



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
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NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(9): 141-144
Received: 22-07-2026
Accepted: 28-08-2026

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Effect of organic sources of nitrogen and panchagavya on protein content and oil content of sesame (*Sesamum indicum* L.)

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DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i9b.6480>

Abstract

A field experiment was conducted during the *Kharif* season, 2023, at the Agronomy farm, S.K.N. College of Agriculture, Jobner, to study the “Effect of organic sources of nitrogen and panchagavya on protein content and oil content of sesame (*Sesamum indicum* L.)”. The experiment was laid out in a factorial randomized block design with three replications. The treatments consisting of five treatment of organic sources of nitrogen (control, 100% RDN through FYM, 100% RDN through FYM + *Azospirillum* and PSB, 80% RDN through FYM + *Azospirillum* and PSB and 60% RDN through FYM + *Azospirillum* and PSB) and four treatment of panchagavya spray (Control, 3% spray of panchagavya at 30 DAS, 3% spray of panchagavya at 45 DAS and 3% spray of panchagavya at 30 + 45 DAS) were applied to the sesame *var.* RT-372. The experimental results showed that application of 80% RDN through FYM + *Azospirillum* and PSB remained at par with 100% RDN through FYM + *Azospirillum* and PSB and recorded significantly higher protein content in seed and oil content in seed of sesame. Significantly higher protein content in seed and oil content in seed of sesame. Was not improved significantly due to application of organic sources of nitrogen. Results further showed that foliar spray of 3% panchgavya at 30 + 45 DAS recorded significantly higher protein content in seed and oil content in seed of sesame, foliar spray of 3% panchgavya at 30 DAS and foliar spray of 3% panchgavya at 45 DAS. Further, the foliar spray of 3% panchgavya at 30 + 45 DAS also registered significantly higher protein content in seed and oil content in seed of sesame. Therefore, application of 80% RDN through FYM + *Azospirillum* and PSB was found to be a better cultural practice for sesame crop as it provided higher productivity and profitability. Further, foliar spray of 3% panchgavya at 30 + 45 DAS proved superior for higher productivity and profitability of sesame.

Keywords: Sesame, *Sesamum indicum* L., organic nitrogen, farmyard manure (FYM)

Introduction

Sesame (*Sesamum indicum* L.) is an ancient oilseed crop, domesticated nearly 3,000 years ago. Sesame belongs to the family Pedaliaceae, commonly known as “til”, gingely, simsim, gergelim and biniseed, also called the “Queen of oilseeds”. Sesame oil, popularly termed as “poor man’s ghee,” is highly nutritious and holds several health benefits. The seeds are rich in calcium, magnesium, zinc, antioxidants like sesamin and sesamol and Vitamin E, which support heart health, digestion, skin and bone strength (Ranganayaki *et al.*, 2012a) ^[28]. During the Past two decades, there has been a surge in the demand for sesame seeds owing to their superior oil quality, protein richness, antioxidant properties and remarkable adaptability to diverse climatic and soil conditions (Myint *et al.*, 2020) ^[17]. The *Sesamum* genus includes 30 species that are widely acknowledged and 17 species whose status is still uncertain (Kalwij, 2012) ^[14]. *Sesamum indicum* (2n = 26) stands out as the predominant species grown across tropical regions, primarily for its oil and protein content. While *Sesamum angustifolium* and *Sesamum radiatum*, both wild species, are cultivated sporadically in African regions.

The oilseed industry has emerged as a highly dynamic segment throughout the global agricultural landscape (Mokariya *et al.*, 2020) ^[16]. Oilseed crops hold significant importance in India, standing alongside cereals. India boosts cultivation of all major annual oilseed varieties and proudly holds the title of the world’s leading producer of minor oilseeds such as castor, safflower and sesame.

India's primary oilseeds include groundnut, rapeseed-mustard, sesame, soybean, safflower, sunflower, linseed and castor (Roy, 2013) [20].

Significance: Productivity remains low at 376 kg ha⁻¹ due to poor soil fertility, minimal inputs and suboptimal agronomic practices (Tejaswi *et al.*, 2025) [24].

Approximately 73% of the sesame grown in the country is dedicated to oil extraction. Another 14.5% serves domestic needs, such as crafting sweet candies, condiments, culinary, and confectionary purposes. Meanwhile, 8.3% is allocated for hydrogenation, and 4.2% finds its way into various industrial applications, including the production of paints, perfumed oils, pharmaceuticals, insecticides, as well as the manufacturing of soap, cosmetics, and skin care products (Jat *et al.*, 2017) [12].

Its oil content generally varies from 46 to 52%, which is highly resistant to oxidative rancidity; its highly nutritious and edible seeds. Sesame oil is also referred to as “poor man’s substitute for ghee”. Oil is an important constituent in the human dietary system next to carbohydrates and proteins (Kalegore *et al.*, 2018) [13].

The protein content is (18-25%); they also offer medicinal and nutritional benefits. Sesame seed consumption appears to increase plasma gamma-tocopherol and enhance vitamin E activity, which are believed to prevent cancer and heart disease (Cooney *et al.*, 2001) [6]. Sesame meal-based products are considered appropriate for individuals with diabetes due to their lower carbohydrate content and higher protein content (Bigoniya *et al.*, 2012) [4].

Its seeds are a rich source of calcium and potassium, high in antioxidants such as sesamol and sesamin, which keep them highly resistant to oxidative rancidity and have an excellent cholesterol-lowering effect in humans and prevent high blood pressure (Suddhiyam *et al.*, 2009) [23].

India is the major producer of sesame (*Sesamum indicum* L.) and ranks first in both area and production. It is extensively cultivated in the states of Gujarat, West Bengal, Tamil Nadu, Maharashtra, Karnataka, Rajasthan and Madhya Pradesh. It is cultivated on 15.23 lakh hectares in the country with total production of 8.02 lakh tonnes. The average productivity of the crop is 527 kg/ha (Meena, 2023) [2]. In Rajasthan, it is cultivated in Pali, Sikar, Sirohi, Karauli, Sawaimadhopur, Hanumangarh, Bhilwara, Nagaur, Jodhpur, Jaipur and Jhunjhunu districts. The crop occupied 2.16 lakh hectares and produced 0.78 lakh tonnes with a productivity of 360 kg/ha (Moury, 2022-23) [3]. Despite the potential of existing varieties Despite an important sesame-growing state, the average productivity is very low in comparison to the global as well as national level.

Organic manures are a potential source of micronutrients, improve soil structure by providing binding action to soil aggregates, increase water holding, nutrient use efficiency and buffering capacity of soils. (Pattnayak *et al.*, 2024a) [18]. To maximise agricultural production and soil health, the use of organic manure, i.e., FYM as a part of nutrient management strategy helps in mitigating the multiple nutrient deficiencies. Application of farm yard manure (FYM) improves soil physical, chemical, and biological properties (Ahmed *et al.*, 2010) [1]. FYM imparts a dark colour to the soil and thereby helps to maintain the temperature of the soil. FYM is one of the oldest manures used by the farmers in growing crops because of its early availability and presence of almost all the nutrients required by plants (Das *et al.*, 2019) [7].

However, information regarding organic nitrogen sources in sesame production in Rajasthan is lacking. Keeping in view the above-discussed facts of insufficient information and sparse related research, the present investigation was undertaken to find out the effect of Organic Sources of Nitrogen and Panchagavya

on yield attributes of sesame (*Sesamum indicum* L.) in Jaipur conditions.

Materials and Methods

The experiment was conducted during the kharif season, 2023, at the Agronomy farm, S.K.N. College of Agriculture, Jobner, Jaipur, situated at a latitude of 26°05' North and longitude of 75°28' East, with an altitude of 427 meters above the mean sea level. The total rainfall of 403.4 mm was received during the crop growing season. The soil of the experiment field had loamy sand in texture, slightly alkaline in reaction, medium in electrical conductivity, low in organic carbon, available nitrogen and medium in available phosphorus and potassium. The experiment was laid out in Factorial Randomized Block Design with five organic sources of nitrogen viz, Control, 100% RDN through FYM, 100% RDN through FYM + Azospirillum and PSB, 80% RDN through FYM + Azospirillum and PSB and 60% RDN through FYM + Azospirillum and PSB as the first factor and four Panchagavya sprays viz. Control, 3% spray of Panchagavya at 30 DAS, 3% spray of Panchagavya at 45 DAS and 3% spray of Panchagavya at 30 DAS + 45 DAS as the second factor. The treatments were replicated three times. Each plot was surrounded by a buffer of 1.0m width to protect the plots from accidental irrigation and loss of water through seepage. The recommended dose of nitrogen (20 kg ha⁻¹) was applied through FYM having nutrient contents of 0.5% N, 0.25% P₂O₅ and 0.5% K₂O, which was applied in the field as per treatments and was thoroughly mixed two week before sowing of sesame. While biofertilizers @ 600g ha⁻¹ were mixed with jaggery solution, which was prepared by boiling the jaggery in water, the seeds required for one hectare were mixed in the slurry so as to have uniform coating of the inoculants over the seeds and then dried in shade for 30 minutes. Seed treatment with biofertilizers was done by taking the culture of biofertilizer @ 5ml of formulation and dissolved in sufficient quantity of water to treat one kg of seed. The seeds were well coated with the solution and dried under the shade before sowing. However, panchgavya was applied as per treatment as a foliar spray. Sesame variety “RT-372” was used for sowing. Observations were recorded as per standard procedure. The data relating to each character were analyzed as per the procedure of analysis of variance, and significance was tested by the “F” test (Gomez and Gomez 1984) [11].

Determination of protein and oil content of sesame seed:

The protein of defatted sesame meal was obtained by alkaline extraction at room temperature by varying the pH from 6.8 to 10.0 according to the method of (Taha *et al.* 1987). For protein determination, the test portion (0.7 to 2.2g) of the sample was weighed and placed in a digestion flask (Gerhardt-Turbotherm). It was then mixed with 0.7g of mercuric oxide, 10g of powdered potassium sulphate or anhydrous sodium sulphate, 1g of copper sulphate and 25 ml of concentrated sulphuric acid. The digestion tubes were placed in a digestion chamber, and the sample was digested until the solution was clear (2h for test portions containing organic material). The sample was allowed to cool down, and 20 ml of water was added to it (Ranganayaki *et al.*, 2012b) [19].

Oil content in sesame seed was determined by Soxhlet apparatus using petroleum ether (60-80 °C) as an extractant.

$$\text{Oil (\%)} = \frac{\text{Final weight} - \text{initial weight}}{\text{Sample weight}} \times 100$$

Table 1: Treatment details with their symbols

S. No.	Treatment	Symbols
1. Organic sources of nitrogen		
(i)	Control	: O ₀
(ii)	100% RDN through FYM	: O ₁
(iii)	100% RDN through FYM + <i>Azospirillum</i> and PSB	: O ₂
(iv)	80% RDN through FYM + <i>Azospirillum</i> and PSB	: O ₃
(v)	60% RDN through FYM + <i>Azospirillum</i> and PSB	: O ₄
2. Panchagavya spray		
(i)	Control	: P ₀
(ii)	3% spray of panchagavya at 30 DAS	: P ₁
(iii)	3% spray of panchagavya at 45 DAS	: P ₂
(iv)	3% spray of panchagavya at 30 DAS + 45 DAS	: P ₃

Results and Discussion

Protein content in seed

Effect of organic sources of nitrogen: Data regarding protein content in seed of sesame presented in Table 1 revealed that protein content was significantly influenced due to application of organic sources of nitrogen over control. Among the different treatments, the application of 80% RDN through FYM + *Azospirillum* and PSB recorded significantly higher protein content in seed of sesame (22.08%) which proved significantly superior as compared to control (19.90%), 100% RDN through FYM (21.01%) and 60% RDN through FYM + *Azospirillum* and PSB (21.21%) and remained at par with 100% RDN through FYM + *Azospirillum* and PSB (22.27%) (Watsh *et al.* 2024) [26]. The magnitude of increase in protein content with the application of 80% RDN through FYM + *Azospirillum* and PSB was 11.0, 5.1 and 4.1%, respectively, over control, 100% RDN through FYM and 60% RDN through FYM + *Azospirillum* and PSB. (Veeral and Nayakanti 2019) [25].

Effect of panchgavya spray: It is clear from the data presented in Table 1 that the protein content in the seed of sesame increased significantly with the foliar application of panchgavya over the control. The foliar spray of 3% panchagavya at 30 + 45 DAS gave the highest protein content in the seed of sesame (22.02%) as compared to the control (20.55%), foliar spray of 3% panchagavya at 30 DAS (21.37%) and foliar spray of 3% panchagavya at 45 DAS (21.24%) (Gayathri and Aiswariya 2020) [9]. The protein content in the seed of sesame ranged from 20.55% to 22.02%, respectively, from control to foliar spray of 3% panchagavya at 30 + 45 DAS.

Oil content in seed

Effect of organic sources of nitrogen: A close perusal of data presented in Table 1 revealed that the oil content in seed of sesame was significantly increased due to organic sources of nitrogen (Watsh *et al.*, 2023) [27]. Significantly highest oil content in seed (45.85%) of sesame was obtained with application of 80% RDN through FYM + *Azospirillum* (Keshav *et al.*, 2025) [15] and PSB which was closely followed by 100% RDN through FYM + *Azospirillum* and PSB (46.15%) and found significantly better over control (41.93%), 100% RDN through FYM (43.88%) and 60% RDN through FYM + *Azospirillum* and PSB (44.24%) (Salman 2020) [21]. The magnitude of increase in phosphorus content in the seed of sesame due to application of 80% RDN through FYM + *Azospirillum* and PSB was 9.3, 4.5 and 3.6%, respectively, over control, 100% RDN through FYM and 60% RDN through FYM + *Azospirillum* and PSB (Singh *et al.*, 2023) [22].

Effect of panchgavya spray: A critical examination of data further revealed that the oil content in the seed of sesame was

affected significantly by foliar application of panchgavya as compared to control. The foliar spray of 3% panchagavya at 30 + 45 DAS recorded the highest oil content significantly in seed (46.23%) of sesame, which was found superior when compared to control (42.77%), foliar spray of 3% panchagavya at 30 DAS (44.56%) and foliar spray of 3% panchagavya at 45 DAS (44.08%) (Chandrasekaran *et al.*, 2025) [5]. The corresponding increase in oil content of seed due to foliar spray of 3% panchagavya at 30 + 45 DAS was 8.1% over control, 3.7% over foliar spray of 3% panchagavya at 30 DAS and 4.9% over foliar spray of 3% panchagavya at 45 DAS (Gagung *et al.*, 2025) [8].

Table 2: Effect of organic sources of nitrogen and panchagavya on protein content and oil content of sesame

Treatment	Protein content (%)	Oil content (%)
Organic sources of nitrogen		
Control	19.90	41.93
100% RDN through FYM	21.01	43.88
100% RDN through FYM + <i>Azospirillum</i> and PSB	22.27	46.15
80% RDN through FYM + <i>Azospirillum</i> and PSB	22.08	45.85
60% RDN through FYM + <i>Azospirillum</i> and PSB	21.21	44.24
SEm ⁺	0.19	0.45
CD (P=0.05)	0.54	1.28
Panchagavya spray		
Control	20.55	42.77
3% spray of panchagavya at 30 DAS	21.37	44.56
3% spray of panchagavya at 45 DAS	21.24	44.08
3% spray of panchagavya at 30 + 45 DAS	22.02	46.23
SEm ⁺	0.17	0.40
CD (P=0.05)	0.48	1.14
CV (%)	3.07	3.48

The foliar spray of 3% panchagavya at 30 + 45 DAS recorded the highest protein content and oil content significantly in the seed of sesame, which was found superior when compared to control, foliar spray of 3% panchagavya at 30 DAS and foliar spray of 3% panchagavya at 45 DAS (Giradharlal 2011) [10].

Conclusion

From the above overall study, it is recommended that to obtain higher protein content and oil content in seed and qualitative characters of sesame should be grown by application of 80% RDN through FYM + *Azospirillum* and PSB along with 3% spray of panchagavya at 30 DAS + 45 DAS stage under agro-climatic conditions of Jaipur region of Rajasthan.

Acknowledgment

We greatly appreciate the facilities offered by the Department of Agronomy, S.K.N. College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, (303329) Rajasthan, India.

References

- Ahmed BO, Inoue M, Moritani S. Effect of saline water irrigation and manure application on the available water content, soil salinity, and growth of wheat. *Agricultural Water Management*. 2010;97(1):165-170.
- Meena MS, Singh SK, Meena HN, Bishnoi R. Yield gaps and scaling up of sesame variety RT-351 in potential areas of Rajasthan. *Indian Journal of Extension Education*. 2023;59(2):55-60.
- Moury PK. *Agricultural statistics*. New Delhi: Indian Agricultural Research Institute.
- Bigoniya P, Nishad R, Singh CS. Preventive effect of sesame

- seed cake on hyperglycemia and obesity against high fructose-diet induced type 2 diabetes in rats. *Food Chemistry*. 2012;133(4):1355-1361.
5. Chandrasekaran H, Perumal V, Karunakaran V, Sivagamy K, Ravichandran V, Perumal K, *et al.* Effect of organic inputs on the productivity of confectionery sesame (*Sesamum indicum* L.). *Journal of Plant Nutrition*. 2025;48(3):397-405.
 6. Cooney RV, Custer LJ, Okinaka L, Franke AA. Effects of dietary sesame seeds on plasma tocopherol levels. *Nutrition and Cancer*. 2001;39(1):66-71.
 7. Das A, Biswas PK. Effect of sulphur and bio fertilizers on growth attributes of sesame (*Sesamum indicum* L.) and soil fertility in red and lateritic soils of West Bengal, India. *Indian Journal of Hill Farming*. 2019;32(2):287-294.
 8. Gagung N, Doruk K, Rina L, Ramamoorthy P. Effect of foliar application of different organic liquid formulation on growth of black sesame (*Sesamum indicum* L.). *Journal of Scientific Research and Reports*. 2025;31(6):1181-1188.
 9. Gayathri V, Aiswariya K. Effect of different bio-fertilizers on the chlorophyll, nitrogen and vitamin E content in *Arachis hypogaea* L. and *Sesamum indicum* L. *Agricultural Science Digest*. 2020;40(1):49-52.
 10. Giradharlal RM. Effect of different organic sources on yield and quality of sesame. Navsari: Navsari Agricultural University; 2011.
 11. Gomez KA, Gomez AA. Statistical procedures for agricultural research. New York: John Wiley and Sons; 1984.
 12. Jat L, Yadav SS, Dhayal BC, Yadav G, Choudhary KM, Bera M. Effect of sulphur fertilization and varieties on sulphur use efficiency, yield attributes and yield of sesame. *Journal of Pharmacognosy and Phytochemistry*. 2017;6(4):717-720.
 13. Kalegore NK, Kirde GD, Bhusari SA, Kasle SV, Shelke RI. Effect of different level of phosphorus and sulphur on growth and yield attributes of sesame. *Int J Econ Plants*. 2018;5(4):163-166.
 14. Kalwij JM. Review of The Plant List, a working list of all plant species. *Journal of Vegetation Science*. 2012;23(5):998-1002.
 15. Keshav, Reddy GK, Jyothi KN, Kumari PL, Chandrika V. Influence of solid and liquid organic manures on soil properties and quality parameters of summer sesame (*Sesamum indicum* L.) under organic. 2025.
 16. Mokariya LK, Sagarka BK, Sakarvadia HL, Malam KV, Jani CP, Vaja RP. Effect of microbial consortia enriched vermicompost on physico-chemical properties of soil and nutrient content and uptake by summer sesame (*Sesamum indicum* L.). *IJCS*. 2020;8(5):2256-2259.
 17. Myint D, Gilani SA, Kawase M, Watanabe KN. Sustainable sesame (*Sesamum indicum* L.) production through improved technology: an overview of production, challenges, and opportunities in Myanmar. *Sustainability*. 2020;12(9):3515.
 18. Pattanayak A, Mishra G, Sar K, Chowdhury MR, Behera SD. Effect of different organic nutrient sources on the growth and yield of summer sesamum (*Sesamum indicum* L.). *Crops*. 2024;7:9.
 19. Ranganayaki S, Vidhya R, Jaganmohan R. Isolation and proximate determination of protein using defatted sesame seed oil cake. *International Journal of Nutrition and Metabolism*. 2012;4(10):141-145.
 20. Roy R. Problems and prospects of oilseeds production in Uttar Pradesh. Allahabad: Agro-Economic Research Centre, University of Allahabad; 2013. Publication 185. p. 137.
 21. Salman M. Nitrogen management in sesame through organic sources under rainfed conditions. 2020.
 22. Singh KA, Singh B, Pavithran N, Fayaz A, Kaundal M. Panchagavya: a novel approach for the sustainable production of crops. *Current Journal of Applied Science and Technology*. 2023;42(48):137-147.
 23. Suddhiyam P, Suwannaketnikom S, Dumkhum W, Duandao N. Fertilizers for organic sesame. 2009:197-S204.
 24. Tejaswi V, Rao AU, Basu BJ, Rao SG. Effect of diverse nutrient sources and liquid organic manures on growth, yield and economics of sesame (*Sesamum indicum* L.). 2025:19-27.
 25. Veeral DK, Nayakanti G. Effect of integrated organic nutrient management (INM) practices on plant architecture and yield of sesame (*Sesamum indicum* L.). *Crop Research*. 2019;54(5-6):126-130.
 26. Watsh SK, Shivran AC, Chandan AS, Kumawat M, Ashiq IM, Devi, Pradhan SK. Impact of varying sulphur concentrations and foliar application of liquid manure on quality attributes and profitability in sesame cultivation. 2024:2753-2760.
 27. Watsh SK, Shivran AC, Kumawat M, Kumar S. Effect of sulphur levels and foliar application of liquid manures on growth and yield of sesame. *The Pharma Innovation Journal*. 2023;12(11):907-911.