present investigation clearly demonstrated that integrated organic nutrient management significantly improved growth, physiological parameters, yield attributes, yield and economics of sweet corn under organic farming conditions. Among the treatments, vermicompost @ 5 t ha^{-1} applied at sowing along with Jeevamrit application at 30 DAS (T9) proved most effective in enhancing plant growth, chlorophyll content, dry matter accumulation and yield. However, Jeevamrit application at 30 DAS alone recorded highest B:C ratio due to lower cultivation cost. Therefore, integrated application of vermicompost and Jeevamrit may be recommended for sustainable and profitable sweet corn production under organic farming systems.

References

[1] Choudhary, M., Meena, R. S., Kumar, A., & Singh, D. (2024). Organic nutrient management approaches for improving growth and productivity of sweet corn under semi-arid conditions. International Journal of Plant and Soil Science, 36(4), 214–223.

[2] Kumar, P., Sharma, R., Yadav, G. S., & Verma, A. (2023). Influence of vermicompost and organic liquid

formulations on growth and yield of maize crops. Indian Journal of Agronomy, 68(2), 185–191.
[3] Meena, H. P., Choudhary, R., Kumar, S., & Yadav, D. (2023). Effect of organic nutrient management on physiology and productivity of sweet corn (Zea mays saccharata L.). The Pharma Innovation Journal, 12(8), 765–1772.
[4] Patel, R., Singh, V., Sharma, P., & Kumar, M. (2022). Role of Jeevamrit in improving soil fertility and crop productivity under organic farming. Biological Forum – An International Journal, 14(3), 420–427.
[5] Sharma, N., Meena, B. L., Choudhary, M., & Verma, S. (2024). Integrated organic nutrient management for sustainable sweet corn production. Journal of Experimental Agriculture International, 46(1), 115–124.
[6] Yadav, G. S., Kumar, R., Meena, H., & Singh, P. (2024). Effect of organic manures and liquid bio-enhancers on growth, yield and economics of maize under organic farming systems. International Journal of Environment and Climate Change, 14(5), 544–553.

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