



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(5): 380-383
Received: 17-03-2026
Accepted: 21-04-2026

Tsering Yangzom
PG Student, Department of
Agriculture, Himalayan
University, Jollang, Itanagar,
Arunachal Pradesh, India

Lipi Rina
Assistant Professor, Department of
Agriculture, Himalayan
University, Jollang, Itanagar,
Arunachal Pradesh, India

Kasinam Doruk
Assistant Professor, Department of
Agriculture, Himalayan
University, Jollang, Itanagar,
Arunachal Pradesh, India

Raja Hussain
Assistant Professor, Department of
Agriculture, Himalayan
University, Jollang, Itanagar,
Arunachal Pradesh, India

Corresponding Author:
Tsering Yangzom
PG Student, Department of
Agriculture, Himalayan
University, Jollang, Itanagar,
Arunachal Pradesh, India

Effect of mulching and foliar application on yield attributes of white sesame (*Sesamum indicum* L.)

Tsering Yangzom, Lipi Rina, Kasinam Doruk and Raja Hussain

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i5e.5534>

Abstract

A field experiment was conducted at Himalayan University, Jollang, Itanagar, Arunachal Pradesh., during the kharif season of 2025–2026 to study the effect of Mulching and Foliar Application on yield attribute of White Sesame (*Sesamum indicum* L.). The experiment was laid out in a Randomized Block Design (RBD) with seven treatments and three replications, combining mulching practices (stone and biodegradable) with foliar sprays (moringa leaf extract, seaweed extract, and fish meal) against a control. The results revealed that T₆ (Biodegradable mulch + Seaweed extract @ 0.5%) gave superior performance for obtaining higher capsule number (61.00), seeds capsule⁻¹ (66.67), economic yield (1.66 t ha⁻¹), biological yield (3.50 t ha⁻¹), and harvest index (47.48%). The lowest values were recorded in control (T₀). The findings highlight that integrated use of biodegradable mulch and foliar biostimulants significantly improved soil moisture conservation, nutrient uptake, and assimilate translocation, thereby enhancing yield efficiency in sesame.

Keywords: Sesame, mulching, foliar spray, seaweed extract, yield attributes

Introduction

Sesame (*Sesamum indicum* L.) is a very old crop, cultivated in India for the last over 5,000 years (Bedigian and Harlan, 2003; Ashri, 2007) ^[4, 2]. It is the oldest oilseed belonging to the family Pedaliaceae with 46-52% oil and 20-28% protein content (Ashri, 2007) ^[1]. In spite of its nutritional value and wide usage, its productivity is quite low because it is heavily influenced by weeds, low soil fertility and rainfed condition (Debnath *et al.*, 2015; Myint *et al.*, 2020) ^[5, 17].

One well-known agronomic technique for preserving soil fertility, reducing weed growth, and conserving soil moisture is mulching (Kader *et al.*, 2017; Kader *et al.*, 2020) ^[9, 10]. Foliar application of biostimulants like moringa leaf extract, seaweed extract and fish meal gives promoting factors for plant growth, which affect physiological activity and attributes of yield (Fuglie, 2000; Khan *et al.*, 2009) ^[7, 11]. Synergistic effect on sesame productivity under moisture limited condition is predicted with the integration of mulching and foliar sprays.

The application of mulching and foliar application is an outstanding agronomic strategy for boosting the yield performance of sesame (*Sesamum indicum* L.), especially under resource limited conditions. While mulching will promote soil moisture availability, improving the soil microclimate and conditions at the root zone, the foliar application will supply nutrients effectively at specific stage of growth, to ensure rapid and efficient nutrient supply. Both the practices combined, create synergy which improve plant growth performance, physiological efficiency and yield response of sesame crop. Various reports on oilseed crops indicate that maintaining sufficient soil moisture by using mulches, coupled with timely supply of foliar nutrients supply enhances photosynthesis rate, uptake of nutrients and accumulation of biomass. The combination of these technologies will be effective especially in rainfed conditions where water and nutrients are limiting factors (Sarkar *et al.*, 2007; Patil *et al.*, 2017; Panda *et al.* 2001) ^[22, 19, 18].

In sesame, improved microclimate conditions created by the use of mulching alongside increased availability of foliar nutrients will increase yield attributes and nutrient use efficiency. By preventing evaporative losses and reduction of soil temperature fluctuation through mulching, the moisture conservation and availability in the root zone will increase; this along with timely supplied nutrients through sprays will be responsible to improve flowering and

capsule formation along with seed filling as key yield attributes of the crop. Previous studies in some other crops have confirmed that adequate moisture conservation strategy coupled with foliar application significantly increased water use efficiency and nutrient use efficiency. This treatment can also increase plant vigor, boost dry matter accumulation and efficiently translocate photosynthates toward economical yield.

Recent trend in sustainable agricultural research emphasizes integrated use of mulching with foliar application of bio stimulants and micronutrients to boost plant tolerance to climate change variability. Some recent reports have confirmed that use of organic mulches together with application of plant growth regulators or organic extracts as sprays have enhanced plant stress tolerance by stimulating antioxidant capacity, protecting cell membrane stability and metabolic activities. This will improve yield and seed quality along with financial return. It also reduces the necessity for soil applied fertilizers in order to protect environment. Despite the benefits, there is very limited information about the integration of mulching with foliar application on yield performance of sesame crop, indicating a wide gap for future research across different agro-climatic regions (Meena *et al.* 2017) [16].

Materials and Methods

Study area description

The experiment was laid out during the *Kharif* season of 2025 at the Experimental Research Farm, Jollang, College of Agriculture, Himalayan University, Itanagar, Arunachal Pradesh. The location of the farm is situated at 27.14 N latitude and 93.62 E longitude at an elevation of 320 m above the mean sea level. The site is a part of Eastern Himalayan region under subtropical agro-climatic zone of Arunachal Pradesh.

Experimental Design and Analysis

The experiment was conducted in randomized block design (RBD) with three replications consisting of seven treatments, resulting in a total of 21 plots. Sesame variety GT₂21 was used for the experiment during the *Kharif* season. Each plot measured 3 m × 3 m (9 m²), with bunds of 10 cm height and 20 cm width provided between plots to prevent nutrient and water movement. The crop was sown at intervals of 10 cm × 15 cm to maintain optimum plant population. The overall experimental field measured 30 m in length and 12 m in width, covering a gross cultivated area of 360 m², out of which the net cultivated area was 189 m² used for recording observations and yield data. All the observation recorded in this investigation were analyzed statistically with the help of ANOVA. The "F" (variance ratio) table was used to assess the significant and non-significant treatment effects, and the crucial difference at the 5% probability level was used to test the differences between the treatments.

Table 1: Detail of the experiment treatment

	Treatments
T ₀	Control (no mulch, no foliar spray)
T ₁	Stone mulch + Moringa leaf extract @ 3%
T ₂	Stone mulch + Fish meal @ 2 t ha ⁻¹
T ₃	Stone mulch + Seaweed extract @ 0.5%
T ₄	Biodegradable mulch + Moringa leaf extract @ 3%
T ₅	Biodegradable mulch + Fish meal @ 2 t ha ⁻¹
T ₆	Biodegradable mulch + Seaweed extract @ 0.5%

Crop husbandry

Capsules plant⁻¹ (No.); for calculating number of capsules plant⁻¹,

¹, capsules of tagged plants were counted. The average value for each treatment was calculated thereafter. Seed capsules⁻¹ (No.); the total number of seeds capsules⁻¹ from the five fresh capsules was counted and the average was expressed as number of seeds capsules⁻¹. At the end, the total yield of each treatment was calculated in t ha⁻¹. Economic yield (t ha⁻¹); the crop harvested from the net plot were weighted and expressed in t ha⁻¹. Biological yield (t ha⁻¹): The green fodder from the net plot was weighed and expressed in t ha⁻¹ after the capsules were collected and the remaining plants were harvested to the base. By dividing the biological yield (grain + straw) by the economic yield (grain), the harvest index was calculated.

Results and Discussion

Number of capsules plant⁻¹ was observed as a yield feature (table 2), indicating a significant impact of various treatments on the number of capsules plant⁻¹. However, the treatment had the highest quantity of capsules per plant recorded in T₆ (Biodegradable mulch + Seaweed extract @ 0.5%) i.e., (61.00) which is followed by T₅ (Biodegradable mulch + Fish meal (Fish amino acid) @ 2 t ha⁻¹) i.e., (58.67). Lowest number of capsules plant⁻¹ recorded at T₀ (47) and second lowest is T₁ (50.67). The probable reason for recording higher number of capsules plant⁻¹ under treatment T₆ may be attributed to the synergistic effect of biodegradable mulch and seaweed extract, which improved soil-moisture conservation, nutrient uptake, and physiological efficiency, thereby enhancing reproductive development and capsule formation. The present observation was in full agreement with that of Patil *et al.* (2017) [19], who observed that integrated use of mulching and foliar biostimulants significantly increased capsule number and yield in sesame by improving moisture conservation, nutrient availability, and assimilate translocation toward reproductive organs. Maximum number of seed per capsule (66.67) were recorded in T₆ (Biodegradable mulch + Seaweed extract @ 0.5%) where it performed better over all other treatments, followed by T₅ (Biodegradable mulch + Fish meal @ 2 t ha⁻¹, 63.00) and T₄ (Biodegradable mulch + Moringa leaf extract @ 3%, 61.33). Minimum number of seed per capsule (55.00) were recorded in T₀ (Control, no mulch, no foliar spray). The increasing effect of seed number under T might be because of the cumulative effect of biodegradable mulch and seaweed extract which has a positive impact on the soil moisture, nutrients availability and reproductive efficiency thereby contributing for better seed set and fill up of capsules. According to Khan *et al.* (2009) [11], seaweed extracts are abundant in hormones that promote growth and trace elements which are involved in stimulation of physiological activities that can lead to the improved yield traits such as number of seeds and capsules of oil seed crops. The significant and highest economical (grain) yield was recorded in treatment T₆ (Biodegradable mulch + Seaweed extract @ 0.5%, i.e., 1.66 t ha⁻¹) which was significantly higher than rest of the treatments followed by T₅ (Biodegradable mulch + Fish meal @ 2 t ha⁻¹, i.e., 1.59 t ha⁻¹) and T₄ (Biodegradable mulch + Moringa leaf extract @ 3%, i.e., 1.35 t ha⁻¹) whereas minimum economic yield was recorded at T₀ (Control, no mulch, no foliar spray). The significant increase in economic yield under T₆ may be due to synergism of biodegradable mulch and seaweed extract which ultimately maintained optimal moisture level, increased nutrient content, promoted photosynthetic efficiency and thereby increased seed yield. This is in corroboration with Patil *et al.* (2017) [19] who observed that foliar application of seaweed-based biostimulants significantly increased seed yield and productivity

of sesame by augmenting the uptake of nutrients and chlorophyll content and translocate to reproductive sinks. Biological (Stover) Yield (t ha^{-1}), which was measured at harvest, shows that several treatments had a notable impact on the yield (t ha^{-1}). The significant and highest biological yield (3.50 t ha^{-1}) was found in T_6 (Biodegradable mulch + Seaweed extract @ 0.5%), followed by T_5 (Biodegradable mulch + Fish meal @ 2 t ha^{-1} , i.e., 3.32 t ha^{-1}) and T_4 (Biodegradable mulch + Moringa leaf extract @ 3%, i.e., 3.12 t ha^{-1}). The minimum biological yield (2.54 t ha^{-1}) was found in T_0 (Control, no mulch, no foliar spray). It was observed that the substantial increase in biological yield in T_6 could be due to combined effect of biodegradable mulching and foliar seaweed extract, which enhanced moisture retention in the soil, increased uptake of nutrients and maintained better photosynthesis, and eventually resulted in high accumulation of total dry matter. Mulching helped in maintaining the favorable soil temperature and reduced transpiration losses, and the foliar application of biostimulant induced high level of physiological process and allocation of assimilate toward vegetative as well as reproductive stage of development of the plant. This is in line with the work done by Debnath *et al.* (2015) [5] which stated that integrated nutrient management combined with organic mulching practices may significantly improve total biomass and biological yield of sesame through improved soil moisture retention and higher nutrient availability, as well as

photosynthetic performance. Harvest index (%); the harvest index (%) at harvest indicates that the harvest index (%) was significantly impacted by various treatments. T_5 (Biodegradable mulch + Fish meal @ 2 t ha^{-1}) had the greatest and most notable harvest index (47.95%), closely followed by T_6 (Biodegradable mulch + Seaweed extract @ 0.5%, i.e., 47.48 %) and T_4 (Biodegradable mulch + Moringa leaf extract @ 3%, i.e., 43.38 %). The lowest harvest index (38.45 %) was recorded in T_0 (Control, no mulch, no foliar spray). The significant variation among treatments indicates that the combination of biodegradable mulch and foliar biostimulants effectively improved the partitioning of assimilates toward economic yield. The higher harvest index under T_5 and T_6 reflects efficient translocation of photosynthates from vegetative parts to reproductive organs, resulting in better seed formation and yield efficiency. The increase in harvest index values under organic and biodegradable mulching conditions may be because of optimum conservation of soil moisture and moderate temperature and favorable conditions for uptake of nutrient ultimately leading to assimilate partitioning in favouring conditions. This is confirmed by Kumawat *et al.* (2022) [12], that integrated agronomic practice combining organic mulching and nutrient supply considerably enhanced the harvest index and yield efficiency of sesame due to better utilization of resources and improving soil condition

Table 2: Effect of Mulching and Foliar Application on Yield attributes of White Sesame (*Sesamum indicum* L.)

Treatment	No. of capsules plant ⁻¹	Seed capsule ⁻¹	Economical Yield (t ha^{-1})	Stover Yield (t ha^{-1})	Harvest index (%)
T_0 Control	47	55	0.977	2.54	38.45
T_1 Stone mulch + Moringa leaf extract @ 3%	50.67	53.67	1.027	2.65	38.76
T_2 Stone mulch + Fish meal (Fish amino acid) @ 2 t ha^{-1}	52	55.33	1.083	2.75	39.42
T_3 Stone mulch + Seaweed extract @ 0.5%	55.67	59	1.24	2.95	42.06
T_4 Biodegradable mulch + Moringa leaf extract @ 3%	56.67	61.33	1.35	3.12	43.38
T_5 Biodegradable mulch + Fish meal (Fish amino acid) @ 2 t ha^{-1}	58.67	63	1.59	3.32	47.95
T_6 Biodegradable mulch + Seaweed extract @ 0.5%	61	66.67	1.66	3.5	47.48
F test	S	S	S	S	S
SEd ($\pm$)	3.64	3.35	0.05	0.03	2.10
CD(P=0.05)	7.93	7.30	0.11	0.07	4.57

Conclusion

On the basis of research findings, the experiment clearly demonstrated that the combined application of biodegradable mulch and seaweed extract T_6 Biodegradable mulch + Seaweed extract @ 0.5%) was most effective in enhancing yield attributes of sesame under rainfed conditions. The treatment improved soil-moisture retention, nutrient uptake, and photosynthetic efficiency, resulting in superior vegetative growth, reproductive development, and higher economical yield (1.66 t ha^{-1}), biological yield (3.50 t ha^{-1}) was observed.

References

- Ashri A. Sesame (*Sesamum indicum* L.). In: Singh RJ, editor. Genetic resources, chromosome engineering, and crop improvement: Oilseed crops. Boca Raton: CRC Press; 2007. p. 231-289.
- Ashri A. Sesame (*Sesamum indicum* L.): Overview of plant biology and breeding. In: Janick J, editor. Plant breeding reviews. Vol. 28. Hoboken: John Wiley and Sons; 2007. p. 225-274.
- Arif M, Chohan MA, Ali S, Gul R, Khan S. Response of wheat to foliar application of nutrients. Journal of Agriculture and Social Sciences. 2006;2(1):30-34.
- Bedigian D, Harlan JR. Evolution of sesame revisited: Domestication, diversity and prospects. Genetic Resources and Crop Evolution. 2003;50(7):779-787.
- Debnath S, Ghosh S, *et al.* Constraints and opportunities in sesame (*Sesamum indicum* L.) production in India. Agricultural Sciences. 2015;6(4):312-320.
- Dhargalkar VK, Pereira N. Seaweed: Promising plant of the millennium. Current Science. 2005;88(3):399-404.
- Fuglie LJ. The miracle tree: Moringa oleifera: Natural nutrition for the tropics. Dakar: Church World Service; 2000.
- Haritha G, Singh R, Indu T. Studies on yield and economics of sesame (*Sesamum indicum* L.) as influenced by spacing and foliar application of zinc. International Journal of Plant and Soil Science. 2022;34(14):62-67.
- Kader MA, Senge M, Mojid MA, Ito K. Recent advances in mulching materials and methods for modifying soil environment. Soil and Tillage Research. 2017;168:155-166.
- Kader MA, Senge M, Mojid MA, Ito K. Mulching and soil moisture conservation in agricultural systems: A review. Agronomy. 2020;10(11):1837.
- Khan W, Rayirath UP, Subramanian S, Jithesh MN, Rayorath P, Hodges DM, *et al.* Seaweed extracts as biostimulants of plant growth and development. Journal of Plant Growth Regulation. 2009;28(4):386-399.

12. Kumawat S, Yadav RS, Sharma P. Effect of integrated agronomic practices on productivity and profitability in sesame-based cropping systems. *Journal of Oilseeds Research*. 2022;39(2):110-115.
13. Malekiazar L, Rezaei-Chiyaneh E, Dolatabadian A, *et al.* Organic mulching enhances morpho-physiological performance and yield of sesame (*Sesamum indicum* L.) under water deficit conditions. *Scientific Reports*. 2026;16:8070.
14. Maheshwari R, Sharma P, Singh V. Effect of foliar application of micronutrients on growth and yield of sesame (*Sesamum indicum* L.). *International Journal of Plant and Soil Science*. 2023;35(5):45-52.
15. Malunekar RR, Patil SB, Deshmukh VS. Effect of integrated nutrient management with foliar application of Panchgavya on yield and economics of sesame (*Sesamum indicum* L.). *Journal of Oilseeds Research*. 2023;40(1):55-60.
16. Meena RS, Lal R, Yadav RS. Yield enhancement of sesame (*Sesamum indicum* L.) through improved production technologies under farmer field conditions. *Journal of Oilseeds Research*. 2017;34(1):1-6.
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. Panda S, Mohanty S, Das TK. Effect of foliar nutrition on growth, yield and economics of oilseed crops. *Journal of Plant Nutrition*. 2022;45(6):789-798.
19. Patil SB, Reddy SS, Kumar P. Integrated effect of mulching and foliar nutrition on growth and yield of crops. *International Journal of Agricultural Sciences*. 2017;13(2):245-250.
20. Prakash M, Kumar S, Singh R. Effect of moringa leaf extract on growth, yield and seed quality of sesame (*Sesamum indicum* L.) under rainfed conditions. *Journal of Plant Nutrition*. 2019;42(10):1203-1212.
21. Praticò G, *et al.* Mulching practices for soil moisture conservation and crop performance improvement. *Agricultural Water Management*. 2016;177:132-142.
22. Sarkar S, Saha S, Pramanik K. Effect of foliar nutrition on growth and yield of crops. *Journal of Plant Nutrition*. 2007;30(10):1661-1671.