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Effect of novel organic manures and foliar nutrition on growth and yield of summer sesame (*Sesamum indicum* L.)

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Abstract

A field experiment was conducted during summer 2026 at the College Farm, Agricultural College, Polasa, Jagtial, Telangana State, India, to study the effect of organic manures and foliar sprays on growth and yield of summer sesame (*Sesamum indicum* L.). The experiment was laid out in randomized block design with ten treatments and three replications. Nutrient management significantly influenced plant height (cm), leaf area ($\text{cm}^2 \text{ plant}^{-1}$), dry matter production (g m^{-2}), capsules plant^{-1} , seeds capsule $^{-1}$, seed yield and stover yield, whereas test weight and harvest index were non-significant. T₉ (75% RDN + 25% N through vermicompost + one foliar spray of 2% urea at flowering) recorded the highest plant height (116 cm), leaf area ($340 \text{ cm}^2 \text{ plant}^{-1}$), dry matter production (346 g m^{-2}), capsules plant^{-1} (59.7), seeds capsule $^{-1}$ (66), seed yield (1170 kg ha^{-1}) and stover yield (2200 kg ha^{-1}), and was statistically at par with T₆ and T₈ for the respective parameters. Thus, integration of vermicompost with reduced inorganic nitrogen and foliar urea emerged as an effective and sustainable nutrient management strategy for enhancing growth and productivity of summer sesame, while reducing dependence on inorganic fertilizers.

Keywords: Black soldier fly larval frass, foliar nutrition, growth, sesame, vermicompost, yield

1. Introduction

Sesame (*Sesamum indicum* L.), commonly known as Til, is considered the “queen of oilseeds”. It is among the oldest oilseed crops that have been cultivated by mankind for a long time. It belongs to the Pedaliaceae family and grows in diverse types of agro-climatic regions starting from semi-arid to tropical, subtropical and temperate climatic zones. Sesame seeds are rich in oil content ranging from 46-52% along with 18-20% protein content and hence, considered a nutritionally and industrially important crop (Doifode *et al.*, 2025) ^[7]. Sesame cake, which is the residue left after oil extraction, is also rich in proteins, carbohydrates, vitamins and minerals with an estimated N, P and K content of 6.0-6.2%, 2.0-2.2% and 1.0-1.2% respectively, thus making it useful as organic manure (Agnihotri *et al.*, 2023) ^[1]. The presence of sesamol and sesamin contributes to the stability and quality of sesame oil and enhances its food, medicinal and industrial importance (Poveda *et al.*, 2016) ^[11].

In India, sesame was cultivated over 15.76 lakh ha with a production of 8.93 lakh tonnes and productivity of 567 kg ha^{-1} during 2024-25. Telangana accounted for 0.13 lakh ha with a production of 0.08 lakh tonnes and productivity of 636 kg ha^{-1} (Indiastat, 2024-25) ^[16]. In Telangana, sesame cultivation is concentrated mainly in the northern districts such as Adilabad, Jagtial, Karimnagar and Nizamabad, where it is grown during both *kharif* and summer seasons, often after rice, turmeric and cotton.

Integrating organic and inorganic sources like manures, chemical fertilizers, and foliar application can enhance nutrient availability and increase productivity. The vermicompost provides nutrients such as nitrogen, phosphorus, potassium, calcium and magnesium and also humus and growth promoting substances. The use of vermicompost may enhance growth and productivity through nutrient availability and biological activities in the soil (Arancon *et al.*, 2006; Atiyeh *et al.*, 2000) ^[3, 4].

Black soldier fly larval frass is a novel organic manure obtained through insect-mediated recycling of organic wastes. It is rich in N, P, K, chitin and microorganisms and provides a relatively slow

release of nutrients. Beesigamukama *et al.* (2020) ^[5] reported yield improvement through BSF frass application, while Lomonaco *et al.* (2024) ^[9] highlighted its beneficial effects on soil microbial biomass, dehydrogenase activity and nitrogen concentration. Tanga *et al.* (2022) ^[15] also reported the potential of composted BSF frass for improving crop productivity. The foliar application technique delivers nutrients to plant parts and can help to augment soil applied nutrients when crops need them most. Nano fertilizers aid in the controlled release of nutrients, while foliar nutrition helps to enhance photosynthesis and increase nutrient availability. Agnihotri *et al.* (2023) ^[1] found that nano-fertilizers were able to boost sesame growth, whereas Singh *et al.* (2025) ^[13] found that nano urea foliar application was beneficial for crop growth and production. Although organic manures and foliar nutrition have considerable promise, the use of novel organic manures such as BSF larval frass in sesame has received limited attention. Information on the combined use of organic nutrient sources with foliar application of nano-fertilizers and urea in summer sesame is also limited. Hence, the present study was undertaken to evaluate the effect of BSF frass, vermicompost and foliar nutrition on the growth, yield attributes and yield of summer sesame. This research aims to contribute towards the development of sustainable nutrient management practices for improving summer sesame productivity.

2. Materials and Methods

The present field experiment was carried out during the summer of 2026, located at the college farm, Agricultural College, Jagtial, which is geographically situated at 18°84' N latitude and 78°94' E longitude and at an altitude of 243.4 m above mean sea level (MSL) in the Northern Telangana Zone. The soil was sandy loam, slightly alkaline (pH 7.34), non-saline (EC 0.45 dS m⁻¹), low in organic carbon (0.31%) and available nitrogen (176.4 kg ha⁻¹), medium in phosphorus (21.7 kg ha⁻¹) and potassium (190.3 kg ha⁻¹). The treatments includes T₁: 100% RDN (80 kg N ha⁻¹), T₂: 75% RDN + 25% N through BSF frass, T₃: 75% RDN + 25% N through vermicompost, T₄: 100% RDN + 1 foliar spray of Nano urea plus (20% N) @ 4 ml l⁻¹ at flowering stage, T₅: 75% RDN + 25% N through BSF frass + 1 foliar spray of Nano urea plus (20% N) @ 4 ml l⁻¹ at flowering stage, T₆: 75% RDN + 25% N through Vermicompost + 1 foliar spray of Nano urea plus (20% N) @ 4 ml l⁻¹ at flowering stage, T₇: 100% RDN + 1 foliar spray of 2% Urea at flowering stage, T₈: 75% RDN + 25% N through BSF frass + 1 foliar spray of 2% Urea at flowering stage, T₉: 75% RDN + 25% N through Vermicompost + 1 foliar spray of 2% Urea at flowering stage and T₁₀: Control (0:20:20 N: P₂O₅: K₂O kg ha⁻¹).

Table 1: Chemical composition of Black soldier fly larval frass and vermicompost

Parameters	Black soldier fly larval frass	Vermicompost
pH	8.49	6.78
EC (1:10) dS m ⁻¹	7.46	1.02
Total organic carbon (%)	24.2	29.0
Total Nitrogen (%)	1.40	2.00
Total Phosphorus (%)	1.60	1.70
Total Potassium (%)	0.89	1.23

The summer sesamum Jagtial Til-1 (JCS 1020) was raised in plots of 4.5 m x 4.5 m (20.25 m²) at a spacing of 30 cm x 15 cm with a net area of 3.9 m x 4.2 m (16.38 m²). The crop is maintained by following proper agronomic practices and the irrigation schedule was based on the requirements of the crop. Weeds were removed

manually from the experimental plots to keep them weed free. The BSF Frass and vermicompost were added 15 days prior to planting and thoroughly incorporated into the soil to ensure proper nutrient release. Fertilizers were supplied as per the designations of the treatment plans. In the case of treatments with BSF Frass and Vermicompost (T₂, T₃, T₅, T₆, T₈, T₉), the quantity of manure to be supplied was calculated keeping in mind the nitrogen content of the manure in order to meet the requirements of the crop. Also, the supply of phosphorus and potassium from the manure was kept in consideration and the remaining was supplemented with SSP and MOP. In treatments T₁ toT₉, the chemical nitrogen was provided in the form of urea at two equal dosages, first at the time of sowing and second at 30 days after sowing. Foliar sprays of nano urea plus and 2% urea were done at flowering in respective treatments and the control treatment received no nitrogen and was maintained with 20 kg P₂O₅ and 20 kg K₂O ha⁻¹. Field observations for growth and yield characteristics were made on the randomly selected plants tagged for the experiment. Growth characteristics like plant height, leaf area, and dry matter accumulation were noted at different growth stages. At harvest, observations were made on the number of capsules plant⁻¹, number of seeds capsule⁻¹ and test weight. Seed yield and stover yield were also noted from the net plot area expressed in kilograms hectare⁻¹. The data collected in the experiment were statistically analyzed based on Analysis of Variance (ANOVA) suitable for Randomized Block Design (RBD), following the method suggested by Panse and Sukhatme (1978). The significance of the treatment effect was assessed through F-test at a 5% probability level. Critical Difference (CD) was determined for significant differences and NS was taken for non-significant differences.

3. Results and Discussion

3.1 Growth Parameters

The effect of organic manures and foliar sprays on the growth of summer sesame (*Sesamum indicum* L.) is detailed in Table 2. Application of 75% RDN + 25% N through vermicompost + 2% urea spray (T₉) recorded the highest plant height (116 cm), leaf area (340 cm² plant⁻¹) and dry matter production (347 g m⁻²) at harvest, which was statistically at par with T₆ (112 cm, 328 cm² plant⁻¹ and 339 g m⁻²) and T₈ (107 cm, 303 cm² plant⁻¹ and 314 g m⁻²), respectively. The better growth could be due to continuous availability of nutrients through vermicompost and additional foliar N, which would have improved cell division and elongation, leaf expansion, photosynthesis and dry matter production. Similar findings were reported by Shathi *et al.* (2023) ^[12], Kranthikumar *et al.* (2025) ^[8] and Ahirwar *et al.* (2017) ^[2].

3.2 Yield attributes and yield

Effect of organic manures and foliar sprays on yield attributes and yield of summer sesame (*Sesamum indicum* L.) is described in Table 3 and Table 4. 75% RDN + 25% N through vermicompost + 2% urea spray at flowering (T₉) showed the highest value for number of capsules plant⁻¹ (59.7), number of seeds capsule⁻¹ (66), seed yield (1170 kg ha⁻¹) and stover yield (2200 kg ha⁻¹), which was statistically on par with T₆ (57.9 capsules plant⁻¹, 64.4 seeds capsule⁻¹, 1130 kg ha⁻¹ seed yield and 2157 kg ha⁻¹ stover yield) and T₈ (54.9 capsules plant⁻¹, 61.6 seeds capsule⁻¹, 1045 kg ha⁻¹ seed yield and 1994 kg ha⁻¹ stover yield), respectively. Test weight and harvest index were not significantly affected by any treatment. However, T₉ showed the highest numerical value for test weight (2.85 g) and harvest index (34.7%). The higher yield and yield attributes observed under T₉ could be due to sustained

nutrient availability through vermicompost and easily available N through foliar urea, which helped in reproductive development and biomass accumulation. Similar results were also observed by

Bhardwaj *et al.* (2025) ^[6], Shathi *et al.* (2023) ^[12], Sujatha *et al.* (2019) ^[14] and Mahajan *et al.* (2016) ^[10].

Table 2: Effect of organic manures and foliar sprays on the growth of summer sesame (*Sesamum indicum* L.)

Tr. No	Treatments	Plant height (cm)	Dry matter (g m ⁻²)	Leaf area (cm ² plant ⁻¹)
T ₁	100% RDN (80 kg N ha ⁻¹)	69.5	236	186
T ₂	75% RDN + 25% N through BSF frass	71.0	237	198
T ₃	75% RDN + 25% N through Vermicompost	71.7	239	216
T ₄	100% RDN + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	87.6	278	264
T ₅	75% RDN + 25% N through BSF frass + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	96.6	304	290
T ₆	75% RDN + 25% N through Vermicompost + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	109.0	339	328
T ₇	100% RDN + 1 foliar spray of 2% Urea at flowering stage	84.8	276	255
T ₈	75% RDN + 25% N through BSF frass + 1 foliar spray of 2% Urea at flowering stage	102.0	314	303
T ₉	75% RDN + 25% N through Vermicompost + 1 foliar spray of 2% Urea at flowering stage	114.0	347	340
T ₁₀	Control (0:20:20) N: P ₂ O ₅ : K ₂ O kg ha ⁻¹	41.2	105	104
	SEm ±	4.09	11.20	12.12
	CD (p=0.05)	12.20	33.00	36.00
	CV (%)	8.36	7.26	8.45

Table 3: Effect of organic manures and foliar sprays on yield attributes of summer sesame (*Sesamum indicum* L.)

Tr. No	Treatments	Capsules plant ⁻¹	Seeds capsule ⁻¹	Test weight (g)
T ₁	100% RDN (80 kg N ha ⁻¹)	38.5	43.8	2.56
T ₂	75% RDN + 25% N through BSF frass	39.0	44.0	2.60
T ₃	75% RDN + 25% N through Vermicompost	40.0	44.4	2.64
T ₄	100% RDN + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	48.0	52.0	2.71
T ₅	75% RDN + 25% N through BSF frass + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	51.0	57.1	2.76
T ₆	75% RDN + 25% N through Vermicompost + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	57.9	65.4	2.82
T ₇	100% RDN + 1 foliar spray of 2% Urea at flowering stage	47.0	51.0	2.68
T ₈	75% RDN + 25% N through BSF frass + 1 foliar spray of 2% Urea at flowering stage	54.9	59.6	2.79
T ₉	75% RDN + 25% N through Vermicompost + 1 foliar spray of 2% Urea at flowering stage	59.7	66.0	2.85
T ₁₀	Control (0:20:20) N: P ₂ O ₅ : K ₂ O kg ha ⁻¹	19.7	30.0	2.45
	SEm ±	2.05	2.17	0.13
	CD (p=0.05)	6.10	6.40	NS
	CV (%)	7.81	7.32	8.35

Table 4: Effect of organic manures and foliar sprays on yield of summer sesame (*Sesamum indicum* L.)

Tr. No	Treatments	Seed yield (kg ha ⁻¹)	Stover Yield (kg ha ⁻¹)	Harvest index (%)
T ₁	100% RDN (80 kg N ha ⁻¹)	776	1500	34.1
T ₂	75% RDN + 25% N through BSF frass	780	1507	34.1
T ₃	75% RDN + 25% N through Vermicompost	784	1509	34.2
T ₄	100% RDN + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	919	1763	34.3
T ₅	75% RDN + 25% N through BSF frass + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	1004	1926	34.3
T ₆	75% RDN + 25% N through Vermicompost + 1 spray of Nano urea plus (20% N) @ 4 ml l ⁻¹ at flowering stage	1130	2157	34.4
T ₇	100% RDN + 1 foliar spray of 2% Urea at flowering stage	910	1751	34.2
T ₈	75% RDN + 25% N through BSF frass + 1 foliar spray of 2% Urea at flowering stage	1045	1994	34.4
T ₉	75% RDN + 25% N through Vermicompost + 1 foliar spray of 2% Urea at flowering stage	1170	2200	34.7
T ₁₀	Control (0:20:20) N: P ₂ O ₅ : K ₂ O kg ha ⁻¹	385	775	33.2
	SEm ±	42.22	77.40	1.39
	CD (p=0.05)	125.00	230.00	NS
	CV (%)	8.21	7.85	7.05

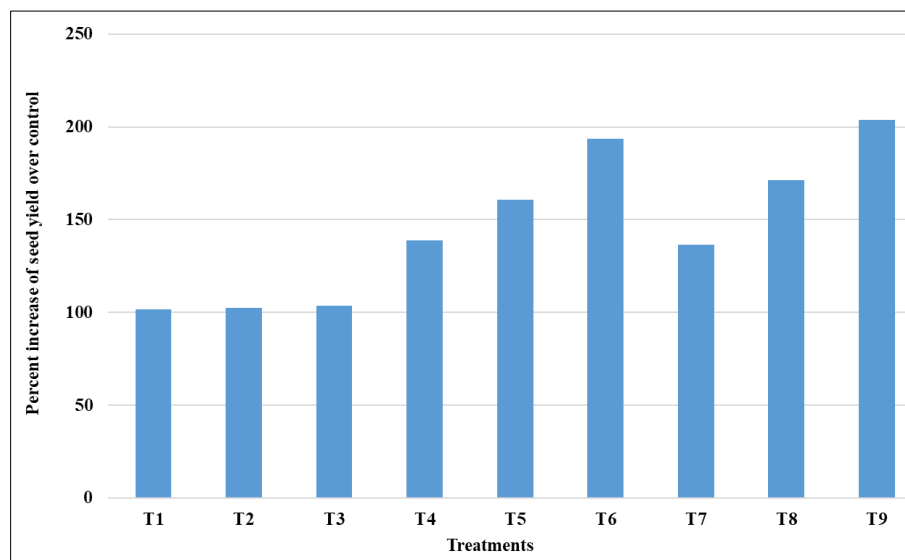


Fig 1: Percent seed yield increase in summer sesame under different nutrient management practices over control

4. Conclusion

Organic manures such as BSF larval frass and vermicompost were studied in conjunction with foliar nutrition with respect to their influence on the growth and yield of summer sesame. It was observed that the application of 75% RDN and 25% N using vermicompost in addition to 2% urea spray on leaves resulted in significant improvement in all growth parameters, yield characters and yield. Thus, it can be concluded that the replacement of 25% nitrogen with vermicompost along with foliar nutrition is an effective technique for nutrient management and increasing yield in sesame cultivation. It also reduces dependence on synthetic fertilizers, contributing to sustainable and eco-friendly agriculture.

References

1. Agnihotri R, Tyagi DB, Nehal N, Tripathi LK, Bhati D. Effect of nano-fertilizer and conventional fertilizer on the growth, yield and yield attributes of sesame (*Sesamum indicum* L.). Asian J Multidiscip Adv Res. 2023;12(1):18-25.
2. Ahrwar K, Panda S, Jyotishi A. Optimisation of sesame (*Sesamum indicum* L.) production through integrated nutrient management. Int J Curr Microbiol Appl Sci. 2017;6:1701-1707.
3. Arancon NQ, Edwards CA, Bierman P, Welch C, Metzger JD. Influences of vermicompost on field strawberries: Part 1. Effects on growth and yields. Bioresour Technol. 2006;97(6):831-840.
4. Atiyeh RM, Edwards CA, Subler S, Metzger JD. Earthworm-processed organic wastes as components of horticultural potting media for growing marigolds and vegetable seedlings. Compost Sci Util. 2000;8(3):215-223.
5. Beesigamukama D, Mochoge B, Korir NK, Fiaboe KKM, Nakimbugwe D, Khamis FM, *et al.* Exploring black soldier fly frass as novel fertilizer for improved growth, yield and nitrogen use efficiency of maize under field conditions. Front Plant Sci. 2020;11:574592.
6. Bhardwaj S, Bisen JS, Turkar D, Satankar N, Choudhary AS, Hanwat D. Impact of integrated nutrient management on growth, yield and its contributing traits of sesame (*Sesamum indicum* L.). Int J Adv Biochem Res. 2025;9(9):359-362.
7. Doifode DS, Bisen JS, Turkar D, Satankar N. Response of inorganic and organic fertilizer on growth and yield of sesame (*Sesamum indicum* L.). Int J Res Agron. 2025;8(11):93-96.
8. Kranthikumar P, Ghotmukale AK, Sireesha P, Khedkar VA, Sukne SS. Effect of foliar application of fertilizer on growth and seed yield of sesame (*Sesamum indicum* L.). Plant Arch. 2025;25(1):1513-1518.
9. Lomonaco G, Franco A, De Smet J, Scieuzo C, Salvia R, Falabella P. Larval frass of *Hermetia illucens* as organic fertilizer: composition and beneficial effects on different crops. Insects. 2024;15(4):293.
10. Mahajan HS, Patil YG, Hirwe NA, Patil TR, Deshmukh MR. Effect of foliar nutrition of urea and diammonium phosphate on seed yield and economics of sesame (*Sesamum indicum* L.) under rainfed situation. Int J Agric Sci. 2016;12(1):101-105.
11. Poveda T, Vilcacundo R, Carpio C, Carrillo W. Analysis of sesame proteins isolate (*Sesamum indicum* L.) with water and salt treatment. Asian J Pharm Clin Res. 2016;9(3):404-407.
12. Shathi TA, Syed M, Rahman MK. Growth and quality characteristics of sesame (*Sesamum indicum* L.) as influenced by vermicompost and chemical fertilizers. J Asiatic Soc Bangladesh Sci. 2023;49(1):43-53.
13. Singh SD, Patil SS, Jadhav DB, Birunagi SM, Karmakar K, Saini N, *et al.* Response of soil applied urea and foliar applied nano urea on the growth, yield and quality of kharif sesame (*Sesamum indicum* L.) under the central plain agro-climatic zone of Punjab. Agric Sci Dig. 2025;46(3):422-427.
14. Sujatha V, Rao SG. Effect of foliar nutrition of nitrogen and potash on seed yield and economics of sesame (*Sesamum indicum* L.) in North Coastal zone of Andhra Pradesh. Int J Chem Stud. 2019;7(6):138-140.
15. Tanga CM, Beesigamukama D, Kassie M, Egonyu PJ, Ghemoh CJ, Nkoba K, *et al.* Performance of black soldier fly frass fertiliser on maize (*Zea mays* L.) growth, yield, nutritional quality and economic returns. J Insects Food Feed. 2022;8(2):185-196.
16. Indiatat. Selected state and season-wise area, production and productivity of sesame, Telangana, 2023-2024. <https://www.indiatat.com/table/telanganastate/agriculture/elected-state-season-wise-area-production-product/1469695>