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Effect of different types of vermicompost and nitrogen levels on yield of sweet corn (*Zea mays* L. *saccharata*)

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Abstract
A field experiment entitled "Effect of Different Types of Vermicompost and Nitrogen Levels on Yield of Sweet Corn (*Zea mays* L. *saccharata*)" was conducted during the summer season of 2025 at the Agronomy Farm, College of Agriculture, Pune. Results showed significant improvement in yield attributes with integrated nutrient management. The treatment T_1 (50% RDN through RDF + 50% tree litter vermicompost) produced the longest cobs (23.53 cm), highest girth (19.68 cm), maximum cob weight and the highest cob (250.67 q ha^{-1}) and stover yields (373.37 q ha^{-1}), performing comparably with RDF + vermicompost (T_{10}). The enhanced performance was attributed to sustained nutrient release and improved soil health. Overall, integrating 50% RDF with 50% tree litter vermicompost proved the most effective, confirming that partial substitution of chemical fertilizers with vermicompost can significantly enhance sweet corn productivity.

Keywords: Sweet corn, vermicompost, nitrogen levels, yield attributes, integrated nutrient management, cob

Introduction
Maize (*Zea mays* L.) is a key global cereal crop grown for food, feed and industrial uses, ranking third after wheat and rice in area and production (Ranum *et al.*, 2014). India is an important producer, cultivating 11.24 million hectares and yielding 37.67 million tonnes in 2023-24 (IPAD, 2024). Sweet corn (*Zea mays saccharata*), a specialty type valued for its high sugar content and tender kernels, is increasingly cultivated due to its short duration, nutritional quality and high market demand (Gopalan *et al.*, 2012) [3].
Despite expanding interest, sweet corn yields often remain suboptimal because of nutrient imbalance and declining soil fertility. Nitrogen is particularly critical for growth and yield, but excessive use of chemical fertilizers leads to nutrient losses and environmental concerns (Lim *et al.*, 2015) [9]. Integrating organic amendments with inorganic fertilizers is therefore essential for improving nutrient-use efficiency and sustaining soil health.
Vermicompost, produced by earthworm-mediated decomposition, is a nutrient-rich, microbially active amendment that enhances soil structure, water retention and nutrient availability (Edwards & Arancon, 2007) [2]. Feedstocks such as tree litter, soybean straw, sugarcane trash and spent mushroom substrate generate vermicomposts with distinct chemical and biological properties (Karmegam *et al.*, 2019; Yadav & Garg, 2011) [8, 14]. Vermicomposting is also an efficient waste-recycling method, reducing organic waste volume by up to 80-90% (Hanc & Chadimova, 2014) [5]. Studies show that combining vermicompost with nitrogen fertilizers improves chlorophyll content, root growth and cob yield, while reducing dependence on synthetic fertilizers (Patel & Reddy, 2017; Patel *et al.*, 2018). Given the rising demand for sweet corn and the need for sustainable nutrient strategies, evaluating different vermicompost types with nitrogen levels is vital for optimizing growth, yield and soil health.

Materials and Methods
A field experiment entitled "Effect of Different Types of Vermicompost and Nitrogen Levels on Growth, Yield and Quality of Sweet Corn (*Zea mays* L. *saccharata*)" was conducted during the

summer season of 2025 at the Agronomy Farm, College of Agriculture, Pune. The field trial was conducted following a Randomized Block Design with ten treatment combinations, each replicated three times, using gross and net plot sizes of 5.00 m × 4.50 m and 4.20 m × 3.00 m, respectively. The treatments involved varying integrations of recommended dose of nitrogen (RDN) through chemical fertilizers (RDF) and different types of vermicompost: T_1 (50% RDN through RDF + 50% RDN through tree litter vermicompost), T_2 (75% RDN through RDF + 25% RDN through tree litter vermicompost), T_3 (50% RDN through RDF + 50% RDN through button mushroom spent vermicompost), T_4 (75% RDN through RDF + 25% RDN through button mushroom spent vermicompost), T_5 (50% RDN through RDF + 50% RDN through sugarcane trash vermicompost), T_6 (75% RDN through RDF + 25% RDN through sugarcane trash vermicompost), T_7 (50% RDN through RDF + 50% RDN through soybean straw vermicompost), T_8 (75% RDN through RDF + 25% RDN through soybean straw vermicompost), T_9 (GRDF: 120:60:40 $N:P_2O_5:K_2O$ kg ha^{-1} +10 t FYM ha^{-1}), and T_{10} (RDF + 5 t vermicompost ha^{-1}).

Sweet corn variety 'Mithas' was dibbled at a spacing of 75 cm × 20 cm on 16th April 2025, receiving a full basal application of phosphorus, potassium and nitrogen in three split doses: at sowing, 30 DAS and 45 DAS, as per treatment requirements. Cob harvest was completed by 7th July, 2025. The experimental site had a clay loam texture, moderately alkaline reaction (pH 8.40), medium available nitrogen (175.16 kg ha^{-1}) and phosphorus (23.80 kg ha^{-1}), and moderately high available potassium (721.28 kg ha^{-1}) with organic carbon content at 0.42%. Well rotten FYM applied 10 tones ha^{-1} 15 days before sowing, nutrition of N was applied through urea and vermicompost. P and K were applied through chemical fertilizer single super phosphate and murate of potash respectively. Urea was applied in three splits i.e. at time of sowing, 30 DAS and 45 DAS. Vermicompost was applied at time of layout as basal application. Data on yield and yield-attributing characters were collected at time of harvest. Cob length was measured from the base to the tip of five plants using a ruler, and cob girth was measured at the midpoint of five cobs per plot using a Vernier caliper; the averages were recorded. Fresh cobs (with and without husk) from five plants were weighed. Kernel rows on five dehusked cobs were counted and averaged. Green cob and stover yields from each plot were weighed and expressed in q ha^{-1}.

Results and Discussion

Influence of different types of vermicompost and nitrogen levels on yield and yield attributes of sweet corn

1) Length of cob (cm)

Table 1 shows that the average cob length of sweet corn was 21.60 cm. The longest cobs were recorded in T_1 (50% RDN through RDF + 50% RDN through tree litter vermicompost) at 23.53 cm, significantly higher but at par with T_{10} (23.23 cm). The superior performance of T_1 is attributed to the combined effect of chemical fertilizer and tree litter vermicompost, providing both immediate and sustained nutrient supply, improving soil structure, microbial activity, and nutrient uptake, which promotes optimal cob growth (Gunadal, 2005; Murmu *et al.*, 2013) [4, 10].

2) Girth of cob (cm)

Table 1 shows that the average cob girth was 17.93 cm. The largest girth was recorded in T_1 (50% RDN through RDF + 50% RDN through tree litter vermicompost) at 19.68 cm, comparable to T_{10} (18.38 cm). The combined treatment provides immediate and sustained nutrient supply, enhances soil microbial activity, and promotes cell expansion, resulting in thicker, healthier cobs (Gunadal, 2005; Parthasarathi *et al.*, 2008) [4, 11].

3) Weight of cob with husk or without husk (g)

Table 1 shows that the average cob weight was 334.22 g with husk and 240.37 g without husk. The highest weights were recorded under T_1 (50% RDN through RDF + 50% RDN through tree litter vermicompost), 388.87 g with husk and 271.60 g without, comparable to T_{10}. The improvement is attributed to better soil aeration, moisture retention, and sustained nutrient supply from vermicompost, combined with the immediate nutrient availability from RDF, which enhances photosynthesis, grain filling, and overall cob biomass (Kale *et al.*, 1991; Ramesh *et al.*, 2013) [7, 12].

4) Number of grain rows cob^{-1}

As indicated in Table 1, the average number of grain rows per cob was 14.08. Statistical analysis revealed that differences among treatments were non-significant for this parameter. Although T_1 recorded the numerically highest value, the variation was not statistically significant, indicating that the number of grain rows per cob is primarily controlled by the crop's genetic potential rather than by nutrient management alone (Jadhav *et al.*, 2012; Ramesh *et al*., 2013) [6, 12].

5) Cob and stover yield (q ha^{-1})

Table 2 shows that the mean cob yield of sweet corn across treatments was 219.15 q ha^{-1}, with the highest yield recorded in T_1 (50% RDN through RDF + 50% tree litter vermicompost) at 234.44 q ha^{-1}, comparable to T_{10} (231.83 q ha^{-1}). The superior yield is attributed to continuous and balanced nutrient supply through integrated nutrient management, enhancing vegetative growth, leaf functionality, and cob development.

Mean stover yield was 319.37 q ha^{-1}, with the highest in T_1 (373.37 q ha^{-1}), statistically at par with T_{10} (372.08 q ha^{-1}). Higher stover yield resulted from improved vegetative growth, leaf area, chlorophyll content, photosynthetic activity, and soil health due to the combined effect of chemical fertilizers and tree litter vermicompost (Murmu *et al.*, 2013; Kale *et al.*, 1991; Rani *et al.*, 2014; Chaitanya *et al.*, 2013) [1, 7, 10, 13].

Table 1: Yield attributes of Sweet corn as influenced by different treatments:

Treatment	Length of cob (cm)	Girth of cob (cm)	Weight of cob with husk (g)	Weight of cob without husk (g)	No. of grain rows cob^{-1}
T_1: 50% RDN through RDF + 50% RDN through tree litter vermicompost	23.53	19.68	388.87	283.33	14.93
T_2: 75% RDN through RDF + 25% RDN through tree litter vermicompost	21.20	18.10	326.47	235.27	14.07
T_3: 50% RDN through RDF + 50% RDN through button mushroom spent vermicompost	21.47	18.03	342.87	247.67	14.03
T_4: 75% RDN through RDF + 25% RDN through button mushroom spent vermicompost	20.80	17.06	314.40	223.67	14.00
T_5: 50% RDN through RDF + 50% RDN through sugarcane trash vermicompost	21.47	17.88	335.13	235.60	13.67

T_6: 75% RDN through RDF + 25% RDN through sugarcane trash vermicompost	20.40	16.56	272.93	195.13	13.53
T_7: 50% RDN through RDF + 50% RDN through soybean straw vermicompost	21.60	18.03	338.67	243.67	13.97
T_8: 75% RDN through RDF + 25% RDN through soybean straw vermicompost	20.67	17.83	297.13	213.73	13.93
T_9: GRDF (120:60:40 N: P_2O_5: K_2O kg ha^{-1}+10t FYM ha^{-1})	21.63	18.08	350.00	254.07	14.07
T_{10}: RDF (120:60:40 N: P_2O_5: K_2O kg ha^{-1}+ 5t vermicompost ha^{-1})	23.23	18.38	375.73	271.60	14.63
S.E.m ±	0.64	0.51	4.78	6.28	0.29
C.D at 5%	1.84	1.46	13.81	18.15	NS
General mean	21.60	17.93	334.22	240.37	14.08

*NS= non-significant

Table 2: Cob and stover yield of sweet corn as influenced by different treatments:

Treatment	Cob yield (q ha^{-1})	Stover yield (q ha^{-1})
T_1: 50% RDN through RDF + 50% RDN through tree litter vermicompost	234.44	373.37
T_2: 75% RDN through RDF + 25% RDN through tree litter vermicompost	214.07	285.94
T_3: 50% RDN through RDF + 50% RDN through button mushroom spent vermicompost	219.97	334.03
T_4: 75% RDN through RDF + 25% RDN through button mushroom spent vermicompost	212.13	283.32
T_5: 50% RDN through RDF + 50% RDN through sugarcane trash vermicompost	211.00	282.30
T_6: 75% RDN through RDF + 25% RDN through sugarcane trash vermicompost	208.87	260.10
T_7: 50% RDN through RDF + 50% RDN through soybean straw vermicompost	222.63	313.06
T_8: 75% RDN through RDF + 25% RDN through soybean straw vermicompost	216.73	332.08
T_9: GRDF (120:60:40 N: P_2O_5: K_2O kg ha^{-1}+10t FYM ha^{-1})	223.44	357.39
T_{10}: RDF (120:60:40 N: P_2O_5: K_2O kg ha^{-1}+ 5t vermicompost ha^{-1})	231.83	372.08
S.E.m ±	3.72	4.23
C.D at 5%	10.74	12.21
General mean	219.51	319.37

Conclusion

The study indicates that integrated nutrient management, combining 50% RDN through RDF with 50% RDN through tree litter vermicompost (T_1), consistently improved the yield yield attributes of sweet corn. T_1 produced the longest and thickest cobs, the highest cob weight (with and without husk), and the maximum cob and stover yields, comparable to T_{10}. These improvements are attributed to the synergistic effects of chemical fertilizers and vermicompost, which provide both immediate and sustained nutrient supply, enhance soil structure, microbial activity, photosynthesis, and biomass accumulation. However, the number of grain rows per cob was largely unaffected by nutrient treatments, indicating genetic control. Overall, T_1 proved to be the most effective treatment for optimizing sweet corn productivity and biomass.

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