



e-ISSN: 2456-6632

This content is available online at AESA

Archives of Agriculture and Environmental Science

Journal homepage: journals.aesacademy.org/index.php/aaes



ORIGINAL RESEARCH ARTICLE



Evaluation of different growing media on the growth and development of chilli (*Capsicum annuum* L.) seedlings in the mid-hill region of Nepal

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ARTICLE HISTORY

Received: 30 August 2025

Revised received: 06 November 2025

Accepted: 14 November 2025

Keywords

Chilli
CRD
Growing media
Nursery
Seedlings

ABSTRACT

The experiment evaluating different growing media on the growth and development of chilli (*Capsicum annuum* L.) seedlings in the mid-hill region of Nepal was conducted under polyhouse conditions using a Completely Randomized Design (CRD) with six treatments and four replications in Tehrathum district. The treatments included various combinations of organic and inert components, i.e. soil, FYM, cocopeat, vermicompost, poultry manure, vermiculite, and perlite in different ratios. Parameters recorded included germination percentage, plant height, stem diameter, number of leaves, root length, secondary root number, fresh weight, and dry weight at different growth stages. Results revealed significant differences among treatments for all parameters except for germination. All treatments demonstrated high and comparable germination rates, ranging from 92.66% to 96.66% with the highest germination recorded in T₂ (cocopeat + soil, 4:1) at 96.66% and the lowest in T₄ (vermicompost + poultry manure + soil, 1:1:2) at 92.66%. The combination of vermicompost + poultry manure + soil (1:2:1) i.e. T₄ produced the most vigorous seedlings, with maximum seedling height (18.65 cm), leaf numbers (9.46), stem diameter (0.38 cm), fresh weight (2.47 gm), dry weight (0.27 gm), root length (86.12 cm) and secondary root numbers (13.87). Seedlings grown in T₂ (Soil + cocopeat, 1:4) exhibited the poorest performance across all parameters, with significant differences at the 5% level of significance. The findings suggest that nutrient-rich organic growing media with proper aeration and moisture-holding capacity are optimal for nursery production of chilli in the mid-hill region of Nepal.

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Citation of this article: Dhungel, S., Parajuli, N., Chaudhary, B. K., & Karki, A. (2025). Evaluation of different growing media on the growth and development of chilli (*Capsicum annuum* L.) seedlings in the mid-hill region of Nepal. *Archives of Agriculture and Environmental Science*, 10(4), 625-632, <https://dx.doi.org/10.26832/24566632.2025.1004010>

INTRODUCTION

Chilli (*Capsicum annuum* L.) is the most common spice grown and used worldwide, which belongs to the family Solanaceae. The crop originated from the present-day Mexico (Kraft *et al.*, 2014), is widely famous as a spice crop for fresh consumption, salads, vegetables, pickles, and natural colour in foods (Poudyal *et al.*, 2023). It can be grown in a diverse soil range but is best suited to well-aerated and well-drained loamy soil rich in organic matter (Pandit *et al.*, 2020). The pH should range from 6 to 7 for chilli cultivation. As it cannot tolerate waterlogged conditions, the plantation should be done in well-draining soil or raised beds

(Rony *et al.*, 2023). Although perennial in nature, they are usually grown on an annual basis, and their fruit is harvested in one growing season. The crop grows well in tropical climates due to its adaptation in warm and humid regions with temperatures ranging from 18 to 30°C (Khaitov *et al.*, 2019). Chilli is suitable for Nepal's varied agroclimatic zones as it can adapt to elevations of up to 2,000 meters and thrive in tropical to sub-tropical climates. Despite being an economically important cash crop in Nepal, chilli production is constrained by poor seedling vigour and inconsistent nursery management practices. High-value crops like capsicum and chilli pepper are first raised in nurseries under controlled conditions to ensure high germi-

nation and healthy seedling growth (Baral et al., 2020). As the cultivation begins with transplanting nursery seedlings into the main field, healthy seedlings are of great importance for final establishment and overall performance of the crop. The expensive hybrid varieties of chilli are often grown in plug trays in a nursery under close observation to achieve healthy seedlings. Also, using plug trays avoids the chances of root damage due to uprooting from raised soil beds (Lohani et al., 2023). Seedling development is significantly impacted by seed sowing media and climatic conditions (Shakhidar et al., 2025). Using various growing media can facilitate both easy adaptation in the field and healthy growth in the nursery (Sterrett, 2001). Growing media include inorganic materials like clay, perlite, vermiculite, and mineral wool (Grunert et al., 2008), as well as organic materials like peat, compost, tree bark, coconut coir, and poultry feathers, and their mixes such as peat and perlite or peat and compost (Nair et al., 2011). Seed germination, seedling emergence, seedling growth, and seedling quality at the nursery stage are all directly impacted by growing media (Unal, 2019). Growing media is a source of plant nutrients as well as support to the root system through anchoring functioning by growing media (R et al., 2024). In the context of Nepal, Chilli is cultivated in all 77 districts covering around 9195 ha of land with 95,398 metric tons' annual production and 10.37 Mt/ha productivity (Bhattarai et al., 2023). While the global Chilli productivity ranges from 15-20 Mt/ha, Nepal witnesses lower productivity compared to the global average. In the Terhathum district of Nepal, the productivity of Chilli pepper is 5.07 Mt/ha (Teyung, 2024). In the mid-hills, production of chilli is hugely challenged by tough climatic conditions, soil types, pests and diseases. Traditional soil-based nurseries often found to result in seedlings of uneven quality, making them more vulnerable to transplant shock and diseases. Farmers lack a basic idea about the comparative effectiveness of various growing media and their composition. Thus, there is a lack of reliable information on which growing media are most effective under the local conditions in Terathum. For healthy and viable seedling production of chilli, it is necessary to evalu-

ate different nutrient media and their mixtures. This research will shed light on the effectiveness of the most appropriate and locally available growing media for nursery raising of chilli pepper, which evaluates the performance of growing seedlings based on different parameters, particularly within the Myanglung Municipality. The novelty of this research lies in it being the first of its kind research in Myanglung Municipality to scientifically evaluate different combinations of locally available organic and inorganic growing media for chilli seedlings under controlled polyhouse conditions. Thus, it addresses the research gap regarding the limited understanding of media effectiveness in the mid-hill region of Nepal. The findings of this research will provide data-driven recommendations to the local farmers regarding the most suitable growing media to adopt for nursery raising of chilli. This research will empower the local farmers with knowledge about the localized recommendations on growing media usage during the nursery raising of chilli. It can thus promote resource-efficient farming, reduce production cost, and enhance chilli productivity in this region. Furthermore, the findings of this research will serve as the baseline data for similar studies in future within Myanglung Municipality of Terathum district of Nepal. Overall, the study aims to improve transplanting success rates, increase seedling quality, and ultimately increase chilli productivity in the area by determining the best growing media in Myanglung Municipality of Terhathum, Nepal.

MATERIALS AND METHODS

Experimental site

The experiment was carried out in Myanglung Municipality ward number 02, which is located in Terhathum district (Latitude: 27.1333°N, Longitude: 87.5667° E). The municipality is situated at an elevation of about 1500 meters above sea level (Figure 1). It lies in mid mid-hill of Koshi Province of eastern Nepal (Nepal Guidify, 2025) and provides a suitable agro-climatic environment for chilli production. The period of the experiment was from February 26th, 2025 to April 28th, 2025.

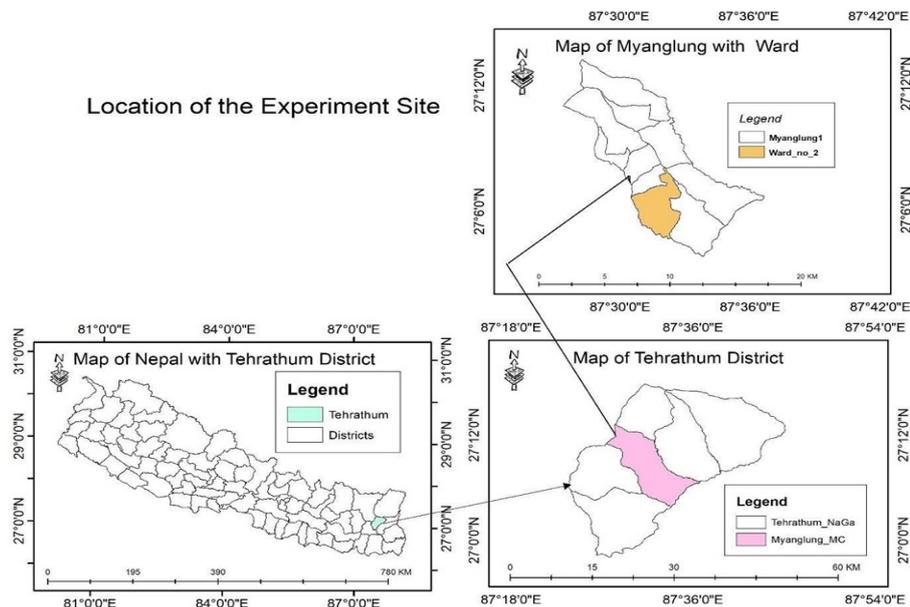


Figure 1. Location of experimentation site.

Table 1. Details of treatment.

Symbol	Treatment
T ₁	Soil (control)
T ₂	Soil + cocopeat (1:4)
T ₃	Soil + vermicompost + vermiculite (2:1:1)
T ₄	Soil + vermicompost + poultry manure (2:2:1)
T ₅	Soil + FYM + perlite (2:2:1)
T ₆	Soil + cocopeat + perlite (2:2:1)

Selected chilli variety for study

The hybrid variety named NS-1701 has been selected for this study. With its well-developed branching and tall, expansive plant growth, this premium hybrid produces an abundant yield (Bhattarai et al., 2023). When the fruits mature, their glossy green colour changes to a brilliant deep red. The fruits of this hybrid are characterized by their intense spiciness and measure between 7 and 12 centimeters in length with a girth of 0.8 centimeters. This hybrid is ideal for farmers seeking both fresh and dried chilli production under diverse climatic conditions.

Treatment details

Six treatments (Growing Media) were integrated into the study, as shown in Table 1.

Experimental design and layout

The experiment was carried out in a completely randomized design (CRD). There were six treatments and four replications. The experiment was carried out using 72 plug cell trays.

Nursery management practices

The prepared media were used to fill 72-cell plastic plug trays, with each tray accommodating two replications (30 cells per replication) and a separation buffer of 12 unfilled cells in the middle. Seeds of chilli (*Capsicum annum* L.) were sown at uniform depth across all treatments. The trays were labelled clearly according to treatment and randomly arranged in a polyhouse following a Completely Randomized Design (CRD). All activities were carried out specifically under a polyhouse to ensure uniformity and protection against external climatic fluctuations (Jalwania et al., 2025). After sowing, regular irrigation was performed using a fine rose watering can to maintain optimal moisture levels in the growing media without causing waterlogging or seed displacement. Regular monitoring of seedling trays was carried out, with observations made after germination of the plant. Weekly weeding was performed manually in and around the nursery area to reduce competition and maintain hygiene. No chemical inputs, such as fertilizers or pesticides, were applied, and sanitation prevented disease contamination. Uniform light and temperature exposure were maintained. Trays were labelled and randomly arranged per the experimental layout, with consistent care supporting healthy, uniform seedling development.

Observation and data collection

Throughout the experimental period, the seedlings were regularly observed for germination progress and growth characteristics. Visual inspection was carried out daily after sowing to record the onset of germination, morphological uniformity, and any signs of

physiological disorders. Germination counts were taken once the first seedling emergence was noted and continued until no further germination occurred. The study followed the standard formula described by the International Seed Testing Association (ISTA), i.e.

$$\text{Germination(\%)} = (\text{Number of seeds germinated}) / (\text{Total sown seed}) \times 100$$

Data collection began 10 days after the first germination, which was observed around 20 days after sowing, primarily due to low temperature and climatic conditions that delayed emergence. Observations were recorded at 30, 40, 50, and 60 days after sowing (DAS) to evaluate seedling growth and development under different growing media. Parameters assessed included plant height, stem diameter, number of leaves, number of secondary roots, root length, fresh weight, and dry weight.

Statistical analysis

The collected data were entered into Microsoft Excel 2021 Version, and the average values for each replication were calculated. The processed data were then exported to R-Studio Version 4.2.2, where statistical analysis was performed. Analysis of Variance (ANOVA) was used to determine the significance of differences among treatments. Duncan's Multiple Range Test (DMRT) was used for separating means and for comparison between treatments.

RESULTS AND DISCUSSION

Germination percentage

The analysis of germination percentage among different media (substrate) treatments revealed no statistically significant differences, as shown in Table 2. All treatments demonstrated high and comparable germination rates, ranging from 92.66% to 96.66%. The highest germination was recorded in T₂ at 96.66% followed by T₅ and T₆ with 94.58% and 94.16%, respectively. The lowest germination was recorded in T₄ at 92.66%. This high germination rate of Chilli across all treatments is an indication that variation in physical and chemical properties of media didn't hinder the metabolic activity of premium hybrid Chilli variety, i.e. NS-1701. Kaledzi et al. (2020) also found similar results where different growing media had no significant effect on the 50% germination of chilli seedlings. This is supported by Shakhidar et al. (2025) by who mentioned that growing media functioning as reservoirs of moisture and plant nutrients significantly increases seed germination. The slightly greater germination seen in cocopeat-containing media, i.e. T₂, can be related to the influence of organic matter-enriched media on seed emergence. This aligns with the findings of Sapkota et al. (2025), who found superior germination levels in growing media containing soil + FYM + coco peat.

Table 2. Effect of different growing media on the germination percentage of seedlings.

Treatment	Germination (%)
T ₁	93.58 ^a
T ₂	96.66 ^a
T ₃	93.33 ^a
T ₄	92.66 ^a
T ₅	94.58 ^a
T ₆	94.16 ^a
Grand Mean	94.16
LSD	10.82
F-Value	0.0169
Significance	ns
SEm (±)	1.47
CV (%)	7.83

Where, DAS: Days after Sowing, CV: Coefficient of variation, LSD: Least significant difference, Ns: Non-significant, *: Significant at 5% significance, **: Significant at 1% significance, ***: Significant at 0.1% significance, ns: non-significant and SEm: Standard error of mean.

Table 3. Effect of different growing media on the height of seedlings.

Treatment	Height 30 DAS (cm)	Height 40 DAS (cm)	Height 50 DAS (cm)	Height 60 DAS (cm)
T ₁	5.67 ^a	7.04 ^b	9.12 ^b	11.78 ^{bc}
T ₂	3.36 ^b	3.49 ^c	3.95 ^c	5.39 ^d
T ₃	5.67 ^a	6.71 ^b	8.65 ^b	10.79 ^{bc}
T ₄	5.53 ^a	9.04 ^a	12.87 ^a	18.65 ^a
T ₅	5.39 ^a	6.97 ^b	9.95 ^b	14.08 ^b
T ₆	3.71 ^b	3.73 ^c	5.24 ^c	8.27 ^{cd}
Grand Mean	4.89	6.16	8.30	11.49
LSD	0.54	1.23	1.43	3.94
F-Value	33.48	26.59	45.35	12.04
Significance	***	***	***	***
SEm (±)	0.21	0.43	0.64	0.99
CV (%)	7.47	13.49	11.61	23.11

Where, DAS: Days after Sowing, CV: Coefficient of variation, LSD: Least significant difference, Ns: Non-significant, *: Significant at 5% significance, **: Significant at 1% significance, ***: Significant at 0.1% significance, ns: non-significant and SEm: Standard error of mean.

Height of seedlings

Plant height was significantly influenced by the different growing media at all observation stages (30, 40, 50, and 60 DAS) at p -value = 0.000 < 0.001, as shown in Table 3. At 30 DAS, the greatest height was observed in T₁ (5.67 cm), which was statistically similar to T₃ (5.67 cm), T₄ (5.53 cm) and T₅ (5.39 cm). The lowest height was observed in T₂ (3.36 cm), which was statistically similar to T₆ (3.71 cm). At 40 DAS, the greatest height was found in T₄ (9.04 cm) and the lowest height was shown by T₂ (3.49 cm). T₄ exhibited the greatest height (12.87 cm) at 50 DAS, while T₂ (3.97 cm) showed the least height, which was statistically similar to T₆ (5.24 cm). At 60 DAS, the tallest seedlings were recorded in T₄ with an average height of 18.65 cm, which was significantly higher than all other treatments. This was followed by T₅ with 14.08 cm, which was at par with T₁ and T₃ with 11.78 and 10.79, respectively. The lowest plant height (5.39 cm) was recorded in T₂. During all stages, it was found that T₄ consistently exhibited superior height, while T₂ showed the poorest performance in height. The high quality of T₄ is explained by the high-quality sources of nutrients (vermicompost and poultry manure) that provide the required macronutrients, including nitrogen and phosphorus, which are important in the division and elongation of cells that underlie the growth of the shoot. The amendments are also organic and increase the soil microbi-

al activity, which promotes mineralization and bioavailability of nutrients (Ray et al., 2025). Similar results were obtained by Sapkota et al. (2025), where the highest seedling length was observed in growing media with soil and vermiculite mixture. Lohani et al. (2023) also found tallest seedlings were grown in Vermicompost + Vermiculite media. Lower inherent nutrient content can be attributed to lower seedling height in cocopeat-rich media (T₂ and T₆). Despite its great water retention and aeration capabilities, cocopeat needs to be supplemented with good nutrition to allow it to grow vigorous shoots (Wu et al., 2024).

Number of leaves

The number of leaves was also influenced by the different growing media at all observation stages (30, 40, 50, and 60 DAS) at p -value = 0.000 < 0.001, as shown in Table 4. At 30 DAS, maximum leaf numbers were observed in T₃ (1.93), which was statistically similar to T₁ (1.87) and T₅ (1.75). The least number of leaves was found in T₂ (0.00). Likewise, at 40 DAS, T₄ had the greatest number of leaves (4.31) and T₂ exhibited the least number of leaves (1.78), which was statistically similar to T₆ (1.91). T₄ showed the greatest leaf numbers (7.43) at 50 DAS, while the fewest numbers of leaves were observed in T₂ (2.21). At 60 DAS, significantly, a higher number of leaves (9.46) was observed when chilli seedlings were raised with T₄, which was at par with T₅ (7.97).

Table 4. Effect of different growing media on the number of leaves (L.N.) of the seedlings.

Treatment	LN 30 DAS	LN 40 DAS	LN 50 DAS	LN 60 DAS
T ₁	1.87 ^a	3.96 ^{ab}	5.46 ^{bc}	7.00 ^b
T ₂	0.000 ^c	1.78 ^c	2.21 ^e	2.9 ^d
T ₃	1.93 ^a	3.67 ^b	5.02 ^c	6.27 ^{bc}
T ₄	1.18 ^b	4.31 ^a	7.43 ^a	9.46 ^a
T ₅	1.75 ^a	4.02 ^{ab}	6.07 ^b	7.97 ^{ab}
T ₆	0.37 ^c	1.91 ^c	3.16 ^d	4.47 ^{cd}
Grand Mean	1.18	3.27	4.89	6.34
LSD	0.445	0.424	0.909	2.06
F-Value	30.48	62.006	39.25	11.61
Significance	***	***	***	***
SEm (±)	0.16	0.22	0.38	0.51
CV (%)	25.26	8.72	12.50	21.94

Where, DAS: Days after Sowing, CV: Coefficient of variation, LSD: Least significant difference, Ns: Non-significant, *: Significant at 5% significance, **: Significant at 1% significance, ***: Significant at 0.1% significance, ns: non-significant and SEm: Standard error of mean.

Table 5. Effect of different growing media on the stem diameter of the seedlings.

Treatment	Diameter 40 DAS (cm)	Diameter 50 DAS (cm)	Diameter 60 DAS (cm)
T ₁	0.29 ^a	0.30 ^b	0.33 ^b
T ₂	0.21 ^b	0.23 ^c	0.25 ^c
T ₃	0.29 ^a	0.31 ^b	0.32 ^b
T ₄	0.31 ^a	0.35 ^a	0.38 ^a
T ₅	0.29 ^a	0.30 ^b	0.36 ^{ab}
T ₆	0.21 ^b	0.23 ^c	0.28 ^c
Grand Mean	0.27	0.29	0.32
LSD	0.037	0.031	0.362
F-Value	12.47	18.97	16.30
Significance	***	***	***
SEm (±)	0.0096	0.0097	0.016
CV (%)	9.34	7.37	7.55

Where, DAS: Days after Sowing, CV: Coefficient of variation, LSD: Least significant difference, Ns: Non-significant, *: Significant at 5% significance, **: Significant at 1% significance, ***: Significant at 0.1% significance, ns: non-significant and SEm: Standard error of mean.

The lowest number of leaves (2.9) was observed when T₂ was used as the medium for raising chilli seedlings. Overall, T₄ consistently delivered a superior number of leaves at all stages except 30 DAS, while the least leaf number was consistently found in seedlings raised in T₂. The findings are supported by Mahala & Sharma (2022) who found that higher number of leaves was observed when treated with Vermiculite + Perlite + Vermicompost (1:1:2) and lowest number was observed when treated with Vermiculite + Perlite + cocopeat (1:1:2). Besides, Joshi *et al.* (2024) also reported that the maximum number of leaves (5.87) was recorded in Vermicompost + FYM and a minimum number of leaves (4.27) was recorded in the control treatment. The superior performance of organic-enriched substrates can be explained by the fact that they are better in terms of their physical and chemical characteristics, which increase nutrient assimilation and water retention. This supports Rekha *et al.* (2018), who emphasized organic amendments importance on stimulating leaf initiation by enhancing it. Root-zone conditions. The low nutrient content of T₂, which is mostly based on cocopeat, is reflected in its poor leaf performance since cocopeat primarily provides aeration and water retention capabilities but requires nutrient addition to sustain leaf growth.

Stem diameter

Stem diameter increased steadily over time and differed significantly among treatments at p-value = 0.000 < 0.001, as shown in

Table 5. At 40 DAS, seedlings raised in T₄ had the greatest stem diameter (0.31 cm), which was statistically similar to T₁ (0.29 cm), T₃ (0.29 cm) and T₅ (0.29 cm). The lowest stem diameter was observed in seedlings raised in T₆ (0.21 cm) and T₂ (0.21 cm), which were statistically similar to each other. At 50 DAS, T₄ again exhibited maximum stem diameter (0.35 cm) while T₂ (0.23 cm) and T₆ (0.23 cm) showed the least stem diameter, being statistically similar to each other. At 60 DAS, T₄ exhibited the maximum stem thickness (0.38 cm), which was at par with T₅ (0.36 cm). The lowest stem diameter (0.25 cm) was observed in T₂. Overall, seedlings raised in T₄ consistently showed superior stem diameter, while T₂ exhibited the least stem diameter at all stages. Similar result was obtained by Mahala & Sharma (2022), where higher seedling girth was seen when seedlings were grown in Vermiculite + Perlite + Vermicompost (1:1:2). These results are also in line with Mathowa *et al.* (2017) and Olatunji & Afolayan (2019), who discovered that organic-enriched substrates enhance the stem robustness by having better soil structure, water-holding capacity, and nutrient content. The high organic matter in T₄ and T₅ was probably involved in the release of nutrients and proper moisture balance, which helped to strengthen stem development. According to Atiyeh *et al.* (2001), vermicompost contains humic acids, nitrogen-fixing and phosphate-solubilizing bacteria, enzymes and other necessary plant growth promoters, vitamins, which might be attributed to its good performance, including stem diameter.

Table 6. Effect of different growing media on the fresh weight, dry weight, root length and secondary root number of the seedlings.

Treatment	Fresh Weight (gm)	Dry Weight (gm)	Secondary Root Numbers	Root Length
T ₁	1.08 ^b	0.10 ^{bc}	65.90 ^b	12.72 ^{ab}
T ₂	0.26 ^c	0.05 ^c	25.38 ^c	10.49 ^{bc}
T ₃	1.11 ^b	0.14 ^b	53.21 ^b	14.62 ^a
T ₄	2.47 ^a	0.27 ^a	86.12 ^a	13.87 ^a
T ₅	1.40 ^b	0.23 ^a	62.10 ^b	12.87 ^{ab}
T ₆	0.44 ^c	0.06 ^c	30.81 ^c	8.81 ^c
Grand Mean	1.12	0.14	53.92	12.22
LSD	0.474	0.064	13.87	2.65
F-Value	24.33	17.53	24.33	17.53
Significance	***	***	***	*
SEm (±)	0.16	0.019	4.65	0.52
CV (%)	28.27	30.09	17.31	14.61

Where, DAS: Days after Sowing, CV: Coefficient of variation, LSD: Least significant difference, Ns: Non-significant, *: Significant at 5% significance, **: Significant at 1% significance, ***: Significant at 0.1% significance, ns: non-significant and SEm: Standard error of mean.

Weight of seedlings

The data for fresh weight, presented in Table 6, revealed significant differences among the various treatments at p-value = 0.000 < 0.001. The maximum fresh weight (2.47 g) was observed in T₄. This was followed by T₅ (1.40 g), T₃ (1.11 gm) and T₁ (1.08 g), which were statistically similar to each other. In contrast, the minimum fresh weight (0.26g) was recorded in T₂, being statistically similar to T₆(0.44 g). Likewise, the data for dry weight, presented in Table 6, revealed a significant difference among the various treatments at p-value = 0.000 < 0.001. The maximum dry weight (0.27g) was observed in T₄, which was statistically similar to treatment (0.23g) in T₅. T₃ with 0.14 g followed this, which was at par with T₁ (0.10 g). In contrast, the minimum dry weight (0.05g) was recorded in T₂ and in T₆ was recorded (0.06gm), which were statistically similar to each other. It was found that seedlings raised in T₄ exhibited superior performance in both the fresh and dry weight, while seedlings raised in T₂ consistently showed the poorest performance in both parameters. In the context of fresh weight, Joshi et al. (2024) also reported that the maximum fresh weight of chilli seedlings was observed in the treatment (vermicompost + FYM). Also, the findings of Verma & Singh (2015) corroborate this study, which discovered that a blend of soil, vermicompost, and farm yard manure yielded the highest dry weight. The superior performance of T₄ is attributed to its efficient nutritional and moisture-retaining capacity. This is in agreement with the findings of Rekha et al. (2018) and Olatunji & Afolayan (2019), who stated that the biomass of seedlings is increased by organic amendments through improved nutrient availability and root development.

Root length and secondary root numbers

The data for secondary root number and root length presented in Table 6 revealed significant differences among the various treatments at p-value = 0.000 < 0.001 and at p-value = 0.000 < 0.05, respectively. The longest root length (14.62 cm) was recorded in T₃, which was statistically similar to T₄ (13.87 cm). Both T₃ and T₄ were at par with T₅ (12.87 cm) and T₁ (12.72 cm). This was followed by T₂ (10.49 cm). The shortest root length (8.81 cm) was observed in T₆. Regarding secondary root number, T₄ had the highest count (86.12). This was followed by T₁ (65.90), T₅ (62.10) and T₃ (53.21), which were statistically similar to each other. The lowest root count

(25.38) treatment was recorded as T₂, followed by T₆, which was (30.81). This result is supported by the findings of Uttekar et al. (2021), who found that growing media containing vermicompost led to the maximum length of the tap root. The production of the longest roots in vermicompost-containing media showed that the soil was in the best physical and nutritional condition. These are consistent with (Olaria et al., 2016), who reported an improved root and canopy growth on substrates with high organic content. The poor performance of T₂ and T₆ further supports the significance of balanced nutrient inputs in enhancing early seedling development. Hence, the maximum length of the tap root is related to enhanced soil porosity, water content, drainage, media permeability and water availability. The maximum number of adventitious roots (secondary root numbers) could be due to the good physical and biological conditions in vermicompost. This is attributed to its low pH of 4.0 and high abundance of micronutrients, namely iron, manganese, and zinc, which have been known to increase the growth of roots (Ingole et al., 2024).

Conclusion

This study evaluated the different growing media for chilli (*Capsicum annum* L.) seedling production under polyhouse conditions in the Myanglung municipality of the mid-hill region of Nepal. The study took place with the completely randomized design consisting of six treatments including various combinations of organic and inert components, i.e. soil, FYM, cocopeat, vermicompost, poultry manure, vermiculite, and perlite in different ratios. The findings suggested significant variation among the treatments, confirming that media composition has a significant influence on the growth and development of seedlings. The mixture of soil, vermicompost and poultry manure (2:2:1) consistently produced the most vigorous seedlings with the best height, leaf numbers, biomass, root, and shoot vigour. Although the media enriched with cocopeats, i.e. soil and cocopeat (1:4), enhanced germination and water retention, the lack of nutrients in such media led to the poorest performance of chilli seedlings among different observed parameters. The findings suggest that nutrient-rich organic growing media with proper aeration and moisture-holding capacity are optimal for nursery production of chilli in the mid-hill region of Nepal.

DECLARATIONS

Authors' contribution statement: Conceptualization, methodology: S.D., N.P., B.K.C. and A.K.; Software, validation: S.D. and N.P.; Investigation: S.D., N.P., B.K.C. and A.K.; Data curation: S.D. and N.P.; Writing-original draft preparation: S.D. and N.P.; Writing-review and editing: S.D. and N.P.; Supervision: S.D. All authors have read and agreed to the published version of the manuscript.

Conflicts of interest: The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

Ethics approval: This study did not involve any animal or human participant and thus ethical approval was not applicable.

Consent for publication: All co-authors gave their consent to publish this paper in AAES.

Data availability: The data that supports the findings of this study are available on request from the corresponding author.

Supplementary data: No supplementary data is available for the paper.

Funding statement: No external funding is received for this study.

Additional information: No additional information is available for this paper.

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