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Effect of different growing media on growth and survivability of *Aloe Vera* (*Aloe barbadensis)*.

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Abstract
An experiment was conducted during 2024–2025 at the Shade Net House, Horticulture Farm, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture and Research Station, Sankara-Patan, Durg (Chhattisgarh), to evaluate the effect of growing media on the growth and survivability *of Aloe Vera* (*Aloe barbadensis Mill*.). Among the treatments, T_1 (Vermicompost + Sand + Soil) exhibited superior performance across most growth parameters at 180 DAP. Plants in T_1 achieved the highest number of leaves plant^{-1} (7.20), plant height (38.23 cm), length of leaf (37.53 cm), stem diameter (2.60 cm) and root length (15.37 cm). In contrast, T_0 control (Sand + Soil) consistently showed the lowest values, indicating poor growth performance. Statistical analysis revealed significant differences among treatments for most parameters at 120 and 180 DAP, except for number of sucker which were non-significant (NS). Overall, vermicompost-based medium (T_1) promoted optimal leaf development, Root growth in *Aloe Vera*. These findings highlight the potential of T_1 as an efficient medium for commercial cultivation under controlled environments.

Keywords: *Aloe Vera*, growing media, vermicompost, growth, root length

Introduction
Aloe Vera is a perennial succulent that grows to a height of approximately 60–80 cm. *Aloe Vera* is xerophytic plant with short and thick stems, fibrous roots and evergreen leaves arranged in a rosette form. The leaves are spear-shaped, fleshy and covered with a waxy cuticle, having thorny margins. Aloe produces bright red to yellow flowers on nearly branched inflorescences. Due to its protoandrous nature, in which the anthers mature before the pistil and the filament is longer than the pistil, the plant is self-incompatible and relies primarily on bees for pollination. Mature fruits develop into capsules (Rathod and Parmar 2025) [17].

The name "*Alloeh*" derives from Arabic, meaning "shining bitter substance," while "*vera*" is Latin for "true" (Christaki and Florou Paneri, 2010) [4]. Among more than 400 reported species, *Aloe arborescens* and *Aloe barbadensis* are the most widely cultivated for commercial purposes (Moghaddasi and Verma, 2011 [10]; Manvitha and Bidya, 2014) [9]. The species grows predominantly in arid and semi-arid regions of Asia, Africa, Europe and the Americas. Structurally, its leaves consist of an outer green parenchyma enclosing a thick, mucilaginous, colorless gel rich in bioactive compounds (Surjushe *et al.*, 2008) [24].

Growing media plays a vital role in plant growth and the biosynthesis of multiple metabolites that improve the nutritional profile of young seedling (Sukewijaya *et al.*, 2025) [22]. Growing media are used to support the growth of plants and they perform four major functions uphold the roots, supply nutrients, water and air. Good quality media also provide physical support to plants and maximum root growth (Grunert et al., 2016) [6]. Soil is the fundamental resource for growing horticultural crops, playing a crucial role in plant health, growth and productivity. (Cannavo *et al*., 2025) [3]. Sand is an important natural substrate for plant growth. (Richardson *et al*., 2025) [18]. Blouin *et al.* (2019) [2] reported that applying vermicompost at 30–50% soil volume increased commercial crop yields by 26%, shoot biomass by 78% and root biomass by 57%. Furthermore, vermicompost fosters antagonistic microbial populations in the rhizosphere, which suppress plant pathogens and pests (Sarma *et*

al., 2010) [20]. Its eco-friendly nature makes it a sustainable alternative to chemical fertilizers, helping to reduce environmental pollution while improving soil health (Pathma and Sakthivel, 2012) [13]. Coco peat, with its high porosity and water retention capacity, has been recognized as a sustainable medium for water-scarce regions, as it reduces irrigation frequency while maintaining soil moisture (Neethi *et al.*, 2006) [11]. Azospirillum is a free-living bacteria promote the yield and growth of plants (Sun *et al*., 2025) [23]. Ghanjeevamrit improve crop productivity by providing sustainable and balanced nutrient (Pushkarna *et al*., 2025) [15]. Garden soil functions as a baseline medium when supplemented with organic amendments, supports sustainable cultivation by reducing reliance on synthetic inputs (Hussain *et al.*, 2014) [7]. Neem cake, with its antifungal and insect repellent properties, also plays an important role in integrated pest management and organic farming systems (Saurabh *et al.*, 2021) [21].

2. Material and Methods

The experiment was conducted during the year 2024–2025 in the shade net house of the Horticulture Farm, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture and Research Station (CHRS), Sankara-Patan, Durg, Chhattisgarh. The experiment was laid out in a Completely Randomized Design (CRD) with seven treatments *viz*. T_0 Control (Soil + Sand), T_1 (Vermicompost + Soil + Sand), T_2 (Coco peat + Soil + Sand), T_3 (Azospirillum + Soil + Sand), T_4 (Garden soil + Soil + Sand), T_5 (Ghanjeevamrit + Soil + Sand), T_6 (Neem cake + Soil + Sand) replicated three times. Each treatment consisted of 30 plants. The trial was conducted in polybags of size 15 × 15 cm filled with treatment-specific growing media (T_0-T_6). The bags were arranged according to designated treatment groups. Uniform *Aloe Vera* suckers with 2–3 leaves, 8–10 cm height and free from insect and pest were selected as planting material. Suckers were planted in each polybag filled with growing media according to treatments. The growth parameter were measured including number of leaves plant^{-1}, plant height (cm), length of leaf(cm), stem diameter(cm), number of suckers, root length(cm) and survival % were recorded at 60, 120 and 180 days after planting (DAP).

Table 1: Growth Parameters of *Aloe Vera* (3.1-3.7)

Notation	Treatment details	No. of leaves plant^{-1}			Plant height (cm)			Leaf length (cm)			Stem diameter (cm)			Number of suckers			Root length (cm)	Survival (%)
		60 DAP	120 DAP	180 DAP	60 DAP	180 DAP	180 DAP	60 DAP	120 DAP	180 DAP	60 DAP	120 DAP	180 DAP	60 DAP	120 DAP	180 DAP	180 DAP	180 DAP
T_0	Control (Soil + Sand 1:1)	4.00	4.67	5.13	21.90	25.57	30.24	20.06	24.57	29.24	1.09	1.28	1.72	0.00	0.00	0.67	9.72	100
T_1	Vermicompost + Soil + Sand (1:2:1)	4.80	6.47	7.20	26.56	33.56	38.23	25.87	32.86	37.53	1.60	1.91	2.60	0.00	0.67	0.33	15.37	100
T_2	Coco peat + Soil + Sand (1:2:1)	4.40	4.73	5.40	23.45	26.95	31.29	22.54	25.46	30.39	1.29	1.59	2.07	0.00	0.33	1.00	14.61	100
T_3	Azospirillum + Soil + Sand (1:2:1)	4.47	5.33	6.47	25.65	31.22	36.22	24.69	30.61	35.32	1.34	1.83	2.27	0.00	0.33	0.67	13.31	100
T_4	Garden soil + Soil + Sand (1:2:1)	4.07	4.80	5.80	22.62	28.79	33.12	21.77	27.85	32.41	1.17	1.57	2.08	0.00	0.33	0.33	12.91	100
T_5	Ghanjeevamrit + Soil + Sand (1:2:1)	4.40	5.27	6.00	26.05	31.03	36.07	25.79	30.63	35.17	1.41	1.80	2.23	0.00	0.67	1.00	13.08	100
T_6	Neem cake + Soil + Sand (1:2:1)	4.13	5.13	5.93	24.88	29.22	33.55	23.96	28.72	32.58	1.30	1.55	1.98	0.00	0.33	1.33	11.41	100
	SEm±	0.24	0.35	0.33	-	0.79	0.798	-	1.64	1.712	0.044	0.052	0.306	-	-	-	0.798	-
	CD	NS	1.075	1.008	NS	1.12	2.422	NS	5.93	5.52	0.134	0.157	0.929	NS	NS	NS	2.422	-

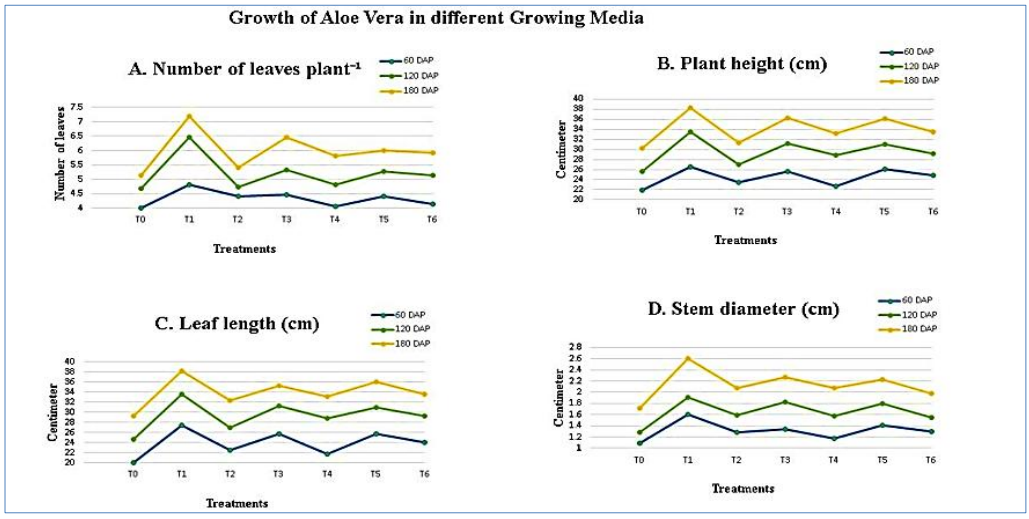

Fig 1: Growth of *Aloe Vera* under different growing media (A – Number of leaves per plant; B – Plant height; C – Leaf length; D – Stem diameter)

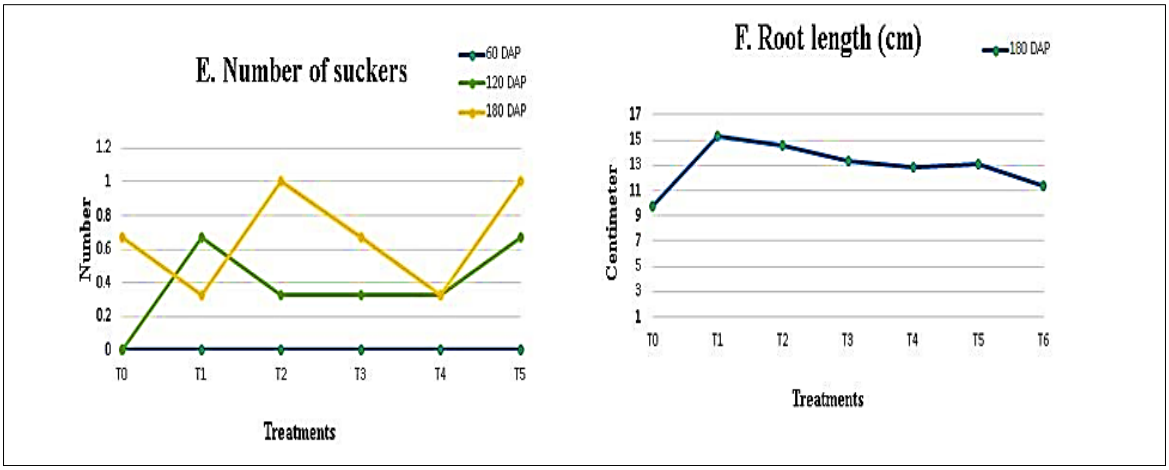

Fig 2: Growth of *Aloe Vera* under different growing media (E- Number of sucker; F- Root length)

3. Results and Discussion

Result of present study revealed that number of leaves plant^{-1}, plant height, leaf length, stem diameter, root length was significantly influenced by different growing media except number of suckers per plant was found non-significant as presented in table 1.

3.1 Number of Leaves Plant^{-1}

The number of leaves per plant increased progressively from 60 DAP to 180 DAP across all treatments (Table 1) (Fig. 1). At 60 DAP, the maximum number of leaves (4.80) was recorded in T_1, while the lowest (4.00) was noted in T_0. At 120 DAP, T_6 again showed superiority (6.47), followed by T_3 (5.33) whereas T_0 remained the lowest (4.67). At 180 DAP T_1 maintained the highest value (7.20) followed by T_3 (6.47) and the minimum was observed in T_0 (5.13).Overall, T_1 was the most effective treatment for enhancing the number of leaves per plant, whereas T_0 consistently showed the lowest performance throughout the growth period. Vermicompost is assumed to be rich availability of enzymes, vitamins, micro and microelements and growth stimulating hormones which beneficial for growth of medicinal plants more quickly. Through improving N_2 fixation and disbanding phosphorus, it also enhance both nitrogen and phosphorus availability (Prabha *et al.*, 2007) [14].

3.2 Plant Height (cm)

Plant Height showed a consistent increase with the advancement of growth stages under different treatments ((Table 1) (Fig. 1). At 60 DAP, the tallest plants (26.56 cm) were observed in T_1, followed by T_5 (26.05 cm), while the shortest plants (21.90 cm) were recorded in T_0. At 120 DAP, T_1 again exhibited the maximum height (33.56 cm), closely followed by T_3 (31.22 cm), whereas the minimum height (25.57 cm) was in T_0. At 180 DAP, T_1 maintained superiority with 38.23 cm, followed by T_3 (36.22 cm), while the lowest height (30.24 cm) was found in T_0. Overall, T_1 consistently produced the tallest plants across all stages, while T_0 showed the least growth in height throughout the experiment. According to Saha et al., 2005 [19] organic manures for example vermicompost are more advantageous for the somatic growth of *Aloe Vera* compare than chemical fertilizers. Vermicompost includes substantial amounts of humic acids, hamate and nutrients therefore response of the plant to growth might be alike to hormone stimulate activity (Atiyeh *et al.*, 2000) [1].

3.3 Length of Leaf (cm)

The Length of leaves increased steadily with crop age under different treatments (Table 1)
(Fig. 1). At 60 DAP, the maximum leaf length (25.87 cm) was recorded in T_1, followed by T_5 (25.79 cm), while the minimum (20.06 cm) was noted in T_0. At 120 DAP, T_1 again showed the highest value (32.86 cm), followed by T_3 (30.61 cm), whereas the lowest (24.57 cm) was recorded in T_0. At 180 DAP, T_1 maintained superiority with 37.53 cm, followed by T_5 (35.87 cm), while T_0 remained the lowest (29.24 cm). Overall, T_1 was the most effective treatment in promoting leaf elongation at all growth stages, whereas T_0 consistently showed the least leaf length throughout the experiment. Tavali *et al.*, (2022) [25] investigated the collective influence of vermicompost on number of bacteria in soil, alkaline phosphatase, β-glycosidase, dehydrogenase, urease and height of the plant, leaf number, herbage yield, sucker number and weight of fresh gel was observed. Additionally examined that in soil bacterial number 140% increased, 125% in urease activity, 122% in alkaline phosphatase activity, 170% in dehydrogenase activity, 123% in β-glycosidase activity, 65% in plant height and 45% in leaf yield and gel weight.

3.4 Stem Diameter (cm)

Stem diameter increased progressively with plant growth across all treatments (Table 1) (Fig. 1). At 60 DAP, the maximum Stem diameter (1.60 cm) was observed in T_1, followed by T_3 (1.41 cm), while the minimum (1.09 cm) was recorded in T_0. At 120 DAP, T_1 again showed the highest stem diameter (1.91 cm), followed by T_3 (1.83 cm), whereas T_7 remained the lowest (1.28 cm). At 180 DAP, T_1 maintained superiority with 2.60 cm, followed by T_3 (2.27 cm), while T_0 had the minimum stem diameter (1.72 cm). Overall, T_1 consistently produced the thickest stems, indicating it was the most effective treatment for enhancing stem robustness, whereas T_0 consistently showed the least stem growth. Application of vermicompost be able to improve stem height, leaf area, number of leaves and weight of plant (Nurhayati *et al.*, 2020 [12]; Putra *et al.*, 2025) [16].

3.5 Number of Suckers

The Number of suckers per plant increased gradually with age across the treatments (Table 1) (Fig. 2). At 60 DAP, no suckers were observed in any treatment. There is no significant differences found between the treatments in number of suckers. Dipin (2014) [5] observed that there is no significant difference observed in about 6 month after planting on his experiment.

3.6 Root Length (cm)

The Root length at 180 DAP varied among the treatments (Table 1) (Fig. 2). The maximum Root length (15.37 cm) was observed in T_1, followed by T_2 (14.61 cm) and T_3 (13.31 cm), while the minimum (9.72 cm) was recorded in T_0. Other treatments showed intermediate values, with T_5 at 13.08 cm, T_4 at 12.91 cm and T_6 at 11.41 cm. Overall, T_1 consistently promoted the longest root growth, indicating superior nutrient uptake potential, whereas T_0 exhibited the shortest roots, reflecting limited growth under control conditions. Vermicompost alone produced more shoots, roots and plantlets weight. According to Joshi *et* al., 2015 [8] vermicompost application enhance number of leaves, stem height and length of root and improved the quality.

3.7 Survival Percentage (%)

All treatments applied to *Aloe Vera* plants achieved a 100% survival rate at 180 DAP, with no mortality observed across T_0 (Control), T_1 (Vermicompost + Soil + Sand), T_2 (Coco peat + Soil + Sand), T_3 (Azospirillum + Soil + Sand), T_4 (Garden soil + Soil + Sand), T_5 (Ghanjeevamrit + Soil + Sand) and T_6 (Neem cake + Soil + Sand). This consistent 100% survival indicates *Aloe Vera*'s inherent resilience as a succulent, capable of withstanding diverse soil conditions due to its efficient water storage and drought-tolerant physiology. (Table 1) (Fig. 2).

Aloe Vera retain their greenness in arid environments and have a tremendous ability to adapt to climate change. These results are consistent with those of Wabuyel *et al*., (2008), who also found no effect of organic manures on the survival rate of *Aloe Vera* cultivars.

4. Conclusion

The study demonstrated that all growing media supported a 100% survival rate of *Aloe Vera* at 180 DAP. However, significant variations were observed in growth and quality parameters across treatments. Treatment T_1 consistently outperformed the others, exhibiting superior performance in the number of leaves plant^{-1}, plant height, leaf length, stem diameter and root length at 180 DAP. This indicates that the growing medium used in T_1 is the most suitable for optimizing both leaf and root growth, as well as quality attributes of *Aloe Vera*. In contrast, T_0 consistently recorded the lowest values across most parameters, suggesting it is the least effective medium. These findings provide valuable insights for selecting the optimal growing medium to enhance *Aloe Vera* cultivation for both growth and commercial gel production, aligning with the objective of identifying the best medium for growth and quality attributes.

References

1. Atiyeh RM, Subler S, Edwards CA, Bachman G, Metzger JD, Shuster W. Effects of vermicompost and composts on plant growth in horticultural container media and soil. Pedobiologia. 2000;44(5):579-590.
2. Blouin M, Barrere J, Meyer N, Lartigue S, Barot S, Mathieu J. Vermicompost significantly affects plant growth. A meta-analysis. Agron Sustain Dev. 2019;39(4):34.
3. Cannavo P, Herbreteau A, Juret D, Martin M, Guénon R. Short-term effects of food waste composts on physicochemical soil quality and horticultural crop production. J Plant Nutr Soil Sci. 2025;188(1):31-44.
4. Christaki EV, Florou-Paneri PC. *Aloe Vera*: a plant for many uses. J Food Agric Environ. 2010;8(2):245-249.
5. Dipin MN. Growth and Yield Analysis of *Aloe* (*Aloe Vera* L. Burm.f.) Under Different Organic Nutrient Regimes. M.Sc. Thesis, Kerala Agricultural University, Kerala; 2014. p.48.
6. Grunert O, Reheul D, Van Labeke MC, Perneel M, Hernandez-Sanabria E, Vlaeminck SE, Boon N. Growing media constituents determine the microbial nitrogen conversions in organic growing media for horticulture. Microb Biotechnol. 2016;9(3):389-399.
7. Hussain A, Iqbal K, Aziem S, Mahato P, Negi AK. A review on the science of growing crops without soil (soilless culture) - a novel alternative for growing crops. Int J Agric Crop Sci. 2014;7(11):833.
8. Joshi R, Singh J, Vig AP. Vermicompost as an effective organic fertilizer and biocontrol agent: effect on growth, yield and quality of plants. Environ Sci Biotechnol. 2015;14(1):137-159.
9. Manvitha K, Bidya B. *Aloe Vera*: A valuable wonder plant for food, medicine and cosmetic use - a review. J Pharmacogn Phytochem. 2014;2(5):85-88.
10. Moghaddasi S, Verma SK. *Aloe Vera* their chemicals composition and applications: A review. Int J Biol Med Res. 2011;2(1):466-471.
11. Neethi Manickam I, Subramanian P. Study of physical properties of coir pith. Int J Green Energy. 2006;3(4):397-406.
12. Nurhayati E. Meningkatkan keaktifan siswa dalam pembelajaran daring melalui media game edukasi quiziz pada masa pencegahan penyebaran covid-19. J Paedagogy. 2020;7(3):145-150.
13. Pathma J, Sakthivel N. Microbial diversity of vermicompost bacteria that exhibit useful agricultural traits and waste management potential. Springerplus. 2012;1(1):26.
14. Prabha ML, Jayaraaj IA, Jeyaraaj R, Rao S. Comparative studies on the digestive enzymes in the gut of earthworms, *Eudrilus eugeniae* and *Eisenia fetida*. Indian J Biotechnol. 2007;6(4):567.
15. Pushkarna M, Sharma RK, Meena RH, Choudhary J, Babu SR, Singh DP. Effect of Vermicompost and Ghanjeevamrit on Growth, Yield Attributes and Productivity of Maize (*Zea mays* L.). Int J Environ Agric Biotechnol. 2025;10(4):620071.
16. Putra M, Raksun A, Sedijani P. Effect of NPK Fertilizer and Vermicompost on The Vegetative Growth of Green Eggplant (*Solanum melongena* L.). J Biologi Tropics. 2025;25(1):199-210.
17. Rathod AH, Parmar SK. Reproductive Phenology and Floral Anatomy of *Aloe Vera*. Contemp Res Perspect Biol Sci. 2025;9:97-105.
18. Richardson P, Goings P, Markel B, Dixon J, Ahmad S, Albert, Clay K. Growth of beach-adapted plants in recycled glass sand compared to natural beach sand. J Plant Soil. 2025;1-18.

19. Saha R, Palit S, Ghosh BC, Mittra BN. Performance of *Aloe Vera* as influenced by organic and inorganic source of fertilizers supplied through fertigation. Conserv Cultiv Sustain Use MAPs. 2005;3(2):676.
20. Sarma BK, Singh P, Pandey SK, Singh HB. Vermicompost as modulator of plant growth and disease suppression. Dyn Soil Dyn Plant. 2010;4(1):58-66.
21. Saurabh JR, Ali S, Khandwe R. Impact of integrated nutrient management on growth and yield of okra [*Abelmoschus esculentus* (L.) Moench]. Int J Chem Stud. 2021;9(2):302-305.
22. Sukewijaya IM, Dwiyani R, Bimantara PO. Optimization of Growing Media to Support Microgreens Growth and Nutritional Profile. Agro Bali Agric J. 2025;8(1):102-113.
23. Sun W, Shahrajabian MH, Wang N. A study of the different strains of the genus *Azospirillum* spp. on increasing productivity and stress resilience in plants. J Plants. 2025;14(2):267.
24. Surjushe A, Vasani R, Saple D. *Aloe Vera*: a short review. Indian J Dermatol. 2008;53(4):163-166.
25. Tavali IE, Ok H. Comparison of Heat-Treated and Unheated Vermicompost on Biological Properties of Calcareous Soil and *Aloe Vera* Growth under Greenhouse Conditions in a Mediterranean Climate. J Agron. 2022;12(11):2649.
26. Wabuyele E, Kyalo S. Sustainable use of East African aloes: the case of commercial aloes in Kenya. In: Int Workshop Convention Int Trade Endanger Species Wild Fauna Flora. 2008;12(2):3.