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Performance of sesame (*Sesamum indicum* L.) under the synergistic effects of integrated weed management practices and vermicompost

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Abstract
A field study was carried out during the *kharif* season of 2024 at the Agricultural Research Farm of Suresh Gyan Vihar University, Jaipur (Rajasthan) on loamy sand soil. The experiment comprised ten weed management treatments and two levels of vermicompost, resulting in twenty treatment combinations. These treatments were evaluated in a factorial randomized block design with three replications, using sesame (*Sesamum indicum* L.) variety 'RT-346'.
The findings revealed that hand weeding performed twice at 30 and 60 days after sowing (W_9) significantly enhanced plant height, dry matter accumulation, number of branches per plant, capsules per plant, seeds per capsule, as well as seed, stalk, and biological yields. This treatment also recorded the lowest weed density, weed dry matter, and weed index, along with the highest weed control efficiency when compared to the weedy check. Furthermore, application of vermicompost at 5.0 t/ha markedly improved plant height, dry matter production, number of branches per plant, seeds per capsule, and seed, stalk, and biological yields over the control. In contrast, weed-related parameters remained statistically unaffected by vermicompost application.

Keywords: Sesame, weed, growth, yield, vermicompost

Introduction
Sesame (*Sesamum indicum* L.), a member of the family Pedaliaceae, is one of the oldest oilseed crops cultivated and utilized by humans worldwide. The crop is believed to have originated in South-Western Africa and is known by different local names such as Til, Sisim, Gingelly, Ajonjoli, Sisamo, Gergelim and Biniseed. Historically, sesame occupied an important position among oilseed crops due to its ease of oil extraction, excellent storage stability and remarkable tolerance to drought conditions. It is predominantly grown as a rainfed crop across tropical and subtropical regions. Although sesame is a short-day plant, it can also perform satisfactorily under long-day conditions. India occupies the leading position globally in terms of both area and production of sesame. Other major sesame-producing countries include China, Myanmar, Sudan, Pakistan, Mexico, Ethiopia, Sri Lanka and several African nations. In India, sesame ranks next to groundnut among oilseed crops, with major cultivation concentrated in Gujarat, Rajasthan, Madhya Pradesh, Karnataka, Maharashtra, Uttar Pradesh, Tamil Nadu, Andhra Pradesh, Kerala and Punjab.
Sesame meal is valued for its superior nutritional quality, particularly due to its high protein content and well-balanced amino acid composition. Defatted sesame flour contains an excellent proportion of sulfur-containing amino acids, especially cysteine and methionine (6.1%), which are generally deficient in leguminous crops characterized by low lysine content (3.1%). The nutrient composition of sesame meal includes 28.17% carbohydrates, 7.92% moisture, 27.83% fat, 6.22% crude fiber, 30.56% protein and 5.27% ash content (Onsaard, 2012) [8].
Vermicompost serves as an efficient source of both macro- and micronutrients in chelated forms and ensures a sustained supply of nutrients to crops over an extended period. In addition to improving nutrient availability, vermicompost contributes significantly to the maintenance of soil fertility and promotes an eco-friendly soil environment. It plays a vital role in lowering the carbon-to-nitrogen ratio, enhancing humus content, and supplying readily available nutrients

such as nitrate, soluble phosphorus, exchangeable potassium, calcium and magnesium (Talashilkar *at al.*, 1999) [11]. Furthermore, vermicompost contains several biologically active compounds, including plant growth-regulating substances, which positively influence crop growth and development (Krishnamoorthy and Vajranabhaiah, 1986) [3]. Weed management is a critical agronomic practice in sesame due to its slow initial growth and poor competitive ability during early crop stages. Weeds compete with the crop for nutrients, moisture, light and space, causing significant reductions in growth and yield if not controlled timely. Yield losses in sesame due to unchecked weed infestation have been reported to range from 50 to 90 per cent depending on weed flora and management practices. Integrated weed management (IWM), which combines cultural, mechanical and chemical methods, has been found more effective and sustainable than sole reliance on a single control measure. Adoption of IWM practices improves weed control efficiency, enhances crop growth and yield attributes, and ensures better resource-use efficiency in sesame cultivation (Chauhan *at al*., 2021; Kumar *at al*., 2022; Yadav *at al*., 2023) [1, 4, 14].

Materials and Methods

The field experiment entitled **"**Performance of Sesame (*Sesamum indicum* L.) under the Synergistic Effects of Integrated Weed Management Practices and Vermicompost" was conducted during the *kharif* season of 2024 at the Agricultural Research Farm of Suresh Gyan Vihar University, Jaipur (Rajasthan), on loamy sand soil. The study was laid out in a factorial randomized block design comprising combinations of weed management practices and vermicompost treatments *viz*., ten weed management practices Weedy check (W_0), Pendimethalin @ 750g/ha PE (W_1), Pendimethalin @ 750g/ha + HW at 30 DAS (W_2), Imazethapyr @ 60 g/ha POE at 20 DAS (W_3) Imazethapyr @ 60 g/ha + HW at 30 DAS (W_4), Quizalofop + Imazethapyr @ POE (W_5), Imazethapyr + Imazamox @ 70g/ha POE (W_6), Pendimethalin + Imazethapyr @ 750g/ha POE (W_7), Pendimethalin + Imazethapyr @ 750g/ha POE + HW (W_8) and Two hand weed at 30 and 60 DAS (W_9)] and two levels of vermicompost (Control and 5.0 t/ha). The sesame variety as test crop "RT-346" was used. The experimental farm is located in the south-eastern part of Rajasthan at an elevation of 548 m above mean sea level, between 26°92′ N latitude and 75°77′ E longitude, and falls under agro-climatic zone III-A (Semi-Arid Eastern Plain) of Rajasthan. The region experiences a typical semi-arid climate, characterized by wide variations in temperature during summer and winter seasons. The average annual rainfall of Jaipur ranges from 400 to 450 mm, of which nearly 80-85 per cent is received through the south-west monsoon, mainly from July to early September. During the cropping period, the maximum temperature varied from 31.41 to 38.71°C, while the minimum temperature ranged between 20.71 and 27.85°C. The relative humidity fluctuated up to 91 per cent during the season. Average daily sunshine hours ranged from 0.68 to 5.01 hours, whereas wind velocity varied between 0.88 and 2.82 km/h. The recorded observations were statistically analyzed using standard procedures as described by Fisher (1950) [2].

Results and Discussion

Weed management practices with Two hand weeding at 30 and 60 DAS (W_9) significantly enhanced growth parameters *i.e.* plant height (97.23 cm), number of branches/plant (5.65) and dry matter accumulation (242.86 g/plant) at harvest over weedy check but remained statistically at par with pendimethalin + imazethapyr @ 750g/ha POE + HW (W_8) presented in table-1 and fig-1. Weed management practices through two hand weeding at 30 and 60 DAS (W_9) markedly enhanced plant height, dry matter accumulation and branches per plant compared with weedy check. The significant improvement in growth parameters of sesame under two hand weeding at 30 and 60 DAS (W_9) may be attributed to effective and prolonged weed suppression during the critical period of crop-weed competition. Timely removal of weeds reduced competition for essential growth resources such as nutrients, moisture, light and space, resulting in enhanced plant height, greater number of branches per plant and higher dry matter accumulation at harvest. Similar improvements in sesame growth due to manual weed control have been reported by Yadav *at al*. (2021) [12] and Kumar *at al*. (2022) [4], who observed that effective weed-free conditions during early growth stages promoted better vegetative development and biomass accumulation. The comparable performance of pendimethalin + imazethapyr @ 750 g/ha PoE + one hand weeding (W_8) with two hand weedings (W_9) indicates that integrated weed management practices can provide weed control efficiency similar to manual weeding alone. The combined application of herbicides followed by hand weeding effectively controlled both grassy and broad-leaved weeds, thereby minimizing weed density and dry matter throughout the crop growth period. Enhanced growth parameters under integrated weed management practices have also been documented in sesame by Chauhan *at al*. (2020) [1], Meena *at al*. (2022) [7] and Singh *at al*. (2023) [10], who reported improved plant stature and branching due to reduced weed competition and improved nutrient availability. Further results revealed that the application of vermicompost with 5.0 t/ha recorded maximum growth parameters *viz.*, plant height (103.23 cm) number of branches/plant (5.87) and dry matter accumulation (234.68 g/plant) at harvest over control presented in table-1 and fig-1. Application of vermicompost at 5.0 t/ha resulted in a significant increase in plant height, dry matter accumulation and number of branches/plant as compared to the control. The observed enhancement in growth parameters can be attributed to the gradual mineralization of nutrients from vermicompost, ensuring a continuous availability of essential macro- and micronutrients. This sustained nutrient supply improves enzymatic activity, soil physico-chemical characteristics and overall nutrient uptake, which collectively promote vigorous vegetative growth. These findings corroborate the results of Yadav *at al.* (2018) [13], who reported improved plant height and branching in oilseed crops following vermicompost application. Comparable outcomes were also reported by Meena *at al.* (2020) [6], who observed increased chlorophyll content due to improved nutrient availability and photosynthetic efficiency under organic nutrient management. Similarly, Sharma *at al.* (2021) [9] documented that higher doses of vermicompost in legumes did not proportionally increase growth, indicating diminishing returns beyond optimal levels. Furthermore, Kumar *at al.* (2022) [4] highlighted that moderate vermicompost application rates effectively sustain crop growth and yield while enhancing soil organic carbon and microbial activity, thereby offering a more economical and sustainable alternative to higher doses.

Further; yield attributes and yields like number of capsules/plant (55.77), number of seeds/capsule (46.15), seed yield (1028 kg/ha), stover yield (1308 kg/ha) and biological yield (2337 kg/ha) presented in table 2 and fig-2, recorded under two hand weeding at 30 and 60 DAS (W_9) over weedy check (W_0) but it

was remained statistically at par with pendimethalin + imazethapyr @ 750g/ha POE + HW (W_8). Further, yield attributes and yields such as number of capsules per plant, number of seeds per capsule, seed yield, stover yield and biological yield were significantly enhanced under two hand weedings at 30 and 60 DAS (W_9) compared with the weedy check (W_0). The higher yield under W_9 may be attributed to effective weed control during the critical growth period, which reduced crop–weed competition and facilitated better utilization of nutrients, moisture and assimilates for reproductive development. Improved yield attributes under weed-free conditions have also been reported in sesame by Yadav *at al*. (2021) [12], Kumar *at al*. (2022) [4] and Meena *at al*. (2023) [5]. The statistical parity of W_9 with pendimethalin + imazethapyr @ 750 g/ha POE + one hand weeding (W_8) indicates that integrated weed management practices can effectively control weeds and sustain yield levels comparable to manual weeding, as also observed by Chauhan *at al*. (2020) [1] and Singh *at al*. (2023) [10]. Whereas; application of 5.0 t/ha recorded significantly higher yield attributes and yields *viz*., capsules/plant (56.04), seeds/capsule (47.52), seed yield (1065 kg/ha), stover yield (1365 kg/ha) and biological yield (2430 kg/ha) presented in table 2 and fig-2. The application of vermicompost at the rate of 5.0 t/ha significantly improved plant height, dry matter production, number of branches per plant and chlorophyll content compared to the untreated control. The positive response of growth attributes may be ascribed to the slow and continuous release of nutrients through vermicompost decomposition, which ensures sustained availability of both macro- and micronutrients throughout the crop growth period. This gradual nutrient supply enhances enzymatic activity, improves soil physico-chemical properties and facilitates better nutrient absorption by plants, ultimately resulting in enhanced vegetative growth. These results are in agreement with the findings of Yadav *at al.* (2018) [13], who observed notable improvements in plant height and branching in oilseed crops with vermicompost application. Likewise, Meena *at al.* (2020) [6] reported enhanced chlorophyll content under organic nutrient management due to improved nutrient uptake and photosynthetic efficiency. Sharma *at al.* (2021) [9] also reported that application beyond the optimum level of vermicompost in legume crops did not lead to proportional increases in growth, indicating diminishing marginal benefits. In addition, Kumar *at al.* (2022) [4] emphasized that optimum doses of vermicompost are effective in maintaining crop growth and yield while improving soil organic carbon status and microbial activity, making them a cost-effective and sustainable nutrient management option. Moreover; among weed parameters *viz*; two hand weeding at 30 and 60 DAS (W_9) recorded least weed population (0.54), weed dry weight (0.54 g), weed index (0.00%) and higher weed control efficiency (99.41%) over weedy check (W_0) and remained statistically at par with pendimethalin + imazethapyr @ 750g/ha POE + HW (W_8). However; weed parameters under vermicompost levels remains unaffected. The effective and timely removal of weeds under W_9 ensured near weed-free conditions throughout the critical crop growth period, thereby suppressing weed emergence and biomass accumulation. The statistical parity of W_9 with pendimethalin + imazethapyr @ 750 g ha^{-1} POE + one hand weeding (W_8) indicates that integrated weed management practices are equally effective in reducing weed pressure and improving weed control efficiency in sesame, as also reported by Chauhan *at al*. (2020) [1], Kumar *at al*. (2022) [4] and Singh *at al*. (2023) [10].

Table 1: Effect of weed management practices and vermicompost levels on growth parameters of sesame

Treatment	Plant height (cm)	Branches/plant	Dry matter accumulation (g/plant)
Weed management practices			
W_0	81.05	3.56	199.30
W_1	91.18	4.62	213.92
W_2	95.06	4.97	227.61
W_3	90.92	4.61	212.98
W_4	100.21	5.16	205.37
W_5	88.83	4.10	206.60
W_6	88.97	4.15	220.36
W_7	93.04	4.79	233.29
W_8	96.99	5.14	234.60
W_9	97.23	5.65	242.86
S.Em+	1.01	0.14	3.81
CD (P=0.05)	3.05	0.42	11.43
Vermicompost levels			
V_0	81.95	3.83	204.68
V_1	103.23	5.87	234.68
S.Em+	1.25	1.15	5.44
CD (P=0.05)	3.75	3.45	16.34
CV (%)	9.54	7.29	9.24

Table 2: Effect of weed management practices and vermicompost levels on yields of sesame

Treatment	Number capsules/plant	Number seeds/capsule	Seed yield (kg/ha)	Stalk yield (kg/ha)	Biological yield (kg/ha)
Weed management practices					
W_0	35.05	23.67	429	690	1119
W_1	43.08	33.78	651	995	1646
W_2	51.19	41.67	861	1202	2064
W_3	42.24	33.72	637	897	1535
W_4	50.08	41.22	852	1194	2046
W_5	40.11	27.41	527	793	1321
W_6	41.62	27.94	536	795	1331
W_7	46.65	37.47	749	1096	1846
W_8	54.73	45.36	987	1302	2289
W_9	55.77	46.15	1028	1308	2337
S.Em+	1.06	1.21	32	32	34
CD (P=0.05)	3.20	3.65	95	97	103
Vermicompost levels					
V_0	35.69	23.92	705	1157	1863
V_1	56.04	47.52	1065	1365	2430
S.Em+	3.92	3.12	44	63	85
CD (P=0.05)	11.76	9.38	134	189	254
CV (%)	8.56	8.98	8.56	8.98	9.24

Table 3: Effect of Weed management practices and vermicompost levels on weed parameters of sesame

Treatment	Weed population/m^{-2}	Weed dry weight (gm^{-2})	Weed control efficiency (%)	Weed index (%)
Weed management practices				
W_0	25.27 (5.03)	92.19 (9.63)	0.00	52.30
W_1	21.65 (4.45)	56.38 (7.54)	38.84	29.05
W_2	0.62 (0.59)	0.62 (1.06)	99.33	12.84
W_3	20.15 (4.29)	56.72 (7.56)	38.47	30.09
W_4	18.39 (4.09)	49.17 (7.05)	46.66	13.56
W_5	17.02 (3.93)	58.94 (7.71)	36.07	38.53
W_6	15.33 (3.72)	57.87 (7.64)	37.23	37.86
W_7	15.20 (3.70)	52.33 (7.27)	43.24	21.46
W_8	0.58 (0.56)	0.58 (1.04)	99.37	3.16
W_9	0.54 (1.02)	0.54 (1.02)	99.41	0
S.Em+	0.09	0.09	0.52	2.65
CD (P=0.05)	0.27	0.27	1.56	7.95
Vermicompost levels				
V_0	34.34 (5.90)	88.77 (9.45)	--	--
V_1	24.80 (5.03)	89.68 (9.50)	--	--
S.Em+	0.92	0.21	--	--
CD (P=0.05)	NS	NS	--	--
CV (%)	7.89	8.09	--	--

√(x+0.5) transformation

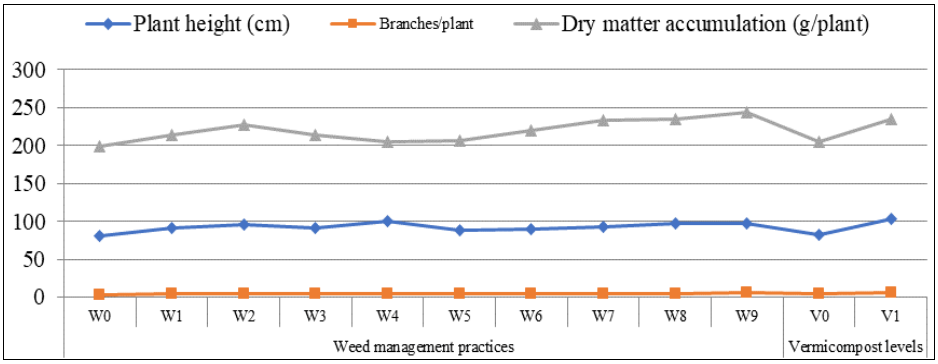

Fig 1: Effect of weed management practices and vermicompost levels on growth parameters of sesame

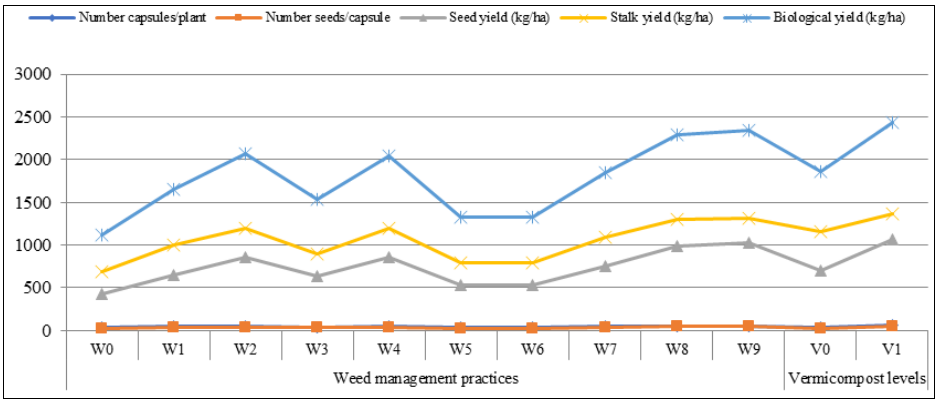

Fig 2: Effect of weed management practices and vermicompost levels on yields of sesame

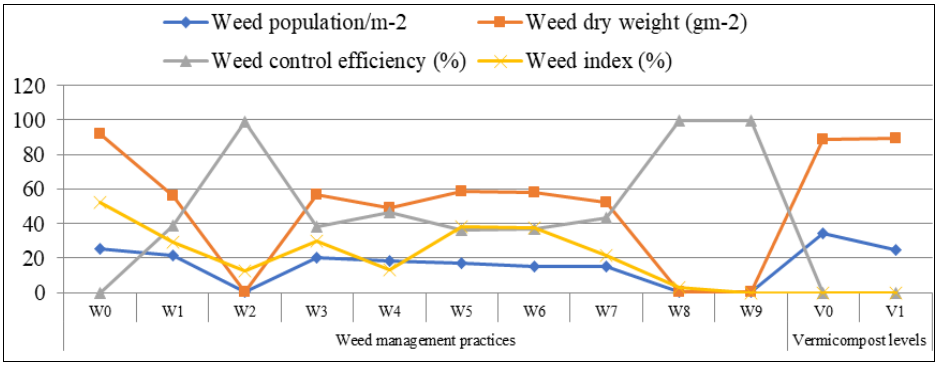

Fig 3: Effect of Weed management practices and vermicompost levels on weed parameters of sesame

Conclusion

On the basis of the results obtained from the present investigation, it can be concluded that the application of weed management practices involving two hand weedings at 30 and 60 days after sowing (W_9), in combination with vermicompost applied at 5.0 t/ha, significantly enhanced the growth and yield of sesame. This integrated approach proved effective in improving crop performance under the prevailing agro-climatic conditions.

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References

1. Chauhan BS, Gill GS, Preston C. Weed management strategies to improve crop productivity and sustainability. Crop Protection. 2020;134:105171.
2. Fisher RA. Statistical methods for research workers. Edinburgh (UK): Oliver and Boyd; 1950.
3. Krishnamoorthy RV, Vajranabhaiah SN. Biological activity of earthworm casts: an assessment of plant growth promoter levels in casts. Proceedings of the Indian Academy of Sciences (Animal Sciences). 1986;95:341-351.
4. Kumar R, Yadav RS, Meena RK. Effect of integrated weed management practices on growth and yield of sesame (*Sesamum indicum* L.). Journal of Crop and Weed. 2022;18(1):145-150.
5. Meena RK, Kumar R, Verma S. Yield response of sesame (*Sesamum indicum* L.) to weed-free conditions and herbicidal weed control. Journal of Crop Research. 2023;58(1):34-39.
6. Meena RK, Singh B, Lal R. Influence of organic manures on growth, yield and quality of oilseed crops. International Journal of Chemical Studies. 2020;8(4):1920-1924.
7. Meena RK, Yadav RS, Sharma SK. Integrated weed management effects on weed dynamics and productivity of sesame. Indian Journal of Weed Science. 2022;54(2):176-181.
8. Onsaard E. Sesame proteins: functional properties and nutritional quality. Asian Journal of Food and Agro-Industry. 2012;5(1):1-10.
9. Sharma SK, Meena RK, Yadav RS. Effect of organic nutrient management on growth, chlorophyll content and yield of oilseed crops. Journal of Plant Nutrition. 2021;44(10):1432-1443.
10. Singh A, Sharma S, Verma S. Herbicide-based integrated weed management in sesame: weed control efficiency and yield performance. Indian Journal of Agronomy. 2023;68(2):210-215.
11. Talashilkar SC, Bhangarath PP, Mehta VB. Changes in chemical properties of soil during composting of organic residues. Journal of the Indian Society of Soil Science. 1999;47(2):227-232.
12. Yadav RS, Kumar R, Meena RK. Crop–weed competition and weed management in sesame. Indian Journal of Weed Science. 2021;53(3):245-250.
13. Yadav RS, Meena HN, Patel CB. Effect of vermicompost on growth and yield of oilseed crops under semi-arid conditions. Indian Journal of Agricultural Sciences. 2018;88(5):728-732.
14. Yadav RS, Meena RK, Sharma SK. Integrated weed management for sustainable sesame production. Journal of Crop Improvement. 2023;37(2):156-168.