



Effect of Panchgavya and Organic Manure in Some Yield Parameters of Black Sesame (*Sesamum indicum* L.)

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted during the Kharif season of 2024 at the Himalayan University Agricultural Farm, Jollang, Itanagar, to evaluate the effect of Panchgavya in combination with bulky organic manure on the productivity and quality of black sesame (*Sesamum indicum* L.). The study employed a Randomized Block Design (RBD) with eight treatments replicated three times, involving various combinations of recommended dose of fertilizers (RDF), farmyard manure (FYM), and Panchgavya.

Significant variations were observed among treatments with respect to seed yield, stalk yield, and harvest index. Among the treatments, T7 (100% RDF + 100% FYM + 5% Panchgavya) recorded the highest values for all yield parameters, demonstrating a synergistic effect of integrating chemical and organic nutrient sources. The results indicate that the combined application of RDF, FYM, and Panchgavya can enhance the growth, yield, and quality of black sesame under the agro-climatic conditions of Arunachal Pradesh.

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Keywords: RDF (recommended dose of fertilizers); FYM (farmyard manure); panchgavya; bulky organic manure.

1. INTRODUCTION

Singh and Ram, (1992) stated that the application of organic manures significantly increased the total number of capsules per plant, number of seeds per capsule, seed and stalk yield of sesame. The significantly highest total number of capsules per plant, number of seeds per capsule, seed and stalk yield were recorded with the application of FYM and Vermicompost. Such increase in yield and have been reported to be associated with the release of macro and micro nutrients during the course of decomposition (Shisanya et al., 2009).

Uzun and Olowe, (2006) stated that plant height, number and weight of capsules per plant, and weight of seeds per plant are important traits in sesame contributing strongly to seed yield and the risk of cultivation failure is decreased with greater options of food supply, more efficient land use, and reduction in seasonality of labour utilisation.

Aliyu and Anon, (2007) mentioned that yield and yield attributes of sesame were significantly increased by the application of manure. This could be attributed to the low nutrient status of the soil and the ability of manures to supply nutrients contained in them gradually to support crop growth which later translated to high yield and yield attributes.

Mubashir *et al.* (2007) mentioned plant selection with appropriate type sesame is essential for increasing seed yield and developing novel sesame varieties. It is considered that breeding based on additively controlled characters helps improving sesame yield.

Dixit *et al.* (2012) stated that application of FYM @ 5 t ha⁻¹ significantly increased yield attributes viz. seed yield, straw yield over FYM @ 2.5 t ha⁻¹ and control have also been reported.

Rahevar *et al.* (2015) stated that the application of FYM could be owing to higher availability of plant nutrients which is conducive for physical environment leading to enhanced moisture holding capacity, better aeration, root activity and nutrient absorption which consequently in complementary effect and finally would have resulted in higher growth and yield of the crop.

Ozturk and Saman, (2016) mentioned that the seed yield of sesame mainly depends on ecological (temperature, rainfall) and management factors. The proper plant population is an important factor to obtain higher yield of sesame. Increased plant density leads to competition among the plants for available resources.

Directorate of Economics and Statistics, (2019) stated that India ranks first in sesame production in the world with 19.47 lakh ha area and 8.66 lakh tones production. The average yield of sesame (413 kg/ha) in India is low as compared to other countries in the world (535 kg/ha).

Feng *et al.* (2019) stated that optimum plant stand is necessary for higher yield.

2. MATERIALS AND METHODS

The experiment was conducted during the Kharif season of 2024, commencing on 26th June, at the Agricultural Research Field of Himalayan University, situated in Jollang, Itanagar (latitude 27.074684°N, longitude 93.652878°E) at an average elevation of 320 meters above sea level. The primary objective of the study was to evaluate the agronomic performance, adaptability, and yield potential of black sesame (*Sesamum indicum* L.) under the influence of Panchgavya in conjunction with bulky organic manure. The aim was to assess productivity and quality under the agro-climatic conditions of the region and to generate data that could aid in identifying the most suitable treatment combinations for enhancing black sesame yield during the monsoon-dominated Kharif season.

The treatment include, T1 – Control, T2 - 100 % RDF, T3 - 100 % FYM, T4 - 100 % RDF + 100 % FYM + 2 % Panchgavya, T5 - 100 % RDF + 100 % FYM + 3 % Panchgavya, T6 - 100 % RDF + 100 % FYM + 4 % Panchgavya, T7 - 100 % RDF + 100 % FYM + 5 % Panchgavya, T8 - 100 % RDF + 100 % FYM + 6 % Panchgavya. The experiment was carried out in Randomized Block Design (RBD) in the year 2024 – 2025.

The climate of Itanagar is characterized as a humid subtropical climate with distinct seasonal variations. The rainy season typically begins in May and extends through September, followed

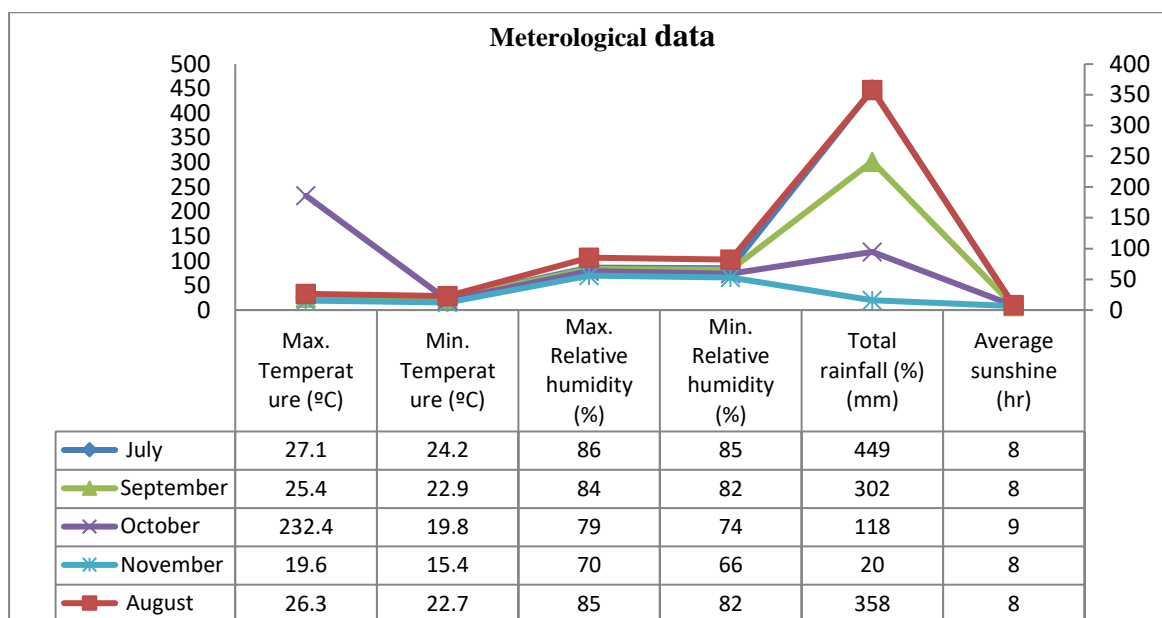


Fig. 1. Meteorological data of weather parameters and total rainfall during the cropping season (Kharif 2024-2025)

by a post-monsoon period from October onwards. The experiment was conducted during the Kharif season of 2024, spanning from July to November. Meteorological data on key weather parameters—temperature, rainfall, relative humidity, and sunshine hours—were obtained from the meteorological observatory located near the experimental site. These data were recorded throughout the cropping period and are summarized in the accompanying table.

During the experimental period, the mean maximum and minimum temperatures were 27.6°C and 22.3°C, respectively. The region experienced high relative humidity, which is typical during the monsoon season, contributing to favorable moisture conditions for black sesame growth. The detailed weather data provided essential insights into the crop’s performance under the specific agro-climatic conditions of the region.

2.1 Crop Yield Attributes

Seed Yield: Following manual threshing, the harvested sesame plants from each plot were carefully processed to separate the seeds. The collected seeds were meticulously cleaned to remove all visible impurities, such as plant debris and dust. After cleaning, the seeds were evenly spread and sun-dried until they reached a standardized moisture content, ensuring uniformity and reliability in subsequent weight

measurements. Once adequately dried, the seed yield from each plot was measured and recorded in kilograms. For consistency and to facilitate comparison across treatments, the grain yield was then converted into kilograms per hectare (kg/ha) based on the net plot area.

Stalk Yield: After harvesting, the sesame plants from each plot were manually threshed to extract the seeds. The remaining plant materials—including stems, leaves, and unfilled panicles—were collectively categorized as stalk or straw. These residues were then thoroughly sun-dried to a constant weight to eliminate moisture variability. Once dried, the total stalk yield from each plot was weighed using a digital scale and recorded in kilograms. This data was used to evaluate the contribution of vegetative biomass alongside seed yield in assessing the overall productivity of each treatment.

Harvest Index: The ratio of economic yield (seed yield) to biological yield was worked out to estimate harvest index as per formula given by (Singh and Stoskopf, 1971).

$$\text{Harvest index}(\%) = \frac{\text{Economic Yield}}{\text{Biological Yield}} \times 100$$

3. RESULTS AND DISCUSSION

The yield and growth parameters of black sesame were recorded under a Randomized

Block Design (RBD) with three replications. Observations were taken for key agronomic traits, including seed yield, stalk yield, and harvest index. The collected data were subjected to statistical analysis to compute the general mean, standard error of difference (SEd), and critical difference (CD) at the 5% level of significance ($P < 0.05$). This analysis enabled the assessment of treatment effects and the identification of statistically significant differences among treatments.

3.1 Crop Yield Parameters

Seed Yield: The seed yield (kg/ha) was recorded after harvesting and is presented in Table 1. The results revealed that different treatment combinations had a significant effect on the seed yield of black sesame. The highest seed yield, 830 kg/ha, was recorded in Treatment T7 (100%

RDF + 100% FYM + 5% Panchgavya), which was found to be statistically significant compared to the other treatments.

In contrast, the lowest seed yield was observed in the control treatment (T1), which received no external nutrient supplementation, with a yield of 499.6 kg/ha. The integration of 100% Recommended Dose of Fertilizers (RDF) with 100% Farmyard Manure (FYM) and 5% Panchgavya significantly improved the seed yield of black sesame (*Sesamum indicum* L.).

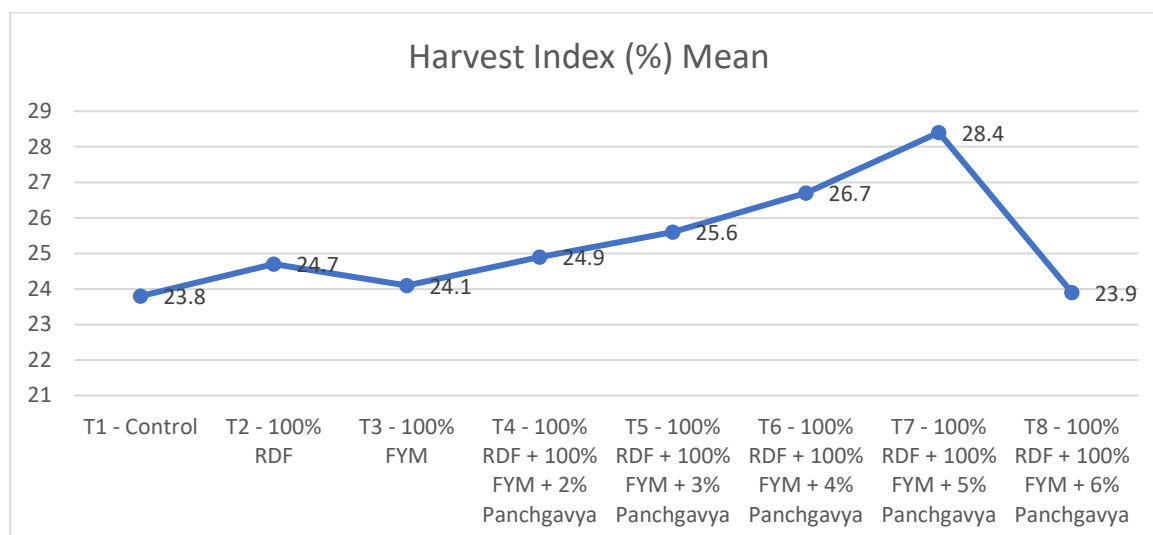
This indicates a synergistic effect of combining organic and inorganic nutrient sources, enhancing not only productivity but also crop quality and potential profitability under the agro-climatic conditions of the region (Ameeben, 2021).

Table 1. Effect of Panchgavya in Conjunction with Bulky Organic Manure on Seed Yield of Black Sesame

Treatments	Seed yield (Kg)
	Mean
T ₁ - Control	499.7
T ₂ - 100% RDF	585.3
T ₃ - 100% FYM	532
T ₄ - 100% RDF + 100% FYM + 2% Panchgavya	596.7
T ₅ - 100% RDF + 100% FYM + 3% Panchgavya	604.3
T ₆ - 100% RDF + 100% FYM + 4% Panchgavya	681.7
T ₇ - 100% RDF + 100% FYM + 5% Panchgavya	830
T ₈ - 100% RDF + 100% FYM + 6% Panchgavya	506
F test	S
S.Ed±	70.81826
CD (P=0.05)	151.8901

Table 2. Effect of Panchgavya in Conjunction with Bulky Organic Manure on stalk yield of Black Sesame

Treatments	Stalk yield (Kg/ha)
	Mean
T ₁ - Control	590
T ₂ - 100% RDF	716.6
T ₃ - 100% FYM	650
T ₄ - 100% RDF + 100% FYM + 2% Panchgavya	770
T ₅ - 100% RDF + 100% FYM + 3% Panchgavya	786.7
T ₆ - 100% RDF + 100% FYM + 4% Panchgavya	790
T ₇ - 100% RDF + 100% FYM + 5% Panchgavya	806.7
T ₈ - 100% RDF + 100% FYM + 6% Panchgavya	616.7
F test	S
S.Ed±	11.46077
CD (P=0.05)	24.5809



Graph 1. Effect of Panchgavya in Conjunction with Bulky Organic Manure on harvest index of Black Sesame

Stalk Yield: The stalk yield (kg/ha) was recorded after harvesting and is presented in Table 2. The data indicate that different nutrient management treatments had a significant effect on stalk yield. The highest stalk yield, 806.7 kg/ha, was obtained under Treatment T7 (100% RDF + 100% FYM + 5% Panchgavya), which was statistically significant compared to all other treatments.

Conversely, the lowest stalk yield was recorded in the control treatment (T1), which did not receive any nutrient supplementation, with a yield of 590.0 kg/ha.

These results underscore the positive influence of integrating organic amendments such as FYM and Panchgavya with the recommended chemical fertilizers. This integrated approach not only improved the vegetative biomass (as indicated by higher stalk yield) but also contributed to enhanced crop performance, yield quality, and overall economic viability of black sesame cultivation under the agro-climatic conditions of the study area (Takar et al., 2017).

Harvest Index: The harvest index (%) was recorded after harvesting and is presented in Graph 1. The results demonstrated a significant effect of different treatments on the harvest index of black sesame. The highest harvest index, 26.77%, was observed in Treatment T7 (100% RDF + 100% FYM + 5% Panchgavya), which was statistically superior to the other treatments.

In contrast, the lowest harvest index was recorded in the control treatment (T1), which did not receive any nutrient supplementation, with a value of 23.84%.

The higher harvest index in T7 indicates that the integration of organic inputs with recommended chemical fertilizers significantly enhanced overall plant health and yield efficiency. This improvement is likely due to better nutrient availability, enhanced photosynthetic activity, and improved plant architecture, all contributing to greater partitioning of biomass toward economically important seed yield components (Veerla and Nayakanti, 2019).

4. CONCLUSION

Based on the comprehensive findings of the study, it can be concluded that the application of 100% Recommended Dose of Fertilizers (RDF) + 100% Farmyard Manure (FYM) + 5% Panchgavya yielded the most favorable results in black sesame cultivation. This integrated treatment (T7) resulted in the highest seed yield (830 kg/ha), highest stalk yield (806.7 kg/ha), and highest harvest index (26.77%) among all the treatments evaluated.

The combination of organic and inorganic nutrient sources demonstrated a synergistic effect, enhancing not only crop productivity but also contributing to improved soil health. This integrated nutrient management approach supports the principles of sustainable agriculture,

making it a viable strategy for improving sesame yield and long-term soil fertility under the agro-climatic conditions of Itanagar and similar regions.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Aliyu, L. (2003). Effect of nitrogen and phosphorus on the chemical composition and uptake of mineral elements by pepper (*Capsicum annum* L.). *Crop Research*, 25(2), 272–279.
- Ameeben, K. P. (2021). Nutrient management in Kharif sesame (*Sesamum indicum* L.) under organic farming.
- Directorate of Economics and Statistics. (2019). Department of Agriculture and Cooperation, Government of India. Normal estimates samum.
- Dixit, J. P., Tripathi, M. L., & Verma, K. L. (2012). Effect of manures and fertilizer dose/ratio on yield of groundnut varieties. *Bhartiya Krishi Anusandhan Patrika*, 26, 62–62.
- Feng, L., Raza, M. A., Chen, Y., Khalid, M., Meraj, H. B., & Ahsan, F. (2019). Narrow-wide row planting pattern improves the light environment and seed yields of intercrop species in relay intercropping system. *Journal, Pune*, e0212885.
- Mubashir, A. K., Mirza, M., Akmal, M., Ali, N., & Khan, I. (2007). Genetic parameters and their implications for yield improvement in sesame. *Sarhad Journal of Agriculture*, 23, 623–627.
- Öztürk, O., & Saman, O. (2012). Effects of different plant densities on the yield and quality of second crop sesame. *International Journal of Agriculture and Biosystematic Engineering*, 6, 644–649.
- Rahevar, H. D., Patel, P. P., Patel, B. T., Joshi, S. K., & Vaghela, S. J. (2015). Effect of FYM, iron and zinc on growth and yield of summer groundnut (*Arachis hypogaea* L.) under North Gujarat agro-climatic conditions. *Indian Journal of Agricultural Research*, 49, 294–296.
- Shisanya, C. A., Mucheru, M. W., Mugendi, D. N., & Kung'u, J. B. (2009). Effect of organic and inorganic nutrient sources on soil mineral nitrogen and maize yields in central highlands of Kenya. *Soil and Tillage Research*, 103(2), 239–246.
- Singh, I. D., & Stoskopf, N. C. (1971). Harvest index in cereals 1. *Agronomy Journal*, 63(2), 224–226.
- Singh, P. N., & Ram, H. (1992). Effect of phosphorus and sulphur on concentration and uptake of micronutrients in chickpea. *Journal of the Indian Society of Soil Science*, 40, 307–312.
- Takar, S. S., Giriraj, J., Bijarnia, A. L., Shivran, A., & Yadav, H. L. (2017). Integrated nitrogen management through organic resources in summer sesame (*Sesamum indicum* L.). *Journal of Pharmacognosy and Phytochemistry*, 6(4), 1490–1492.
- Uzun, B., & Cagirgan, M. I. (2006). Comparison of determinate and indeterminate lines of sesame for agronomic traits. *Field Crops Research*, 96, 13–18.
- Veeral, D., & Nayakanti, G. (2019). Effect of integrated organic nutrient management (INM) practices on plant architecture and yield of sesame (*Sesamum indicum* L.). *Crop Research*, 54(5and6), 126–130.

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