**Influences of Panchgavya in Conjunction with Bulky Organic Manure on Growth Attributes of Black Sesame (*Sesamum indicum* L.*)***

**Abstract**

A field experiment was conducted during the Kharif season of 2024 at the Himalayan University Agricultural Farm, Jollang, Itanagar. The objective was to evaluate the influence of Panchgavya in combination with bulky organic manure on the productivity and quality of black sesame (*Sesamum indicum* L.). The study was designed using a Randomized Block Design (RBD), consisting of eight treatments replicated three times. The treatments involved different combinations of recommended dose of fertilizers (RDF), farmyard manure (FYM), and Panchgavya. Significant differences were observed among the treatments in terms of plant height, leaf length, number of leaves, and dry weight at 30, 60, and 90 days after sowing (DAS). Among all the treatments, T7—comprising 100% RDF + 100% FYM + 5% Panchgavya—was found to be the most effective. This treatment resulted in the highest values for plant height, leaf length, number of leaves, and dry weight, indicating a positive synergistic effect of combining chemical and organic inputs on black sesame growth and productivity.

**Key words** : RDF (Recommended dose of fertilizers), FYM (Farmyard manure), Panchgavya, DAS (Days after sowing).

**Introduction**

Sesame (Sesamum indicum L.) is one of the earliest human production and consumption oil crops in the family of Pedaliaceae. First discovered in ancient sites in Pakistan, sesame is a long-established cultivated crop. Sesame is commonly known as til and is the most ancient oilseed crop cultivated next to groundnut and Indian mustard in India. Sesame is regarded as a queen of oilseeds by the quality of its edible oil and protein content. The sesame contains 50% oil content and 18–20% protein content (Poveda *et al*., 2016).

Sesame is considered as a healthy and popular food in Asian countries due to its high oil content, delicious nutty aroma, and favor. It contains rich nutrients, so it can be used in edible products and for industrial and pharmaceutical aspects while 70% of the global sesame seeds are used to generate oil and meal. Often hailed as the “Queen of Oilseeds”, it owes this distinction to its remarkably high oil content, which can reach to 63%, surpassing the quality of other oilseed crops such as groundnut (45%–56%), sunflower (45%), rapeseed (40%), and soybean (20%) ([Teklu *et al.*, 2021](https://www.sciencedirect.com/science/article/pii/S2096242824000435#bib75)). Sesame seeds contain high levels of fatty acids (45%–55%) and proteins (19%–25%). sesame seeds are also rich in essential minerals, including magnesium, phosphorus, calcium, iron, and zinc. In addition, they contain vitamins B and E and have potent antioxidant properties ([Langyan](https://www.sciencedirect.com/science/article/pii/S2096242824000435" \l "bib40) *[et al](https://www.sciencedirect.com/science/article/pii/S2096242824000435" \l "bib40)*[., 2022](https://www.sciencedirect.com/science/article/pii/S2096242824000435" \l "bib40)).

The low in productivity of sesame is experienced due to poor management and less input in marginal and sub-marginal lands. However, the improved varieties and agro-production technologies were capable of increasing the productivity of sesame. A well-managed crop of sesame can yield around 1200 – 1500 kg/ ha under rainfed conditions (FAOSTAT, 2021).

Despite the huge production potential of this oilseed worldwide, the area under organic production relative to the total area of cultivation is ~1.12% for sesame, with Africa accounting for only 3% of the world’s agricultural land under organic production as at 2017, (Willer and Lernoud, 2019).

According to Uzun and Cagirgan (2006) and Olowe (2004), 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.

Among various nutrient elements, nitrogen is vital for the crop production at an appropriate spacing. An adequate amount of nitrogen promotes cell division and cell enlargement which results in increased leaf area and thus ensures better growth and development of plants producing higher seed yield and dry matter. Nitrogen is also an integral part of chlorophyll, and thus, the need for nitrogen is an important factor for higher yield as well as quality of oilseeds (Yadav *et al*., 2017).

**MATERIALS and METHODS**

The experiment was conducted during the Kharif season, beginning on 26th June 2024, at the agricultural research field of the Himalayan University, located in Jollang at 27.074684°N latitude and 93.652878°E longitude with an average elevation of 320 meters above sea level, with the primary objective of evaluating the agronomic performance, adaptability, and yield potential of black Sesame under the influence of Panchgavya in Conjunction with Bulky Organic Manure on Productivity and Quality under agro-climatic conditions of the region, thereby generating data to identify the most suitable cultivars for enhancing black Sesame productivity during the monsoon-dominated Kharif season.

The treatments 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 condition of Itanagar is humid subtropical climate with distinct season. the rainy season usually starts from May and it extends up to September and from October onwards. The meteorological data of weather parameter. temperature, rainfall, relative humidity and sunshine hours recorded during the period of experimentation from July to November during the year 2024-2025 were obtained from meteorological observatory, for the period of the experimentation have been presented in the table. The mean minimum and maximum temperature recorded during the cropping season was 22.3 °C and 27.6 "C, respectively. The average relative humidity

**Figure 1. Meterological data of weather parameters and total rainfall during the cropping season (*Kharif* 2024-2025)**

**CROP GROWTH ATTRIBUTES**

Plant height was measured in centimeters from the base to the tip of the plant for 5 randomly selected plants in each plot. These plants were tagged so the same ones could be observed again later. Measurements were taken three times—at 30, 60, and 90 days after sowing (DAS). The average height of the plants in each treatment was calculated for each observation time. Leaf length was measured from the base to the tip of the leaf on 5 randomly selected plants in each plot. These plants were tagged and measured again later. Observations were taken at 30, 60, and 90 days after sowing (DAS), and the average leaf length for each treatment was calculated at each time point. The number of leaves was counted by counting the number of leaves on 5 randomly selected plants from each plot. These observations were made at 30, 60, and 90 days after sowing (DAS), and the average number of leaves per treatment was calculated for each time point. The dry weight of a plant is the weight remaining after all the water has been eliminated. This is usually achieved by heating the plant material at a temperature above normal room temperature until all the moisture has been dried out.

**RESULTS AND DISCUSSION**

The growth and development parameters of black sesame were recorded under a Randomized Block Design (RBD) with three replications. Observations were taken for various traits such as plant height (cm), leaf length (cm), number of leaves, and dry weight. The data were statistically analyzed to compute the general mean, standard error (SEd) and critical difference (CD) for each trait.

**Plant height:**

Plant height of black Sesame recorded at 30, 60, and 90 DAS was statistically analyzed and presented in table 1.

At 30 days after sowing (DAS), the tallest plant height was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in an average height of 23.2 cm. The shortest plants, measuring 10.2 cm, were recorded in the control treatment (T1), which did not receive any additional inputs. At 60 DAS, the tallest plant height was observed to be statistically significant in treatment T7 which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in average height of 68.2 cm. The shortest plants, measuring 37.4 cm, were recorded in the control treatment (T1), which did not receive any additional inputs. At 90 DAS, the tallest plant height was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in an average height of 114.6 cm. The shortest plants, measuring 68.1 cm, were recorded in the control treatment (T1), which did not receive any additional inputs.

Taller plants recorded at Treatment T7 might be due to availability of nutrients at optimum value during initial growth stages which might have resulted in better root and shoot growth. The results clearly indicate that integrated use of chemical fertilizer, organic manure and Panchgavya was better than application of organic or chemical sources of nutrient alone. This may be due to supply of nutrients from diversified sources and prolonged availability of nutrients to the growing plants. The beneficial role of free living nitrogen fixing microorganisms for enhancing plant growth through their ability in nitrogen fixation as well as the effect of their metabolites secretion on the crop may also be attributed for the same (Verma *et al*., 2012).

**Table 1. Effect of Panchgavya in Conjunction with Bulky Organic Manure on Plant height of Black Sesame.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Treatments** | **Plant height (cm)** | | |
|  | **30 DAS** | **60 DAS** | **90 DAS** |
| **T1 – Control** | 14.3 | 34.3 | 64.2 |
| **T2 - 100% RDF** | 14.4 | 34.4 | 64.4 |
| **T3 - 100% FYM** | 15.4 | 35.4 | 65.6 |
| **T4 - 100% RDF + 100% FYM + 2% Panchgavya** | 13.9 | 33.9 | 64.0 |
| **T5 - 100% RDF + 100% FYM + 3% Panchgavya** | 14.3 | 34.2 | 64.2 |
| **T6 - 100% RDF + 100% FYM + 4% Panchgavya** | 14.3 | 34.3 | 64.2 |
| **T7 - 100% RDF + 100% FYM + 5% Panchgavya** | 14.3 | 34.3 | 64.3 |
| **T8 - 100% RDF + 100% FYM + 6% Panchgavya** | 14.4 | 34.4 | 64.4 |
| **F test** | S | S | S |
| **S.Ed±** | 1.7855 | 3.2574 | 3.0477 |
| **CD (P=0.05)** | 3.829568 | 6.986487 | 6.536826 |

Leaf Length:

Leaf length of black Sesame recorded at 30, 60, and 90 DAS was statistically analyzed and presented in table 2.

At 30 days after sowing (DAS), the longest leaf length was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in an average length of 5.93 cm. The shortest plants, measuring 4.4 cm, were recorded in the control treatment (T1), which did not receive any additional inputs. At 60 DAS, the longest leaf length was observed to be statistically significant in treatment T7 which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in average height of 8.9 cm. The shortest plants, measuring 7.3 cm, were recorded in the control treatment (T1), which did not receive any additional inputs. At 90 DAS, the longest leaf length was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in an average height of 12.4 cm. The shortest plants, measuring 10.4 cm, were recorded in the control treatment (T1), which did not receive any additional inputs.

Longer leaf length recorded at Treatment T7 might be due to the combined application as it improves chlorophyll content and leaf area index, enhancing photosynthesis and contributing to larger leaves. Application of Panchagavya significantly improved chlorophyll content, plant height, number of branches per plant, leaf area index, and dry matter production (Kumar *et al*., 2011).

**Table 2. Effect of Panchgavya in Conjunction with Bulky Organic Manure on Leaf length of Black Sesame.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Treatments** | **Leaf length** |  |  |
|  | **30 DAS** | **60 DAS** | **90 DAS** |
| **T1 – Control** | 4.4 | 7.4 | 10.4 |
| **T2 - 100% RDF** | 4.8 | 7.8 | 11.2 |
| **T3 - 100% FYM** | 4.7 | 7.7 | 10.8 |
| **T4 - 100% RDF + 100% FYM + 2% Panchgavya** | 5.1 | 8.1 | 11.6 |
| **T5 - 100% RDF + 100% FYM + 3% Panchgavya** | 5.3 | 8.3 | 12.2 |
| **T6 - 100% RDF + 100% FYM + 4% Panchgavya** | 5.4 | 8.4 | 12.2 |
| **T7 - 100% RDF + 100% FYM + 5% Panchgavya** | 5.9 | 8.9 | 12.4 |
| **T8 - 100% RDF + 100% FYM + 6% Panchgavya** | 4.4 | 7.4 | 10.5 |
| **F test** | NS | NS | S |
| **S.Ed±** | 0.269847 | 0.270435 | 0.283053 |
| **CD (P=0.05)** | 0.578764 | 0.580025 | 0.607088 |

**No. of Leaves:**

No. of leaves of black Sesame recorded at 30, 60, and 90 DAS was statistically analyzed and presented in table 3.

At 30 days after sowing (DAS), highest no. of leaves was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in an average no. of 12.6 leaves. The least no. of leaves, counting 6.6, were recorded in the control treatment (T1), which did not receive any additional inputs. At 60 DAS, highest no. of leaves was observed to be statistically significant in treatment T7 which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in an average no. of 74 leaves . The least no. of leaves, counting 59.6, were recorded in the control treatment (T1), which did not receive any additional inputs. At 90 DAS, highest no. of leaves was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in an an average no. of 100.6 leaves. The least no. of leaves, counting 89.6, were recorded in the control treatment (T1), which did not receive any additional inputs.

The combination of 100% Recommended Dose of Fertilizer (RDF), 100% Farm Yard Manure (FYM), and 5% Panchgavya has been shown to significantly enhance the number of leaves and overall growth in sesame (Sesamum indicum L.). This integrated nutrient management (INM) approach leverages the synergistic effects of chemical, organic, and bio-based inputs to optimize plant development (Deepak Bawa *et al.,* 2024)

**Table 3. Effect of Panchgavya in Conjunction with Bulky Organic Manure on No. of Leaves of Black Sesame.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Treatments** | **No. of Leaves** |  |  |
|  | **30 DAS** | **60 DAS** | **90 DAS** |
| **T1 – Control** | 6.7 | 59.7 | 89.7 |
| **T2 - 100% RDF** | 9.3 | 65.7 | 94 |
| **T3 - 100% FYM** | 9 | 65 | 93.3 |
| **T4 - 100% RDF + 100% FYM + 2% Panchgavya** | 10.3 | 69 | 95 |
| **T5 - 100% RDF + 100% FYM + 3% Panchgavya** | 11.7 | 70.7 | 97 |
| **T6 - 100% RDF + 100% FYM + 4% Panchgavya** | 12 | 73 | 98 |
| **T7 - 100% RDF + 100% FYM + 5% Panchgavya** | 12.7 | 74 | 100.7 |
| **T8 - 100% RDF + 100% FYM + 6% Panchgavya** | 8.7 | 63.7 | 93 |
| **F test** | NS | S | S |
| **S.Ed±** | 0.678467 | 0.875142 | 0.737327 |
| **CD (P=0.05)** | 1.455167 | 1.876992 | 1.581409 |

**Dry weight:**

Dry Weight of black Sesame recorded at 30, 60, and 90 DAS was statistically analyzed and presented in Figure 2.

At 30 days after sowing (DAS), highest dry weight was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in 0.72 kg. The lowest dry weight measuring 0.37 kg, were recorded in the control treatment (T1), which did not receive any additional inputs. At 60 DAS, highest dry weight was observed to be statistically significant in treatment T7 which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in 26.3 kg. The lowest dry weight, counting 19, were recorded in the control treatment (T1), which did not receive any additional inputs. At 90 DAS, highest dry weight was observed in treatment T7, which included 100% RDF + 100% FYM + 5% Panchgavya, resulting in 30.9 kg. The lowest dry weight, counting 23, were recorded in the control treatment (T1), which did not receive any additional inputs.

The combination of 100% Recommended Dose of Fertilizer (RDF), 100% Farm Yard Manure (FYM), and 5% Panchgavya has been shown to significantly enhance the dry weight of black sesame plants. This integrated nutrient management (INM) approach synergistically combines chemical, organic, and bio-based inputs, leading to improved plant growth and biomass accumulation (Deepak Bawa *et al.,* 2024).

**Figure 2:** **Effect of Panchgavya in Conjunction with Bulky Organic Manure on Dry Weight of Black Sesame.**

**CONCLUSION**

Based on comprehensive study, it concluded that the utilizing of 100% RDF + 100% FYM + 5% Panchgavya on black Sesame shows the most favourable outcomes across growth parameters *i.e* tallest plant height (114.8 cm), longest leaf length (12.43 cm), highest number of leaves (100.7) and highest dry weight (30.9) at 90 DAS . The approach of use of combination of 100% Recommended Dose of Fertilizer (RDF), 100% Farm Yard Manure (FYM), and 5% Panchgavya not only boosts productivity but also improves soil health, supporting sustainable agriculture in soils.

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