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Effect of moisture conservation and vermicompost on growth and yield of sesame (*Sesamum indicum* L.)

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Abstract

A field experiment was conducted at Agriculture Research farm of Suresh Gyan Vihar University, Jaipur (Rajasthan) during kharif, 2024 on loamy sand soil, which consisted four treatments of moisture conservation (Control, Dust Mulch, Stalk Mulch, Plastic Mulch) and four treatment of vermicompost (Control, 1.5 t/ha, 3.0 t/ha and 4.5 t/ha) thereby making sixteen treatment combinations were tested in factorial randomized block design with three replications. Results further indicated that application moisture conservation with application of Stalk Mulch significantly increased plant height, dry matter accumulation, number of branches/plant, chlorophyll content, number of capsules/plant, number of seeds/capsule, seed yield, stalk yield and biological yield. Further; results clearly showed that application of Vermicompost @ 4.5 t/ha which being at par with Vermicompost @ 3.0 t/ha and significantly increased plant height, dry matter accumulation, number of branches/plant, chlorophyll content, number of capsules/plant, number of seeds/capsule, seed yield, stalk yield and biological yield over control.

Key words: Sesame, moisture, growth, yield

Introduction

Sesame (*Sesamum indicum* L.) belongs to the family Pedaliaceae and is one of the most ancient oilseed crop known and used by mankind of the world. It is originated in South Western Africa. It is recognized by various names like Til, Sisim, Gingelly, Ajonjoli, Sisamo, Gergelim Biniseed, etc. It was a major oilseed crop in the ancient world due to its easiness of extraction, great stability and resistance to drought. Sesame is grown as a rainfed crop throughout the tropic and subtropics areas. It is short day plant but also grow well in long day areas. India ranks first both in the area and production of sesame. The major sesame producing countries are India, China, Myanmar, Sudan, Pakistan, Mexico, Ethiopia, Srilanka, Burma, Africa, etc. Sesame is an important oilseed crop next to the groundnut. In India major sesame cultivating states are Gujarat, Rajasthan, Madhya Pradesh, Karnataka, Maharashtra, Utter Pradesh, Tamil Nadu, Andhra Pradesh, Kerala and Punjab. Sesame meal has exceptional nutritional attributes due to the presence of high-quality protein. An outstanding balance of amino acids is present in defatted sesame flour. Sesame protein is rich in cysteine and methionine (6.1%), the sulfur-containing amino acids. These are typically limiting amino acids in leguminous plants having low lysine content (3.1%). The composition of the nutrient constituent obtained from sesame meal were carbohydrate 28.17%, 7.92% moisture, 27.83% fat, 6.22% fiber, 30.56% protein and 5.27% ash content (Onsaard 2012).

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Vermicompost is a prime source of macro and micro nutrients in chelated form and fulfills the balanced nutrient requirement of crops for longer period. Besides this, it also helps in maintaining soil fertility and precious eco-friendly environment of the soil. Vermicompost also helps in reducing C:N ratio and in increasing humus content of the soil and provides a wide range of nutrients in readily available form to plants, such as nitrate, soluble phosphorus, exchangeable potassium, calcium, magnesium (Talashilkar *et al*., 1999) and many biologically active substances such as plant growth regulators (Krishnamoorthy and Vajranabhaiah, 1986). The use of mulch conserves the moisture content in the soil taking into cognizance the time of planting of the crop thereby allowing the full utilization of available moisture and fertilizer nutrients at the root zone ofthe crop. Ahamefule and Peter (2014) reported higher phosphours use efficiency in cowpea plants. Apart from increasing soil fertility, stalk mulch also serves as soil amendment by adding organic matter to the soil and suppress weed growth (Aguyoh *et al*., 1999). Grass mulch has been found to increase the nutrient content of soil following decomposition and mineralization, hence, can increase the vegetative growth of plants, which ultimately results in high yield (Singh *et al*., 2007, Ahamefule and Peter, 2014) attributable to the reduction in soil temperature and improved moisture holding capacity of the soil (Lal, 1974).

Materials and Methods

The experiment entitled "Effect of Moisture Conservation and Vermicompost on Growth and Yield of Sesame (*Sesamum indicum* L.)" conducted at Agriculture Research farm, Suresh Gyan Vihar University, Jaipur (Rajasthan) during *kharif*, 2024 on loamy sand soil. The experiment was laid out in factorial randomized block design comprising combinations of four moisture conservation practices (Control, Dust Mulch, Stalk Mulch, Plastic Mulch) and four treatment of vermicompost (Control, 1.5 t/ha, 3.0 t/ha and 4.5 t/ha). Experimental farm is situated in South-Eastern part of Rajasthan at an altitude of 548 meter above mean sea level with 26° 92' North, 75° 77' East longitude and this area falls under agro-climatic zone III-A (Semi-Arid Eastern Plain) of Rajasthan. The climate of this region is a typically semi-arid, characterized by extremes of temperature during both summers and winters. The average rainfall of Jaipur is from 400-450 mm, most of which (80-85%) is received from South-West Monsoon during July to early September. The maximum and minimum temperature during the crop season ranged between 31.41 to 38.71^{0}C, while minimum temperature ranged from 20.71^{0}C to 27.85^{0}C during the crop season, respectively. The relative humidity fluctuated between 91 per cent, while the average sunshine hours ranged between 0.68 to 5.01 hrs/ dayand wind velocity fluctuated between 0.88 to 2.82 km/hrs. The observation were recorded was analysed by statistical methods (Fisher, R.A. 1950).

Results and Discussion

Moisture Conservation practices with Stalk Mulch significantly enhanced growth parameters *i.e.* plant height (100.77 cm), dry matter accumulation (215.28 g/mrl), number of branches/plant (4.56) and chlorophyll content (3.78 mg) at harvest over control but remained statistically at par with Plastic Mulching (Table 1 and Fig. 1). Moisture conservation through stalk mulch markedly enhanced plant height, dry matter accumulation, branches per plant and chlorophyll content compared with control. The improvement may be attributed to reduced soil evaporation, moderated soil temperature, and improved soil moisture availability during critical growth phases, which directly enhanced photosynthetic activity and biomass partitioning. Similar findings were reported by Li *et al*. (2020), who emphasized that crop residue mulching improves soil hydrothermal regimes and crop growth. Singh *et al*. (2021) also observed that residue mulching significantly improved chlorophyll content and water-use efficiency in oilseed crops. Comparable growth under stalk mulch and plastic mulch in the present study is in agreement with Zhao *et al*. (2019), who demonstrated that organic mulches can perform at par with plastic film mulching in maintaining soil moisture and crop physiology. Furthermore, Ghosh *et al*. (2022) highlighted that residue recycling not only improves soil health but also provides a sustainable and eco-friendly alternative

Table 1. Effect of Moisture Conservation and vermicompost levels on growth parameters of sesame

Treatment	Plant height (cm)	Dry matter accumulation (g/plmrl)	Branches/plant	Chlorophyll content
Moisture Conservation practices				
Control	87.24	189.22	3.28	3.53
Dust Mulch	93.49	200.49	3.88	3.73
Plastic Mulch	99.83	212.60	4.51	3.98
Stalk Mulch	100.77	215.28	4.56	3.78
SEm±	2.07	3.48	0.19	0.12
CD (P=0.05)	6.23	9.20	0.57	0.36
Vermicompost levels				
Control	87.43	190.04	3.30	3.56
1.5 t/ha	93.87	201.87	3.91	3.76
3.0 t/ha	99.97	213.34	4.55	3.99
4.5 t/ha	101.37	216.04	4.58	3.81
SEm±	2.07	3.48	0.19	0.12
CD (P=0.05)	6.21	10.24	0.56	0.37
CV (%)	8.98	8.76	8.67	9.81

to polyethylene mulches. Further results revealed that the application of vermicompost 4.5 t/ha recorded maximum growth parameters *viz*., plant height (101.37cm), dry matter accumulation (216.04 g/mrl) number of branches plant^{-1} (4.58) and chlorophyll content (3.81) at harvest over control but it was remained statistically at par with application of vermicompost 3.0 t/ha (Table-1 and fig-1). Application of vermicompost @ 4.5 t/ha significantly enhanced plant height, dry matter accumulation, number of branches per plant and chlorophyll content over control. The improvement may be attributed to the continuous mineralization of nutrients from vermicompost, which provides a steady supply of macro- and micronutrients, enhances enzymatic activity and improves soil physico-chemical properties, thereby favouring better vegetative growth. These results are in line with findings of Yadav *et al*. (2018), who reported that vermicompost improved plant height and branching in oilseed crops. Similar observations were made by Meena *et al*. (2020), highlighting that organic amendments such as vermicompost enhance chlorophyll content by improving nutrient uptake and photosynthetic efficiency. The statistical parity between 4.5 t/ha and 3.0 t/ha levels suggests that beyond a certain threshold, nutrient availability from vermicompost may reach an optimum level for crop growth, as supported by Sharma *et al*. (2021), who noted diminishing returns of higher vermicompost doses in legumes. Moreover,

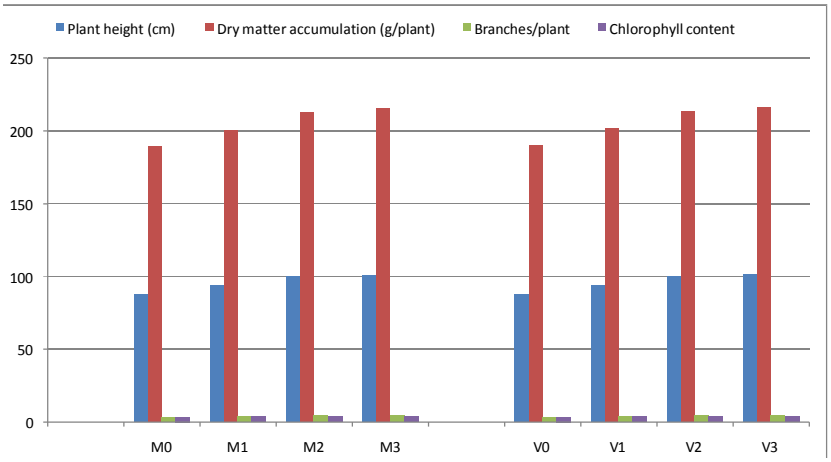

Fig.1. Effect of Moisture Conservation practices and Vermicompost levels on growth parameters of sesame

Table 2. Effect of Moisture Conservation and vermi compost levels on yields of sesame

Treatment	Number of capsules/plant	Number of seeds/capsule	Seed yield (kg/ha)	Stalk yield (kg/ha)	Biological yield (kg/ha)
Moisture Conservation practices					
Control	38.21	22.94	511	1401	1912
Dust Mulch	44.71	31.69	714	1622	2336
Plastic Mulch	51.42	40.62	897	1827	2724
Stalk Mulch	52.06	41.27	914	1865	2779
SEm±	2.08	2.62	58	67	95
CD (P=0.05)	6.25	7.87	176	203	297
Vermicompost levels					
Control	38.73	23.76	517	1419	1936
1.5 t/ha	44.78	32.08	719	1628	2348
3.0 t/ha	51.48	41.56	901	1829	2730
4.5 t/ha	52.18	42.34	916	1868	2784
SEm±	2.07	2.60	58	67	95
CD (P=0.05)	6.21	7.82	174	202	294
CV (%)	8.29	8.94	8.67	8.46	8.72

Kumar *et al*. (2022) emphasized that moderate doses of vermicompost not only sustain growth and yield but also improve soil organic carbon and microbial activity, making them equally effective and more economical than higher applications.

Further yield attributes and yields like number of capsules/plant (52.06), number of seeds/capsule (41.27), seed yield (914 kg/ha), stover yield (1865 kg/ha) and biological yield (2779 kg/ha) presented in table 2 and fig-2, recorded with the application of stalk mulch over control but it was remained statistically at par with plastic mulch. Application of stalk mulch markedly improved yield attributes and yields, as reflected in higher number of capsules per plant, seeds per capsule, seed yield, stover yield and biological yield over the control. This enhancement may be attributed to better soil moisture conservation, moderated root-zone temperature and improved nutrient uptake under mulched conditions, which promoted reproductive efficiency and assimilate partitioning. However, yield performance under stalk mulch remained statistically at par with plastic mulch, indicating that both mulching practices created a favourable microenvironment for sustained crop productivity (Kumar *et al*., 2019; Singh *et al*., 2021; Zhao *et al*., 2022). Morever; application of 4.5 t/ha gave maximum yield attributes and yields like number of capsules/plant (52.18), num-

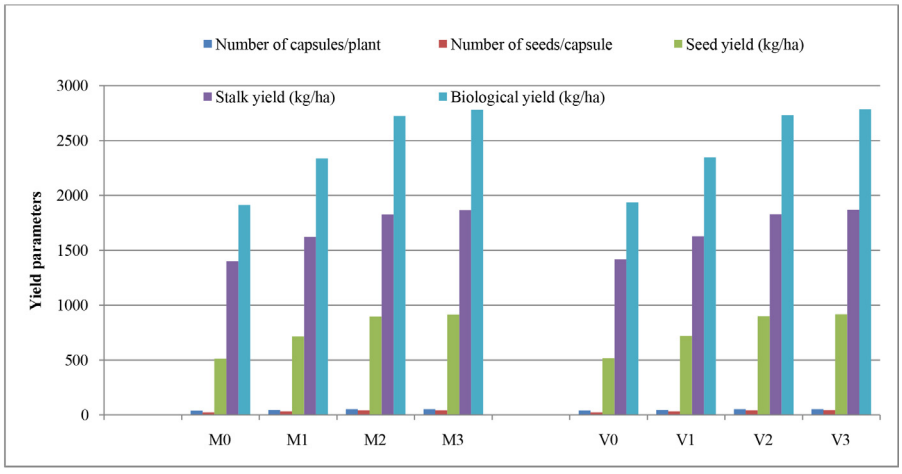

Fig. 2. Effect of Moisture Conservation practices and Vermicompost levels on nodulation and seed yield of sesame

ber of seeds/capsule (42.34), seed yield (916 kg/ha), stover yield (1868 kg/ha) and biological yield (2784 kg/ha) presented in Table 2 and Fig. 2. The improvement may be ascribed to better nutrient availability, enhanced soil organic matter, improved root growth and efficient partitioning of assimilates towards reproductive structures under vermicompost application. Similar beneficial effects of vermicompost on yield traits have been reported by Yadav *et al*. (2018), Meena *et al*. (2020) and Sharma *et al*. (2021).

Conclusion

Based on the results of above experiment it is, concluded that Moisture Conservation practices with Stalk Mulch and Vermicompost levels @ 4.5 t/ha significantly improved the growth and yield of sesame.

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References

Aguyoh, J.N., Masiunas, J.B. and Weston, L.A. 1999. Effect of mulch surface and thickness on weed suppression and potato yield. *Hort Science*. **34**(1): 146–148.

Ahamefule, H.E. and Peter, O. 2014. Mulch type and phosphorus fertilizer effects on phosphorus use efficiency of cowpea. *International Journal of Plant and Soil Science*. 3(7): 795–803.

Fisher, R.A. 1950. *Statistical Methods for Research Workers*. Oliver and Boyd, Edinburgh, London.

Ghosh, S., Barman, M., Mandal, S. and Saha, S. 2022. Residue recycling and mulching: A sustainable and eco-friendly alternative to polyethylene mulches for soil health and crop productivity. *Agricultural Reviews*. **43**(2): 187–195.

Krishnamoorthy, R.V. and Vajranabhaiah, S.N. 1986. Biological activity of earthworm casts: an assessment of plant growth promoter levels in the casts. *Proceedings: Animal Sciences*. **95**(3): 341–351.

Kumar, A., Singh, J. and Yadav, S. 2019. Effect of mulching on soil hydrothermal regime, nutrient uptake and productivity of sesame (*Sesamum indicum* L.). *Journal of Oilseeds Research*. **36**(1): 45–49.

Kumar, R., Meena, R.S. and Lal, R. 2022. Vermicompost and nutrient management: Impacts on soil organic carbon, microbial activity and crop productivity. *Environmental Sustainability*. **5**(1): 23–34.

Lal, R. 1974. Role of mulching techniques in tropical soil and water management. *IITA Technical Bulletin*. 1: 38.

Li, H., Zhao, Y., Zhang, X. and Wang, S. 2020. Effects of crop residue mulching on soil hydrothermal conditions and crop growth: A review. *Soil and Tillage Research*. **199**: 104597.

Meena, V.S., Maurya, B.R. and Verma, R. 2020. Vermicompost and organic amendments improve nutrient uptake, chlorophyll content and photosynthetic efficiency in oilseed crops. *Journal of Plant Nutrition*. **43**(11): 1675–1686.

Onsaard, E. 2012. Sesame proteins. *International Food Research Journal*. **19**(4): 1287–1295.

Sharma, P., Yadav, R.K. and Singh, A. 2021. Response of legumes to graded levels of vermicompost: Growth, yield and soil fertility dynamics. *Legume Research*. **44**(10): 1100–1106.

Singh, A., Singh, H. and Sharma, N. 2007. Effect of mulching on crop productivity and soil fertility. *Agricultural Reviews*. **28**(2): 145–149.

Singh, P., Patel, D. and Rathore, V.S. 2021. Effect of crop residue mulching on soil moisture, chlorophyll content and water-use efficiency in oilseed crops. *Indian Journal of Agronomy*. **66**(3): 321–327.

Talashilkar, S.C., Bhangarath, P.P. and Mehta, V.B. 1999. Changes in chemical properties during composting of organic residues as influenced by

earthworm activity. *Journal of the Indian Society of Soil Science*. **47**(3): 749–752.

Yadav, D., Choudhary, R. and Meena, S. 2018. Influence of vermicompost and organic manures on growth and yield attributes of oilseed crops. *International Journal of Current Microbiology and Applied Sciences*. **7**(4): 1458–1466.

Zhao, X., Liu, Y. and Wu, P. 2019. Comparative effects of organic mulch and plastic film mulch on soil moisture and crop performance in semi-arid regions. *Field Crops Research*. **233**: 28–36.

Zhao, X., Sun, S. and Wu, P. 2022. Organic mulching and plastic mulching: Comparative effects on soil hydrothermal environment and crop productivity in dryland farming. *Agricultural Water Management*. **259**: 107209.