



Response of Foliar Application of Different Organic Liquid Formulation on Yield of Black Sesame (*Sesamum indicum* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A present investigation was carried out during the *Kharif* Season of 2024-2025 at Himalayan University farm, Jullang, Itanagar, to determine the response of Foliar Application of Different Organic Liquid Formulation on Yield of Black Sesame (*Sesamum indicum* L.) The experiment was outlined in a Randomized Block Design (RBD) with nine treatments and Three Replication. The treatment included combination jeevamrut, Panchgavy and liquid bio- fertilizer. The study recorded significance difference among treatments in terms of Seed Yield, Number of capsule and Harvest

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Index. The result revealed that the treatment T₄ (Foliar Spray Jeevamrut @ 2.5% + Foliar Spray Panchgavya @ 5%) was found to be best treatment for obtaining maximum Seed yield this indicating the combined effect of jeevamrut fertilizer on black sesame.

Keywords: Jeevamrut; Panchagavya; liquid bio-fertilizer; randomized block design (RBD).

1. INTRODUCTION

“Among oilseed crops, sesame (*Sesamum indicum* L.) is one of the oldest crop known to humans, which is under cultivation from ancient times and extensively cultivated in several countries of Asia and Africa. It is grown under environment stress with low management by resource poor small farmers.”(Bisht *et al.*, 1998).

“Osmo-priming with PEG (Polyethylene glycol) not only improves seed germination but also enhance crop performance under non-saline or saline condition. Seed priming in combination with removal of apical bud by pinching promotes development of lateral buds; thereby resulting more number of branches plant” (Pathania *et al.*, 2000).

Foliar application of manganese is particularly advantageous for crops when the roots are unable to obtain the necessary nutrients to fulfil the crop's needs at critical stages (Brar & Brar, 2004) Bagci (2007). If the source of auxin is removed by excising the apical meristem, the lateral branching gets accelerated. Moreover, under pinching of terminal bud, the utilization of photosynthates by the crop for the production of lateral branches would be higher and this might be the reason for increased number of branches per plant. Imayavaramban *et al.*, (2004).

The superiority in seed yield due to foliar applications of fertilizers supplemented with 100% RDF mainly due to effect of additional quantity of N and P fertilizers as per needs by the crop which results in the higher GMR and NMR. The outcomes confirm the conclusions drawn by Thanunathan *et al.*, (2006).

Zinc is a crucial micronutrient that acts as a structural component or regulatory cofactor for many enzymes and proteins involved in various essential biochemical processes and protection against pathogens (Gupta *et al.*, 2006).

“The number of branches with manual clipping of leaves, leaving two pair of leaves above cotyledonary leaf in sesame. The increased number of branches and production of more

leaves which alter the crop canopy that in turn increased the value of leaf area index. The clipping practice might have efficiently altered the crop architecture, which in turn increased the lateral branches that led to greater chance for development of source and sink features in sesame. The characters primary branch and secondary branch both which in turn encouraged side branches” (Ahmad *et al.*, 2007).

The increase in seed yield might be due to better availability of nutrients and plant growth hormones during the critical period of crop growth. Higher seed yield under these treatments contributed to improvement in growth attribute and yield attributes having significant positive correlation with seed yield. Similar results were also observed by Shwetha *et al.* (2008).

“Yield of sesame vary in different years due to poor soil moisture availability and rainfall condition, climatic aberrations, disease and pest attack as well as the location of cultivation. One of the important causes of low productivity is moisture stress faced by the crop during the period of growth. Good crop stand leading to optimum plant population depends largely on germination and seedling vigour of the crop. Proper pre-sowing treatment with suitable growth regulators and agrochemicals can improve plant population and productivity of the crop” (Panda *et al.*, 2013).

“The improvement in yields of crop might be due overall improvement in growth and yield attributes like number of capsules per plant, number of seed per capsule and test weight. The considerable increase in seed yield was largely a function of improved growth and the consequent increase in various yields attributes due to sulphur fertilization. In addition to its multiple roles in metabolism, sulphur is essential constituent of amino acids and also improvement in vegetative structures and assimilates thereby maintaining balanced source-sink” (Shah *et al.*, 2013).

Observed that zinc enhances the yield and quality of oil seeds. Manganese is a key micronutrient in plants, essential for the

functioning of enzymes involved in photosynthesis, protein synthesis, lipid metabolism, and other crucial processes (Monreal et al., 2015).

Thus significant increase in biological yield with the application of sulphur could be attributed owing to cumulative effect of increased seed and straw yield. Higher nutrient uptake and better use of solar energy led to higher vegetative and reproductive growth, thus enhancing biological yield in presence of sulphur. The results of present investigation are in line with those of Jat et al., (2017).

“The positive effect of zinc on seed yield might have been because of its requirement in carbohydrate synthesis, the pronounced role in photosynthesis and cell elongation. The increase in stalk yield was the result of increased plant growth in terms of dry matter production and number of branches due to overall better nutritional environment in the rhizosphere. The improvement in biological yield is cumulative effect of seed and stalk yield of sesame. These results are corroborating the findings of” (Eifediyi et al., 2021).

2. MATERIALS AND METHODS

The experiment was carried out at Agriculture Field, Jollang, College of Agriculture, Himalayan University, during the period of Kharif season. On 6th July 2024. The experimental farm is situated

at 27.074684, N latitude and 93.652878 E longitude with an average elevation of 320 meters. It was undertaken with the objective to analyze the different Sesame varieties and to assess their performance in Kharif season.

The Treatment Include, T₁- Control, T₂- Foliar Spray Panchgavya @ 2.5%, T₃- Foliar Spray Panchgavya @ 5% , T₄- Foliar Spray Jeevamrut @ 2.5% T₅- Foliar Spray Jeevamrut @ 5%, T₆- Foliar Spray Vermiwash @ 2.5% , T₇- Foliar Spray Vermiwash @ 5% , T₈- Foliar Spray Liquid Bio-Fertilizer @ 2.5% , T₉ - Foliar Spray Liquid Bio-Fertilizer @ 5%. The experiment was carried out in Random Block Design (RBD) in the year 2024-2025.

2.1 Weather and Climate

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.

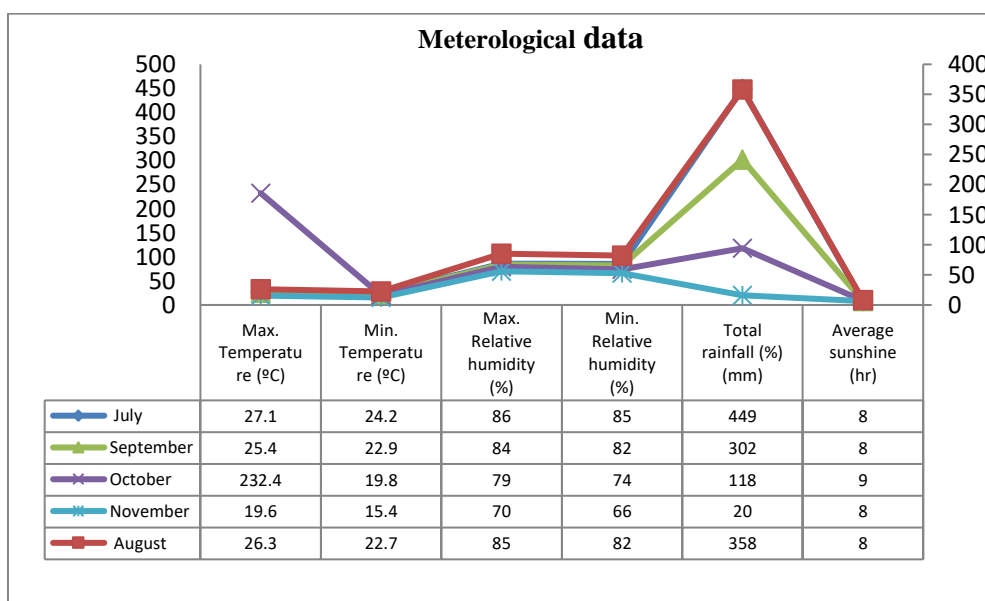


Fig. 1. Meteorological data of weather parameters and total rainfall during the cropping season (Kharif 2024-2025)

2.2 Yield Attributes

2.2.1 Number of capsule

The total number of Capsule per plants was recorded after the harvest of individual plant and average capsule per plant was calculated.

2.2.2 Seed yield

The yield of capsule per plot was taken after the harvesting of individual plot and yield per plot was recorded and then finding was expressed in g/ha.

2.2.3 Harvest Index

It was calculated by diving economic yield by total biological yield (Donald, 1962) the following formula was used.

$$\text{Harvest Index (HI)} = \frac{\text{Economic Yield}}{\text{Biological Yield}} \times 100$$

3. RESULTS AND DISCUSSION

The yield and development attributes of black Sesame were recorded under a Randomized Block Design (RBD) with three replications. Observations were taken for various traits such as Number of Capsule, Seed yield, and Harvest index. The data were statistically analyzed to compute the general mean, standard error (SEd), and critical difference (CD) for each trait.

3.1 Number of Capsule

Number of Capsule of Black Sesame recorded was statistically analyzed After Harvest and presented. The greatest number of Capsule was observed in treatment T₄, which included recommended dose of fertilizers along with Foliar Spray Jeevamrut @ 2.5% and Foliar Spray Panchgavya @ 5%, resulting in an average Capsule of 13.6. Treatment T₃ consisting of

produced a No,of Capsule 12.6, with no significant difference compared to T₄ The less No. of capsule were 8.3 , were recorded in the control treatment (T₁), which did not receive any additional inputs.

“Research on sesame seeds has predominantly focused on physiological indices such as seed count, capsule quantity, plant growth, and the oil and organic acid content of sesame seeds” (Dossou *et al.*, 2021)

“The maturation of sesame capsules is closely linked to the process of lignification, which is essential for the structural integrity of the plant. The preparation of the sesame capsule samples, the analysis of capsule extracts and the quantification and identification of metabolites were performed at Novogene Co., LTD. (Shanghai, China). For metabolites analysis, each sample was repeated six times. The QC quality control samples were prepared to balance the state of chromatography mass spectrometry system and monitoring and maintain the stability of the system during the experiment. Added the supernatant to the LC-MS/ MS system” (Waltham, MA, USA) (Zhang *et al.*, 2024).

3.2 Seed Yield

Seed Yield of Black Sesame recorded was statistically analyzed After Harvest and presented. The greatest number of Capsule was observed in treatment T₄, which included recommended dose of fertilizers along with Foliar Spray Jeevamrut @ 2.5% and Foliar Spray Panchgavya @ 5%, resulting in an average Capsule of 784 kg. Treatment T₃ consisting of produced a seed Yield 783 kg =, with no significant difference compared to T₄ The less Seed Yield 651 kg , were recorded in the control treatment (T₁), which did not receive any additional inputs.

Table 1. Effect of foliar application of different organic liquid formulation on number of capsule of black sesame

Treatments	Number of Capsule
T ₁ - Control	8.3
T ₂ - Foliar Spray Panchgavya @ 2.5%	12.3
T ₃ - Foliar Spray Panchgavya @ 5%	12.6
T ₄ - Foliar Spray Jeevamrut @ 2.5%	13.6
T ₅ - Foliar Spray Jeevamrut @ 5%	11.3
T ₆ - Foliar Spray Vermiwash @ 2.5%	10
T ₇ - Foliar Spray Vermiwash @ 5%	10.3
T ₈ - Foliar Spray Liquid BioFertilizer @ 2.5%	9.3
T ₉ - Foliar Spray Liquid BioFertilizer @ 5%	11
F test	S
SEd(±)	0.306186
CD	0.649086

Table. 2. Effect of foliar application of different organic liquid formulation on seed yield of black sesame

Treatments	Seed yield
T ₁ - Control	651
T ₂ - Foliar Spray Panchgavya @ 2.5%	777
T ₃ - Foliar Spray Panchgavya @ 5%	783
T ₄ - Foliar Spray Jeevamrut @ 2.5%	784
T ₅ - Foliar Spray Jeevamrut @ 5%	773
T ₆ - Foliar Spray Vermiwash @ 2.5%	663
T ₇ - Foliar Spray Vermiwash @ 5%	747
T ₈ - Foliar Spray Liquid BioFertilizer @ 2.5%	655
T ₉ - Foliar Spray Liquid BioFertilizer @ 5%	750
F test	S
SEd(±)	42.86571
CD	90.87124

Table. 3. Effect of foliar application of different organic liquid formulation on harvest index of black sesame

Treatments	Harvest index
T ₁ - Control	30.38
T ₂ - Foliar Spray Panchgavya @ 2.5%	34.41
T ₃ - Foliar Spray Panchgavya @ 5%	34.74
T ₄ - Foliar Spray Jeevamrut @ 2.5%	35.24
T ₅ - Foliar Spray Jeevamrut @ 5%	34.34
T ₆ - Foliar Spray Vermiwash @ 2.5%	31.10
T ₇ - Foliar Spray Vermiwash @ 5%	32.69
T ₈ - Foliar Spray Liquid BioFertilizer @ 2.5%	31.06
T ₉ - Foliar Spray Liquid BioFertilizer @ 5%	31.93
F test	S
SEd(±)	1.708501
CD	3.621861

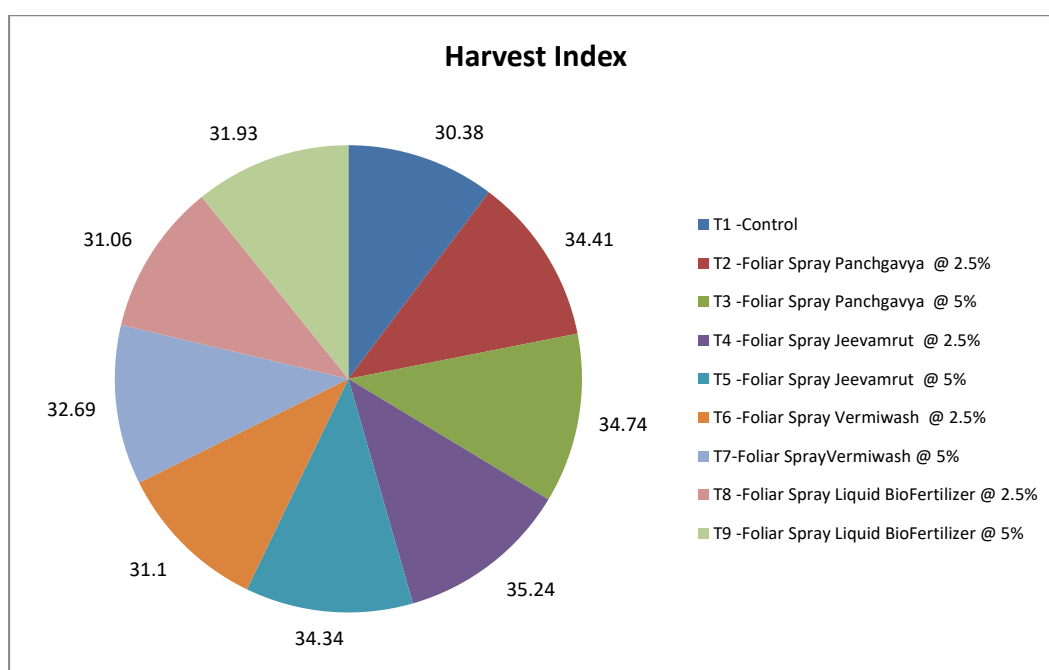


Fig. 2. Pie chart showing harvest index

“The increased seed yield was due to pinching of plants which may be attributed to the proportionate increase in yield contributing characters i.e., more number of productive branches and more number of flowers per plant. Similar results were reported by” (Venkata Reddy et al., 1997; Biswas et al., 2019).

3.3 Harvest Index

Harvest Index of Black Sesame recorded was statistically analyzed After Harvest and presented. The greatest number of Harvest Index was observed in treatment T₄, which included recommended dose of fertilizers along with Foliar Spray Jeevamrut @ 2.5% and Foliar Spray Panchgavya @ 5%, resulting in an Average harvest index of 784 kg. Treatment T₃ consisting of produced a Harvest Index 783 kg, with no significant difference compared to T₄. The less Harvest Index 651 kg, were recorded in the control treatment (T₁), which did not receive any additional inputs.

4. CONCLUSION

In light of results obtained from present investigation, it is concluded that sesame growth under converted organic plot should be given 1000 or 750 lit/ha jivamrut each at 20 days interval for obtaining higher growth and sesame yield. Based on comprehensive study, it concluded that the utilizing of Foliar Application of different organic liquid formulation on number of Capsule, Seed Yield and harvest index of black sesame. T₄ (Foliar Spray Jeevamrut @ 2.5%) demonstrated superior performance, showcasing optimal growth parameters proved to be the most effective treatment among all the mentioned treatments. and lowest treatment among all treatment is T₁ which Control. the approach the use Jeevamrut of only boosts productivity but also improves soil health, supporting sustainable agriculture in Soil.

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.

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