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INFLUENCE OF GROWING MEDIA ON EARLY SEEDLING GROWTH OF PAPAYA (*Carica papaya* L.) CV. RED LADY

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ABSTRACT

Papaya is a significant fruit crop cultivated in India mainly using seeds. The physical, chemical and biological characteristics of the growth medium have great significance in seed germination and the development of seedlings.The selection of the right growth medium is therefore necessary to produce healthy and strong papaya seedlings. This research study, entitled Influence of Growing media on Early seedling Growth of papaya (*Carica papaya* L.) cv. 'Red Lady' was carried out at the Horticulture Garden Farm, Bihar Agricultural University, Bhagalpur (Sabour) during 2021-2022. The experimental design was done using Completely Randomized Design (CRD) with twelve treatment combinations and three replications with each replication having fifteen seeds. The treatments were different media such as cocopeat, vermicompost, soil and cocopeat treated with 2% Multiplex.The best media among the evaluated media were that consisting of cocopeat treated with 2% Multiplex and vermicompost in 4:1 ratio (T_9). The seedling height for T_9 was found 2.49, 6.17, 8.03, 12.37,13.90 cm at 10, 20, 25, 35 and 40 DAS. T_9 also had the highest number of leaves which was 3.00, 5.00, 5.33, 7.67 and 8.33 at 10, 20, 25, 35 and 40 DAS, respectively. The diameter of seedlings was highest in T_9 0.84, 1.80, 2.56, 3.70 and 4.47 mm at 10, 20, 25, 35 and 40 DAS, respectively). T_9 also recorded the highest survival percentage (96.95%, 84.00% and 76.81% at 15, 30 and 45 DAS, respectively). On the other hand, pure cocopeat (T_1 2, control) recorded poor results regarding height, number of leaves and diameter of the seedlings .Indeed, treatment T_9 (cocopeat + 2% Multiplex + Vermicompost in 4:1) shows great potential as an ideal growth medium for healthy seedlings of papaya cv.Red Lady.

Key words : Vermicompost, Soil, Cocopeat, Multiplex, Red Lady.

Introduction

Papaya (*Carica papaya* L.) is a significant fruit crop of the tropics, which is often called papaw or pawpaw, and known to be highly nutritious as well as economically valuable. It is a fast-growing plant with a short life span and a perennial herb that can be grown both in gardens and orchards commercially. The plant is also used as filler material in orchards for young fruits. Papaya can start fruiting in about 8 to 10 months from transplanting under ideal environmental conditions. The cultivation of papaya through commercial production is predominantly dependent upon seeds, and seedling establishment is a significant component in nursery practices. There are various factors associated with the environment and substrate that affect germination and initial growth of seedlings, especially moisture, temperature, air circulation, sunlight, and properties of the growing media. In papaya plants, there could be an occurrence of poor germination that results in seedling establishment and nursery practices becoming challenging. Hossain *et al*. (2023) have proven that there is an impact of seed treatment and growing media on germination and seedling growth, and the media consisting of soil, cocopeat and vermicompost was favorable. The 'Red Lady' hybrid is extensively grown due to its desired fruit traits and good storage ability, in addition to its mainly hermaphroditic nature, which makes it easier for uniform fruit production. Because hybrid seeds are relatively costly, having a large number of vigorous seedlings from the seeds is essential. Effective germination and fast growth will help in reducing nursery

losses and giving healthier planting materials for orchards. Experiments conducted under varying nursery environments have shown that substrate type and growth stimulation techniques can significantly impact the performance of papaya seedlings (Kumawat and Topno, 2024; Rai *et al*., 2024; Pareek *et al*., 2025). Papaya seedlings grown in nurseries have their own set of issues that may include low plant establishment, damping off, and plant death. Factors such as overwatering, poor drainage, and insufficient aeration can negatively affect the root development and might even lead to root diseases. Likewise, soil that is compacted and has poor drainage will hinder the root development process and lower the vigor of the plants. Thus, the growing medium for papaya seedlings must be composed of elements that would provide a perfect combination of moisture holding capacity, drainage, aeration, and nutrient supply. Growing medium composition is essential for the development of papaya seedlings and their nutrient status (Sharma *et al*., 2024; Gurpreet *et al*., 2025). The growing medium is not just a physical support for seedlings but is also the immediate environment where roots grow. The physical and chemical nature of the growing medium determines water and nutrient availability, as well as the quality of the air and rooting environment, and all this affects plant growth. Previous research conducted by Bhardwaj (2013, 2014) has highlighted the significance of growing media in securing better germination and seedling growth in papaya. Recent research has also confirmed that appropriate combination of substrates may help to achieve better germination, seedling growth, and root development (Kumawat and Topno, 2024; Rai *et al*., 2024; Choudhary *et al*., 2025). A range of materials is used in nursery substrates, including soil, sand, cocopeat, farmyard manure and vermicompost. Soil provides a readily available and economical base, whereas sand can improve drainage and pore space. Organic materials contribute nutrients and may improve the physical and biological condition of the substrate. The response of papaya seedlings to different combinations of growing media and plant growth regulators was investigated by Pareek *et al*. (2025), while Sharma *et al*. (2024) demonstrated that variation in growing media could influence both seedling growth and leaf nutrient status.

Of the various organic amendments, vermicompost is especially beneficial in nursery mixtures since it provides nutrition and includes biologically active substances which might promote root and shoot growth. The addition of vermicompost could affect the water retention capacity, nutrient availability and microbial action of the growing mixture. Favorable growth of papaya seedlings in a soil+cocopeat+vermicompost medium was reported by Hossain *et al*. (2023). Similar advantages of vermicompost-added substrates in the development of papaya seedlings were found by Kumawat and Topno (2024), and Rai *et al*. (2024). Cocopeat, obtained as a by-product of coconut husk processing, is another widely used component of soilless and nursery substrates. Its relatively high water-holding capacity, porosity, low bulk density and good aeration make it suitable for raising young seedlings. These properties allow the medium to retain sufficient moisture while maintaining air-filled pore space around developing roots. Combining cocopeat with nutrient-rich organic materials such as vermicompost may therefore create a more favourable root-zone environment for germination and early seedling development. Positive responses of papaya seedlings to cocopeat-based substrates have been documented by Hossain *et al*. (2023), Gurpreet *et al*. (2025), Debnath *et al*. (2025) and Choudhary *et al*. (2025).

Impact of substrate constituents on the performance of papaya nursery has also been demonstrated through recent studies. For example, Debnath *et al*. (2025) observed significant variations in the germination and seedling growth of papaya when different soilless substrates were used while Gurpreet *et al*. (2025) noted the same when different growing medium combinations were used. In another study, Choudhary *et al*. (2025) studied the effects of various growing substrates on the germination and seedling growth of papaya cv. Red Lady-786. The incorporation of enriched substrates has been gaining popularity in recent research conducted in nurseries. For instance, Gupta *et al*. (2026) found that there was growth and vigor in papaya variety 'Red Lady' when cultivated in bio-enriched growing media such as increased plant height, girth of stem, number of leaves and root and shoot biomass. On the other hand, Kaur *et al*. (2026) also found that growing media had significant effects on germination, root development, growth and vigor of 'Red Lady' papaya. This shows that a balanced ratio of substrate components is very essential. Other than organic amendments, formulations of nutrients might serve as another means of providing the necessary nutrients for the early development of seedlings. Multiplex Mixture is one such multi-nutrient formulation that could help in supplying additional nutrients to the growing seedlings. If properly concentrated, such nutrient formulations might help in root and stem development, leaf formation, and generally enhance the vigor of the seedlings. The benefits of nursery substrates enriched with either nutrients or biological entities have been hinted at in the works of Pareek *et al*. (2025), Gupta *et al*.

(2026), and Kaur *et al*. (2026). The performance of papaya seedlings could also be influenced by the interaction between seed treatment and the growing environment created by the medium used. According to Hossain *et al*. (2023), there were favorable rates of germination, survival, and growth of seedlings when GA_3 seed treatment was combined with a soil+ cocopeat + vermicompost growing medium. Similarly, according to Kaur *et al*. (2026), there were significant interactions between GA_3 treatments and growing mediums for germination and seedling growth in the papaya variety 'Red Lady'. Though a number of growing media are available, yet there is a necessity to find such combinations which will provide optimal conditions for germination and growth of seedlings of papaya cultivar 'Red Lady'. Particularly, cocopeat, when used in combination with vermicompost along with some other nutrients, needs to be tested. Hence, the current experiment was conducted to test various growing-media combinations like those with Multiplex-coconut peat and vermicompost substrates for germination and early growth of papaya cv. 'Red Lady'.

Materials and Methods

Papaya seed germination and seedling growth studies were carried out in the year 2021-22 in Horticulture Garden farm, Bihar Agricultural University, Bhagalpur (Sabour). In Horticulture Garden farm (average temperature: 38± 5°C and RH: 60-70%) the treatments included twelve treatment combinations having different combinations. T_1 [Cocopeat + Vermicompost (4:1)], T_2 [Cocopeat + Vermicompost) (3:1)], T_3 [Cocopeat + Vermicompost (2:1)], T_4 [Cocopeat + Vermicompost (1:1)], T_5 [Cocopeat + Vermicompost + Soil (2:1:1)], T_6 [Cocopeat + Vermicompost+ Soil (2:1:2)], T_7[Cocopeat + Vermicompost + Soil (1:1:1)], T_8 [Cocopeat soak @ 2% Multiplex) , T_9 [Cocopeat soak @ 2% Multiplex +Vermicompost (4:1)], T_{10} [Cocopeat soak @ 2% Multiplex + Vermicompost (3:1)], T_{11} [Cocopeat soak @ 2% Multiplex + Vermicompost (1:1)] and T_{12} (Cocopeat (control).

Experimental design and measured parameters

Survival percentage (%) was calculated using following formula

$$\text{Survival percentage} = \frac{\text{Total number of survival seedling}}{\text{Total germination of seed}} \times 100$$

Stem diameter : A Vernier caliper was used to measure the stem diameter one centimeter (cm) above the stem's base.

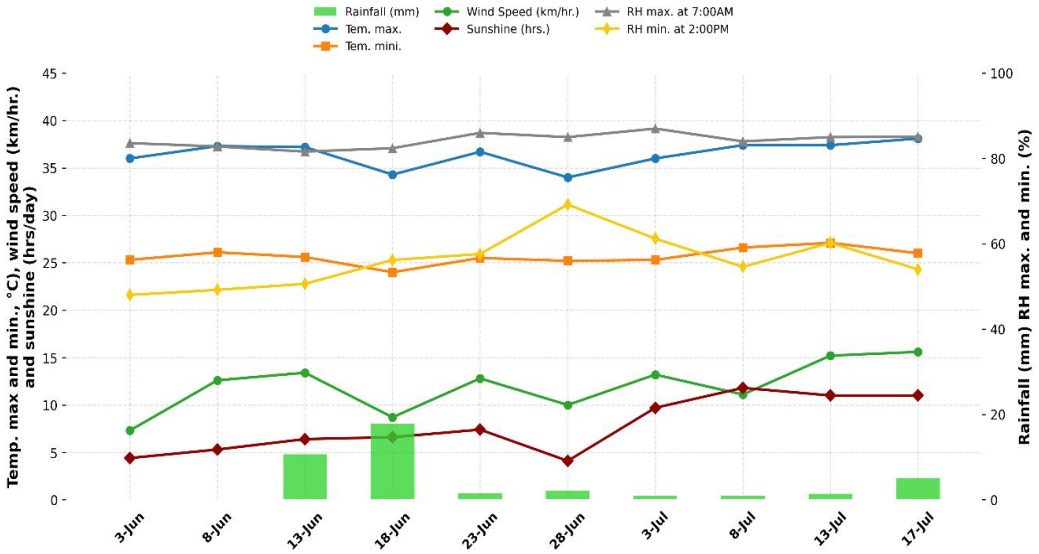
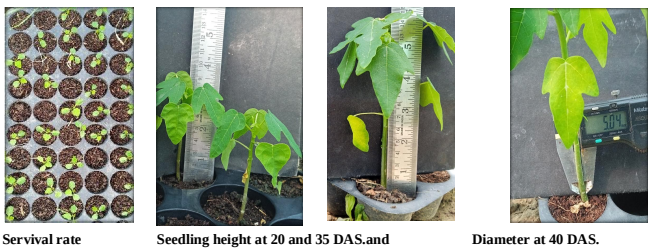


Fig. 1 : Graphical Presentation of weekly meteorological observation(Year 2022).



Servival rate | Seedling height at 20 and 35 DAS.and | Diameter at 40 DAS.

Fig. 2 : Effect of Growing Media on Seedling Survival Percentage, Height and Diameter of Papaya cv. 'Red Lady'.

Plant height : After carefully straightening the leaves, the height of the plant was measured in centimeters (cm) from the surface of the growing medium to the highest leaf tip.

Number of leaves per seedling

The number of leaves that developed from each seedling was recorded at days after sowing 10, 20, 25, 35 and 40 DAS. At each tagging point, the completely

expanded leaves in each seedling were counted manually. The observations that were recorded from each seedling were later on averaged to get the average number of leaves per seedling.

Statistical analysis

Analysis of Variance (ANOVA) appropriate for Completely Randomized Design (CRD) was conducted on the experimental data. The F-test was conducted at a 5% probability level to test the significance of variations among treatment means. Duncan's Multiple Range Test (DMRT) at P=0.05 was used for mean comparison, where treatments sharing the same superscript letter were statistically similar. Precision and variability of the experimental results were calculated using the coefficient of variation (CV%) and standard error of mean (SEm±). Statistical analysis was conducted using the OPSTAT statistical package

Results and Discussion

Number of leaves per seedling

Table 1 presents number of leaves per seedling with growing media treatments, an increase in leaves per seedlings was observed with the increase in seedlings age from 10 to 40 DAS. At 10 DAS, the number of leaves varied from 3.00, 5.00, 5.33, 7.67 and 8.33 leaves at 10, 20, 25, 35 and 40 DAS leaves in T_9. There were no significant differences in the number of leaves among the treatments. At 40 DAS, there was a significant treatment effect where the highest number of leaves was recorded in T_9 (8.33) as compared to T_1 and T_4 (8.00 each), while the lowest value was recorded in T_{12} (6.33). Leaf production observed under T_9 could possibly be attributed to the complementary effect of cocopeat, vermicompost and nutrient supplementation. This is because cocopeat offers favourable moisture retention and aeration properties while vermicompost provides the necessary nutrients and creates a suitable biological environment of the rooting medium, thus promoting root development and subsequently vegetative growth. Nutrient supplementation through Multiplex could also have further contributed to leaf formation and expansion. On the other hand, leaf production observed under T_{12} could be due to the lack of another nutrient source in addition to the sole application of cocopeat. Similar favourable effects of cocopeat and vermicompost combination on the growth of papaya seedlings have been reported by Hossain *et al*. (2023) and Kumawat and Topno (2024). Positive impact of vermicompost and other growth media ingredients on papaya seedlings' growth has been demonstrated by Rai *et al*. (2024) and Giri *et al*. (2023). Moreover, Kumari *et al*. (2026) and Pareek *et al*. (2025) have noted the importance of composition of growing media in determining the vigour and vegetative growth of seedlings, while Gupta *et al*. (2026) have reported better growth of Red Lady papaya seedlings through suitable combination of organic input and growing media.

Seedling height (cm)

Table 2 presents height of the seedling showed progressive increase from 10 to 40 days after sowing (DAS) in all treatments, which indicated continuous vegetative growth in relation to seedling age. Seedling

Table 1 : Effect of growing media on number of leaves per seedling of papaya cv. 'Red Lady'.

Treatments	10 DAS	20 DAS	25 DAS	35 DAS	40 DAS
T_1 Cocopeat + Vermicompost (4:1)	2.67^{a}	4.33^{a}	4.67^{a}	7.33^{a}	8.00^{ab}
T_2 Cocopeat + Vermicompost (3:1)	2.67^{a}	4.33^{a}	4.67^{a}	7.00^{a}	7.33^{abc}
T_3 Cocopeat + Vermicompost (2:1)	2.33^{a}	4.67^{a}	4.67^{a}	6.33^{a}	6.67^{bc}
T_4 Cocopeat + Vermicompost (1:1)	2.67^{a}	4.33^{a}	4.66^{a}	7.67^{a}	8.00^{ab}
T_5 Cocopeat + Vermicompost + Soil (2:1:1)	2.67^{a}	4.33^{a}	4.67^{a}	6.33^{a}	7.33^{abc}
T_6 Cocopeat + Vermicompost + Soil (2:1:2)	2.67^{a}	4.00^{a}	4.67^{a}	6.33^{a}	7.33^{abc}
T_7 Cocopeat + Vermicompost + Soil (1:1:1)	2.33^{a}	4.00^{a}	4.33^{a}	6.33^{a}	7.00^{abc}
T_8 Cocopeat soak @ 2% Multiplex	2.67^{a}	4.67^{a}	5.00^{a}	7.00^{a}	7.33^{abc}
T_9 Cocopeat soak @ 2% Multiplex + Vermicompost (4:1)	3.00^{a}	5.00^{a}	5.33^{a}	7.67^{a}	8.33^{a}
T_{10} Cocopeat soak @ 2% Multiplex + Vermicompost (3:1)	2.67^{a}	4.67^{a}	4.67^{a}	7.00^{a}	7.00^{abc}
T_{11} Cocopeat soak @ 2% Multiplex + Vermicompost (1:1)	2.67^{a}	4.33^{a}	4.33^{a}	6.33^{a}	6.67^{bc}
T_{12} Cocopeat (control)	2.03^{a}	3.40^{a}	4.03^{a}	6.00^{a}	6.33^{c}
SEm (±)	0.304	0.40	0.319	0.47	0.40
CV (%)	20.40	15.66	11.91	12.25	9.51

Note: Means followed by different superscript letters within a column differ significantly at P=0.05 by DMRT. N.S. = Non-significant.

Table 2 : Effect of growing media on seedling height (cm) of papaya cv. 'Red Lady'.

Treatments	10 DAS	20 DAS	25 DAS	35 DAS	40 DAS
T_1 Cocopeat + Vermicompost (4:1)	2.20^{ab}	5.45^{a}	6.96^{ab}	10.20^{bcde}	13.17^{abc}
T_2 Cocopeat + Vermicompost (3:1)	2.10^{ab}	5.20^{a}	7.23^{ab}	11.00^{abcd}	13.20^{abc}
T_3 Cocopeat + Vermicompost (2:1)	2.00^{b}	5.17^{a}	7.11^{ab}	10.57^{abcde}	12.20^{abcd}
T_4 Cocopeat + Vermicompost (1:1)	2.10^{ab}	5.47^{a}	6.89^{ab}	11.47^{abc}	13.47^{ab}
T_5 Cocopeat + Vermicompost + Soil (2:1:1)	1.90^{b}	5.07^{a}	7.22^{ab}	9.67^{cde}	11.37^{cde}
T_6 Cocopeat + Vermicompost + Soil (2:1:2)	1.91^{b}	4.87^{a}	6.67^{b}	10.03^{bcde}	11.40^{cde}
T_7 Cocopeat + Vermicompost + Soil (1:1:1)	1.80^{b}	4.64^{a}	6.43^{b}	9.10^{de}	10.23^{de}
T_8 Cocopeat soak @ 2% Multiplex	2.40^{ab}	5.83^{a}	7.28^{ab}	11.83^{ab}	13.50^{ab}
T_9 Cocopeat soak @ 2% Multiplex + Vermicompost (4:1)	2.49^{a}	6.17^{a}	8.03^{a}	12.37^{a}	13.90^{a}
T_{10} Cocopeat soak @ 2% Multiplex + Vermicompost (3:1)	2.41^{ab}	5.93^{a}	7.32^{ab}	12.00^{ab}	13.37^{abc}
T_{11} Cocopeat soak @ 2% Multiplex + Vermicompost (1:1)	2.00^{b}	4.93^{a}	7.10^{ab}	10.10^{bcde}	11.70^{bcde}
T_{12} Cocopeat (control)	1.60^{b}	4.30^{a}	6.24^{b}	8.70^{e}	10.10^{e}
SEm(±)	**0.10**	**0.21**	**0.30**	**0.50**	**0.48**
CV (%)	**8.21**	**6.85**	**7.35**	**8.19**	**6.75**

Note: Means followed by different superscript letters within a column differ significantly at P=0.05 by DMRT. N.S. = Non-significant.

Table 3 : Effect of growing media on seedling diameter at 10, 20, 25, 35 and 40 DAS.

Treatments	10 DAS	20 DAS	25 DAS	35 DAS	40 DAS
T_1 Cocopeat + Vermicompost (4:1)	0.72^{ab}	1.72^{a}	2.38^{ab}	3.40^{bcde}	3.95^{bc}
T_2 Cocopeat + Vermicompost (3:1)	0.71^{ab}	1.70^{a}	2.34^{ab}	3.33^{cde}	3.91^{bc}
T_3 Cocopeat + Vermicompost (2:1)	0.69^{ab}	1.68^{a}	2.31^{ab}	3.27^{cde}	3.78^{bcd}
T_4 Cocopeat + Vermicompost (1:1)	0.72^{ab}	1.74^{a}	2.39^{ab}	3.47^{abcd}	4.01^{bc}
T_5 Cocopeat + Vermicompost + Soil (2:1:1)	0.64^{b}	1.65^{a}	2.30^{ab}	3.17^{ef}	3.64^{cde}
T_6 Cocopeat + Vermicompost + Soil (2:1:2)	0.64^{b}	1.63^{a}	2.22^{b}	3.14^{ef}	3.50^{de}
T_7 Cocopeat + Vermicompost + Soil (1:1:1)	0.63^{b}	1.62^{a}	2.22^{b}	3.12^{ef}	3.49^{de}
T_8 Cocopeat soak @ 2% Multiplex	0.77^{ab}	1.76^{a}	2.42^{ab}	3.53^{abc}	4.04^{b}
T_9 Cocopeat soak @ 2% Multiplex + Vermicompost (4:1)	0.84^{a}	1.80^{a}	2.56^{a}	3.70^{a}	4.47^{a}
T_{10} Cocopeat soak @ 2% Multiplex + Vermicompost (3:1)	0.82^{a}	1.77^{a}	2.54^{a}	3.63^{ab}	4.44^{a}
T_{11} Cocopeat soak @ 2% Multiplex + Vermicompost (1:1)	0.67^{ab}	1.67^{a}	2.32^{ab}	3.21^{de}	3.66^{cde}
T_{12} Cocopeat (control)	0.62^{b}	1.60^{a}	2.19^{b}	2.90^{f}	3.30^{e}
SEm(±)	0.04	0.05	0.08	0.07	0.09
CV (%)	**9.61**	**5.32**	**5.88**	**3.58**	**4.16**

height was found to be the highest in 2.49, 6.17, 8.03, 12.37 and 13.90 cm, at 10, 20, 25, 35, and 40 DAS in treatment, however, there was statistical difference between the treatments. The consistently greater seedling height under T_9 may be attributed to the complementary effects of cocopeat, vermicompost and nutrient enrichment through Multiplex. Cocopeat provides favourable moisture retention and aeration, while vermicompost contributes nutrients and improves the physical and biological environment of the rooting medium. The additional nutrient supply from Multiplex may have further supported root development and shoot elongation, resulting in enhanced seedling growth. In contrast, the comparatively lower height under T_{12} may be associated with the absence of vermicompost and additional nutrient supplementation when cocopeat was used alone. Similar beneficial responses of papaya seedlings to suitable combinations of cocopeat, vermicompost and other substrate components have been reported by Bhardwaj (2013, 2014), Kumawat and Topno (2024), Rai *et al*. (2024), Debnath *et al*. (2025) and Singh *et al*. (2026). These findings suggest that an appropriate combination of moisture-retentive, aerating and nutrient-supplying components can create favourable conditions for root activity and subsequent shoot growth. Under the present experimental conditions, T_9 maintained a numerical advantage in seedling height from the early stages and showed particularly pronounced growth from 25 to 40 DAS.

Table 4 : Effect of growing media on Survival percentage at 15, 30 and 45 DAS.

Treatments	15 DAS	30 DAS	45 DAS
T_1 [Cocopeat + Vermicompost (4:1)]	86.67^{abc}	71.07^{bcde}	62.11^{de}
T_2 [Cocopeat + Vermicompost (3:1)]	91.24^{abc}	72.12^{bcde}	62.47^{cde}
T_3 [Cocopeat + Vermicompost (2:1)]	88.25^{abc}	70.20^{bcde}	59.88^{defg}
T_4 [Cocopeat + Vermicompost (1:1)]	87.24^{abc}	72.69^{bcd}	65.09^{cd}
T_5 [Cocopeat + Vermicompost + Soil (2:1:1)]	81.87^{c}	68.22^{cde}	58.95^{defg}
T_6 [Cocopeat + Vermicompost + Soil (2:1:2)]	91.55^{abc}	65.80^{de}	55.82^{efg}
T_7 [Cocopeat + Vermicompost + Soil (1:1:1)]	93.88^{ab}	62.00^{e}	52.99^{g}
T_8 [Cocopeat soaked with 2% Multiplex]	83.55^{bc}	78.44^{ab}	69.91^{abc}
T_9 [Cocopeat soaked with 2% Multiplex + Vermicompost (4:1)]	96.95^{a}	84.00^{a}	76.81^{c}
T_{10} [Cocopeat soaked with 2% Multiplex + Vermicompost (3:1)]	87.85^{abc}	79.39^{ab}	75.30^{ab}
T_{11} [Cocopeat soaked with 2% Multiplex + Vermicompost (1:1)]	90.95^{abc}	70.00^{bcde}	54.37^{fg}
T_{12} [Cocopeat (Control)]	83.43^{bc}	62.00^{e}	52.99^{g}
SEm(±)	**2.76**	**2.48**	**1.92**
CV (%)	**5.40**	**6.03**	**5.30**

Seedling diameter (mm)

Table 3 presents under all growing media treatments, seedling diameter gradually grew from 10 to 40 DAS. The maximum diameter was observed in T_9 treatment at 10, 20, 25, 35, and 40 DAS (0.84, 1.80, 2.56, 3.70, and 4.47 mm, respectively), while the lowest values were recorded for the same treatments in T_{12} (0.62, 1.60, 2.19, 2.90 and 3.30 mm, respectively). It is possible that the combined effects of cocopeat, vermicompost and Multiplex may have resulted in increased moisture retention, aeration and nutrients, hence promoting the development of roots and stems, thus leading to larger seedling diameter under T_9. The positive influence of the appropriate growing media mixtures on the development and seedling stem diameter of papaya seedlings was observed by Bishnoi *et al*. (2024), Kumawat and Topno (2024), Gurpreet *et al*. (2025), Debnath *et al*. (2025), Choudhary *et al*. (2025), Gupta *et al*. (2026), Kaur *et al*. (2026), Kumari *et al*. (2026), Abbas *et al*. (2026) and Rai *et al*. (2024). In particular, it was noted by Gupta *et al*. (2026) that the bio-enriched growth media positively affected stem girth, while Rochu *et al*. (2026) reported that the appropriate mixture of soil, FYM, vermicompost, and cocopeat positively affected seedling diameter. Similarly, Abbas *et al*. (2026) reported that nursery media containing cocopeat had a positive effect on the growth of papaya seedlings. The absence of vermicompost and extra nutrient application may explain the lower seedling diameter observed in T_1 2. Between days 10 and 40 after sowing, T_9 recorded the largest seedling diameter.

Survival (%)

Table 4 presents effect of growing media on percentage of survival of papaya seedlings was significant at 15, 30 and 45 DAS. The maximum survival percentage was found in T_9 [cocopeat soaked with 2% Multiplex + vermicompost (4:1)] at 15 DAS (96.95%), 30 DAS (84.00%) and 45 DAS (76.81%), while the minimum percentage of survival was observed in T_5 (81.87%) at 15 DAS, T_7 and T_{12} (62.00%) at 30 DAS, and T_{12} (52.99%) at 45 DAS. Superiority of T_9 could be due to good moisture holding capacity, aeration, nutrient supply and conditions of root zone provided by cocopeat and vermicompost as well as extra nutrients by Multiplex. Similar results of positive impact of suitable growing media on percentage of survival of papaya seedlings have been reported by Abirami *et al*. (2010), Bhardwaj (2013).

Conclusion

The results demonstrated that growing different media markedly influenced the growth, development and survival of papaya seedlings. Among the treatments, T_9 [cocopeat soaked with 2% Multiplex + vermicompost (4:1)] generally recorded superior seedling height and diameter at 10, 20, 25, 35 and 40 DAS, along with the highest number of leaves at 40 DAS. T_9 also recorded the highest survival percentage at 15, 30 and 45 DAS (96.95, 84.00 and 76.81%, respectively). In contrast, T_{12} (cocopeat alone) generally showed comparatively lower growth and survival.

The superior performance of T_9 may be attributed to improved moisture retention, aeration and nutrient availability due to the combined effects of cocopeat, vermicompost and Multiplex, which favoured root development, nutrient uptake and seedling establishment. Thus, T_9 showed considerable potential as a suitable

growing medium for producing vigorous and healthy papaya seedlings of cv. Red Lady.

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Conflict of interest

The authors declare that they have no conflict of interest.

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