International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(12): 1359-1365
www.biochemjournal.com
Received: 09-10-2025
Accepted: 11-11-2025

Tushar Yadav
PG Student, Department of Fruit Science, CHRS, Mahatma Gandhi University of Horticulture & Forestry, Durg, Chhattisgarh, India

Dr. Purnendra Kumar Sahu
Assistant Professor, Department of Fruit Science, CHRS, Mahatma Gandhi University of Horticulture & Forestry, Durg, Chhattisgarh, India

Dr. Johnson Lakra
Assistant Professor, Department of Fruit Science, CHRS, Mahatma Gandhi University of Horticulture & Forestry, Durg, Chhattisgarh, India

Parmeshwar Gore
Assistant Professor, Department of Entomology, CHRS, Mahatma Gandhi University of Horticulture & Forestry, Durg, Chhattisgarh, India

Dr. Richa Sao
Assistant Professor, Department of Genetics & Plant Breeding, CHRS, Mahatma Gandhi University of Horticulture & Forestry, Durg, Chhattisgarh, India

Corresponding Author:
Tushar Yadav
PG Student, Department of Fruit Science, CHRS, Mahatma Gandhi University of Horticulture & Forestry, Durg, Chhattisgarh, India

Effect of different growing media on seed germination of papaya in Bemetara district of Chhattisgarh

Tushar Yadav, Purnendra Kumar Sahu, Johnson Lakra, Parmeshwar Gore and Richa Sao

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i12Sp.6716

Abstract
Papaya (*Carica papaya* L.) is an important tropical fruit crop; however, its commercial nursery production is often limited by slow, uneven and poor seed germination. Seed germination in papaya is influenced by the physical, chemical and biological properties of the growing medium. Therefore, the present study was undertaken to evaluate the effect of different growing media on seed germination of papaya under the agro-climatic conditions of Bemetara district of Chhattisgarh. The experiment was conducted during 2024-25 at the Horticulture Research Farm, College of Horticulture and Research Station, Saja, Bemetara (C.G.). The experiment was laid out in a Completely Randomized Design with ten treatments and three replications, comprising various combinations of garden soil, sand, farmyard manure (FYM), vermicompost and cocopeat. Observations were recorded on seed germination parameters including days taken to start germination, rate of emergence, germination percentage, germination index, seedling vigour index-I and seedling vigour index-II. The results revealed significant differences among the growing media for all germination parameters studied. Among the treatments, vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (T_9) recorded the earliest initiation of germination (6.07 days), highest rate of emergence (249.29%), maximum germination percentage (94.78%) and superior germination index (4.25). Treatments containing vermicompost or FYM with cocopeat topping consistently performed better than sand or garden soil alone. The lowest germination performance was observed under garden soil without any organic amendment. The enhanced germination under vermicompost and cocopeat-based media may be attributed to improved moisture retention, aeration, nutrient availability and favourable microbial activity, which collectively promoted rapid and uniform seed germination. The study concludes that vermicompost-based growing media supplemented with cocopeat are highly effective for improving seed germination of papaya in nursery conditions.

Keywords: Papaya (*Carica papaya* L.), seed germination, growing media, vermicompost, cocopeat, rate of emergence

Introduction
Papaya (*Carica papaya* L.) is an important tropical fruit crop widely cultivated in India due to its high productivity, nutritional value and economic importance. In India, papaya occupies a significant share of fruit production, with major growing states including Andhra Pradesh, Maharashtra, Gujarat, Karnataka, Tamil Nadu and Chhattisgarh (Anonymous, 2023; Kumari *et al.*, 2024) [1 6]. Papaya fruits are rich sources of vitamins, minerals, antioxidants and dietary fibre, making them valuable for human nutrition and health (Dash *et al.*, 2019) [4]. Papaya is predominantly propagated through seeds; however, seed germination is often slow, uneven and associated with poor seedling survival. The presence of a gelatinous sarcotesta, rapid loss of seed viability and susceptibility to soil-borne diseases adversely affect germination and nursery establishment (Bhardwaj, 1988; Bhagat *et al.*, 2013) [3, 2]. Growing media play a crucial role in determining seed germination, root development and overall seedling vigour by influencing moisture retention, aeration, nutrient availability and microbial activity (Singh *et al.*, 2009) [8].

Organic components such as farmyard manure, vermicompost and cocopeat have been reported to improve physical and chemical properties of nursery media, thereby enhancing germination and seedling growth in papaya (Patel *et al.*, 2025) [7].

Therefore, identifying an appropriate growing media combination is essential for producing healthy and vigorous papaya seedlings.

Materials and Methods

The experiment was conducted during 2024-25 at the Horticulture Research Farm, College of Horticulture and Research Station, Saja, Bemetara (Chhattisgarh), to study the effect of different growing media on seed germination and seedling growth of papaya (*Carica papaya* L.). The experiment was laid out in a Completely Randomized Design (CRD) with ten treatments and three replications. Different growing media combinations consisting of garden soil, sand, farmyard manure (FYM), vermicompost and cocopeat were evaluated. Papaya seeds were sown in polybags filled with respective media combinations and two seeds were dibbled per bag at a depth of 2-3 cm. Standard nursery practices including irrigation and plant protection measures were followed uniformly. Observations on seed germination parameters such as days to first germination, germination percentage, rate of emergence, germination index and seedling vigour indices were recorded. Seedling growth parameters including shoot length, number of leaves, stem girth, seedling length, fresh and dry weights of shoot and root and survival percentage were measured and statistically analyzed using analysis of variance (ANOVA) as per Gomez and Gomez (1984) [5].

Results and Discussions

1. Days taken to start germination

The data presented in Table 1 and Fig. 1 showed the effect of different growing media on days taken to start germination of papaya. Results revealed that the earliest germination was recorded in T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (6.07 days), which was statistically at par with T_8-Vermicompost + sand + garden soil (1:1:1) with 2 cm cocopeat (6.13 days) and T_6-FYM + sand + garden soil (1:1:1) with 3 cm cocopeat (6.22 days). These treatments significantly outperformed the rest of the growing media. The next best performance was observed in T_5-FYM + sand + garden soil (1:1:1) with 2 cm cocopeat (6.29 days), followed by T_7-Vermicompost + sand + garden soil (1:1:1) without cocopeat (6.92 days) and T_4-FYM + sand + garden soil (1:1:1) without cocopeat (6.98 days), which were statistically comparable among themselves but significantly superior to the other treatments. Further, T_3-Sand + garden soil (1:1) with 3 cm cocopeat (7.05 days), T_2-Sand + garden soil (1:1) with 2 cm cocopeat (7.18 days) and T_1-Sand + garden soil (1:1) without cocopeat (7.77 days) recorded delayed germination compared to the organic media combinations. The maximum days taken to start germination (8.33 days) were recorded in T_0-Garden soil alone, which was significantly inferior to all other treatments.

The superior performance under T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat may be attributed to the synergistic effect of vermicompost and cocopeat in improving soil aeration, moisture retention and nutrient availability. Vermicompost enriches the growing medium with beneficial microorganisms, enzymes and humic substances, while cocopeat enhances the water-holding capacity and maintains favorable conditions for seed imbibition and metabolic activation, leading to rapid and uniform germination. These results are in accordance with the findings of Kumari *et al.* (2024) [6] and Patel *et al.* (2025) [7], who also reported early and improved germination in papaya and other fruit crops under growing media enriched with vermicompost and cocopeat.

2. Rate of emergence (%)

The data presented in Table 2 and Fig. 2 showed the effect of different growing media on the rate of emergence (%) of papaya. Results revealed that the maximum rate of emergence was recorded in T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (249.29%), which was statistically at par with T_8-Vermicompost + sand + garden soil (1:1:1) with 2 cm cocopeat (245.75%) and T_6-FYM + sand + garden soil (1:1:1) with 3 cm cocopeat (242.04%). These treatments significantly outperformed all other growing media combinations. The next best performance was observed in T_5-FYM + sand + garden soil (1:1:1) with 2 cm cocopeat (238.55%), followed by T_7-Vermicompost + sand + garden soil (1:1:1) without cocopeat (224.13%) and T_4-FYM + sand + garden soil (1:1:1) without cocopeat (221.23%), which were statistically comparable among themselves and significantly superior over other treatments. Further, T_3-Sand + garden soil (1:1) with 3 cm cocopeat (215.72%) and T_2-Sand + garden soil (1:1) with 2 cm cocopeat (211.82%) recorded moderate emergence rates, while T_1-Sand + garden soil (1:1) without cocopeat (193.50%) and T_0-Garden soil alone (166.19%) registered the lowest rate of emergence, being significantly inferior to all other treatments.

The superior rate of emergence under T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat may be attributed to the synergistic effect of vermicompost and cocopeat in improving physical, chemical and biological properties of the growing medium. Vermicompost enhances nutrient availability and microbial activity, while cocopeat maintains optimum moisture and aeration, creating a favorable environment for seed germination and seedling emergence. This combination likely improved seed-soil contact, oxygen diffusion and enzymatic activity, resulting in better seedling vigor and emergence percentage. These findings are in close agreement with the reports of Kumari *et al.* (2024) [6] and Patel *et al.* (2025) [7], who observed enhanced germination and seedling growth in papaya and other fruit crops using media enriched with vermicompost and cocopeat.

3. Germination (%)

The data presented in Table 3 and Fig. 3 showed the effect of different growing media on germination percentage of papaya. Results revealed that the maximum germination was recorded in T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (94.78%), which was statistically at par with T_8-Vermicompost + sand + garden soil (1:1:1) with 2 cm cocopeat (93.94%) and T_6-FYM + sand + garden soil (1:1:1) with 3 cm cocopeat (93.12%). These treatments significantly outperformed all other growing media combinations. The next best performance was observed in T_5-FYM + sand + garden soil (1:1:1) with 2 cm cocopeat (92.31%), followed by T_7-Vermicompost + sand + garden soil (1:1:1) without cocopeat (89.68%) and T_4-FYM + sand + garden soil (1:1:1) without cocopeat (88.98%), which were statistically comparable among themselves and significantly superior over the remaining treatments. Further, T_3-Sand + garden soil (1:1) with 3 cm cocopeat

(88.54%) and T_2-Sand + garden soil (1:1) with 2 cm cocopeat (87.69%) recorded moderate germination percentages, while T_1-Sand + garden soil (1:1) without cocopeat (84.52%) and T_0-Garden soil alone (81.35%) were the lowest, being significantly inferior to all other treatments.

The superior germination percentage under T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat may be attributed to the combined effect of vermicompost and cocopeat in improving the physical, chemical and biological properties of the growing medium. Vermicompost enhances nutrient availability, microbial activity and humic substances, while cocopeat improves moisture retention, aeration and seed-soil contact, thereby stimulating enzymatic activity and seedling vigor. This synergistic action resulted in rapid and uniform germination. These findings corroborate earlier reports that enriched growing media with organic amendments and cocopeat enhance seed germination and seedling establishment in papaya and other fruit crops. Similar findings were reported by Kumari *et al.* (2024) [6] and Patel *et al.* (2025) [7].

4. Germination index (%)

The data presented in Table 4 and Fig. 4 reveal that the germination index of papaya was significantly influenced by different growing media involving combinations of garden soil, sand, FYM, vermicompost and cocopeat. A consistent improvement in germination index was observed with the incorporation of organic amendments and cocopeat compared to garden soil alone.

Among the treatments, the maximum germination index was recorded in T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (4.25%), which was statistically superior to all other treatments. This was closely followed by T_8-Vermicompost + sand + garden soil (1:1:1) with 2 cm cocopeat (4.15%) and T_6-FYM + sand + garden soil (1:1:1) with 3 cm cocopeat (4.01%). These treatments showed a significant increase in germination index over their respective sole organic amendments without cocopeat. Moderate germination index values were observed in T_5-FYM + sand + garden soil (1:1:1) with 2 cm cocopeat (3.94%), T_7-Vermicompost + sand + garden soil (1:1:1) without cocopeat (3.62%) and T_4-FYM + sand + garden soil (1:1:1) without cocopeat (3.58%), which were significantly higher compared to T_3-Sand + garden soil (1:1) with 3 cm cocopeat (3.55%), T_2-Sand + garden soil (1:1) with 2 cm cocopeat (3.50%), T_1-Sand + garden soil (1:1) without cocopeat (3.30%) and the lowest T_0-Garden soil alone (2.10%).

The superior performance of T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat may be attributed to the synergistic effect of vermicompost in enhancing nutrient availability, microbial activity and enzymatic stimulation, along with cocopeat, which improves moisture retention, aeration, and seed-soil contact. This combination resulted in accelerated metabolic activity, uniform germination, and higher seedling vigor. These results are in accordance with the findings of Kumari *et al.* (2024) [6] and Patel *et al.* (2025) [7].

5. Seedling vigour index-I (%)

Table 5 and Fig. 5 present the data on seedling vigour index-I (%) of papaya under different growing media. Results revealed that the maximum seedling vigour was recorded in T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (83.16%), which was statistically superior over all other treatments. The next best performance was noted in T_8-Vermicompost + sand + garden soil (1:1:1) with 2 cm cocopeat (82.24%) and T_6-FYM + sand + garden soil (1:1:1) with 3 cm cocopeat (82.23%), which were at par with each other. Moderate values were observed in T_5-FYM + sand + garden soil (1:1:1) with 2 cm cocopeat (81.64%), T_7-Vermicompost + sand + garden soil (1:1:1) without cocopeat (79.80%) and T_4-FYM + sand + garden soil (1:1:1) without cocopeat (79.35%), which were significantly superior to T_3-Sand + garden soil (1:1) with 3 cm cocopeat (79.05%), T_2-Sand + garden soil (1:1) with 2 cm cocopeat (78.47%), T_1-Sand + garden soil (1:1) without cocopeat (76.03%) and the lowest T_0-Garden soil alone (58.16%).

The higher seedling vigour under T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat may be attributed to the synergistic effect of vermicompost in improving nutrient availability, microbial activity and metabolic stimulation, along with cocopeat, which enhances moisture retention, aeration, and root-soil contact. This combination promoted better root and shoot development, enzymatic activity and overall seedling growth, resulting in superior vigour index. These findings are in agreement with the reports of Kumari *et al.* (2024) [6] and Patel *et al.* (2025) [7], who observed enhanced seedling vigour in papaya and other fruit crops under enriched growing media.

6. Seedling vigour index-II (%)

The data presented in Fig. 5 and Table 5 showed that the seedling vigour index-II (%) of papaya was significantly influenced by different growing media. Results revealed that the maximum seedling vigour was recorded in T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (88.15%), which was statistically superior to all other treatments. The next best performance was observed in T_8-Vermicompost + sand + garden soil (1:1:1) with 2 cm cocopeat (87.18%) and T_6-FYM + sand + garden soil (1:1:1) with 3 cm cocopeat (87.17%), which were at par with each other. These treatments were significantly higher than T_5-FYM + sand + garden soil (1:1:1) with 2 cm cocopeat (86.54%) and T_7-Vermicompost + sand + garden soil (1:1:1) without cocopeat (84.59%), followed by T_4-FYM + sand + garden soil (1:1:1) without cocopeat (84.11%), T_3-Sand + garden soil (1:1) with 3 cm cocopeat (83.80%), T_2-Sand + garden soil (1:1) with 2 cm cocopeat (83.18%), T_1-Sand + garden soil (1:1) without cocopeat (80.59%) and the lowest T_0-Garden soil alone (61.65%).

The superior seedling vigour under T_9-Vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat may be attributed to the combined effect of vermicompost in enhancing nutrient availability, microbial activity and metabolic stimulation, along with cocopeat improving moisture retention, aeration, and root-soil contact. This combination promoted better root and shoot growth, increased photosynthate assimilation and overall biomass accumulation, resulting in enhanced seedling vigour index-II. Similar beneficial effects of enriched growing media on seedling vigour have been reported by Kumari *et al.* (2024) [6] and Patel *et al.* (2025) [7].

Table 1: Effect of different growing media on days taken to start germination of papaya

Treatment details	Days taken to start germination
T_0-Garden soil	8.33
T_1-Sand + Garden soil (1:1) without cocopeat	7.77
T_2-Sand + Garden soil (1:1) with 2cm cocopeat	7.18
T_3-Sand + Garden soil (1:1) with 3cm cocopeat	7.05
T_4-FYM (Farm Yard Manure) + sand + Garden soil (1:1:1) without cocopeat	6.98
T_5-FYM + sand + Garden soil (1:1:1) with 2cm cocopeat	6.29
T_6-FYM + sand + Garden soil (1:1:1) with 3cm cocopeat	6.22
T_7-Vermicompost + sand + Garden soil (1:1:1) without cocopeat	6.92
T_8-Vermicompost + sand + Garden soil (1:1:1) with 2cm cocopeat	6.13
T_9-Vermicompost + sand + Garden soil (1:1:1) with 3cm cocopeat	6.07
SEm (±)	0.16
CD (5%)	0.48
CV (5%)	4.09

Table 2: Effect of different growing media on rate of emergence (%) of papaya

Treatment details	Rate of emergence (%)
T_0-Garden soil	166.19
T_1-Sand + Garden soil (1:1) without cocopeat	193.50
T_2-Sand + Garden soil (1:1) with 2cm cocopeat	211.82
T_3-Sand + Garden soil (1:1) with 3cm cocopeat	215.72
T_4-FYM (Farm Yard Manure) + sand + Garden soil (1:1:1) without cocopeat	221.23
T_5-FYM + sand + Garden soil (1:1:1) with 2cm cocopeat	238.55
T_6-FYM + sand + Garden soil (1:1:1) with 3cm cocopeat	242.04
T_7-Vermicompost + sand + Garden soil (1:1:1) without cocopeat	224.13
T_8-Vermicompost + sand + Garden soil (1:1:1) with 2cm cocopeat	245.75
T_9-Vermicompost + sand + Garden soil (1:1:1) with 3cm cocopeat	249.29
SEm (±)	2.18
CD (5%)	6.45
CV (5%)	4.71

Table 3: Effect of different growing media on germination (%) of papaya

Treatment details	Germination (%)
T_0-Garden soil	81.35
T_1-Sand + Garden soil (1:1) without cocopeat	84.52
T_2-Sand + Garden soil (1:1) with 2cm cocopeat	87.69
T_3-Sand + Garden soil (1:1) with 3cm cocopeat	88.54
T_4-FYM (Farm Yard Manure) + sand + Garden soil (1:1:1) without cocopeat	88.98
T_5-FYM + sand + Garden soil (1:1:1) with 2cm cocopeat	92.31
T_6-FYM + sand + Garden soil (1:1:1) with 3cm cocopeat	93.12
T_7-Vermicompost + sand + Garden soil (1:1:1) without cocopeat	89.68
T_8-Vermicompost + sand + Garden soil (1:1:1) with 2cm cocopeat	93.94
T_9-Vermicompost + sand + Garden soil (1:1:1) with 3cm cocopeat	94.78
SEm (±)	1.02
CD (5%)	2.98
CV (5%)	3.95

Table 4: Effect of different growing media on germination index (%) of papaya

Treatment details	Germination index (%)
T_0-Garden soil	2.10
T_1-Sand + Garden soil (1:1) without cocopeat	3.30
T_2-Sand + Garden soil (1:1) with 2cm cocopeat	3.50
T_3-Sand + Garden soil (1:1) with 3cm cocopeat	3.55
T_4-FYM (Farm Yard Manure) + sand + Garden soil (1:1:1) without cocopeat	3.58
T_5-FYM + sand + Garden soil (1:1:1) with 2cm cocopeat	3.94
T_6-FYM + sand + Garden soil (1:1:1) with 3cm cocopeat	4.01
T_7-Vermicompost + sand + Garden soil (1:1:1) without cocopeat	3.62
T_8-Vermicompost + sand + Garden soil (1:1:1) with 2cm cocopeat	4.15
T_9-Vermicompost + sand + Garden soil (1:1:1) with 3cm cocopeat	4.25
SEm (±)	0.11
CD (5%)	0.32
CV (5%)	5.22

Table 5: Effect of different growing media on seedling vigour index-I (%) and seedling vigour index-II (%) of papaya

Treatment details	Seedling vigour index-I (%)	Seedling vigour index-II (%)
T_0-Garden soil	58.16	61.65
T_1-Sand + Garden soil (1:1) without cocopeat	76.03	80.59
T_2-Sand + Garden soil (1:1) with 2cm cocopeat	78.47	83.18
T_3-Sand + Garden soil (1:1) with 3cm cocopeat	79.05	83.80
T_4-FYM (Farm Yard Manure) + sand + Garden soil (1:1:1) without cocopeat	79.35	84.11
T_5-FYM + sand + Garden soil (1:1:1) with 2cm cocopeat	81.64	86.54
T_6-FYM + sand + Garden soil (1:1:1) with 3cm cocopeat	82.23	87.17
T_7-Vermicompost + sand + Garden soil (1:1:1) without cocopeat	79.80	84.59
T_8-Vermicompost + sand + Garden soil (1:1:1) with 2cm cocopeat	82.24	87.18
T_9-Vermicompost + sand + Garden soil (1:1:1) with 3cm cocopeat	83.16	88.15
SEm (±)	0.92	1.18
CD (5%)	2.73	3.48
CV (5%)	4.05	4.47

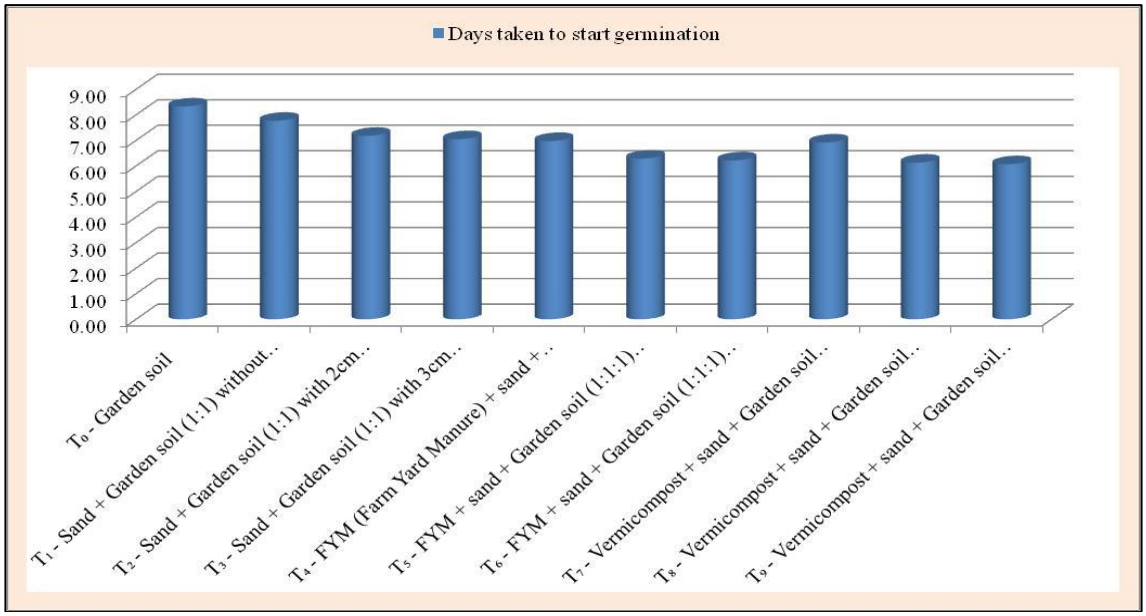

Fig 1: Effect of different growing media on days taken to start germination of papaya

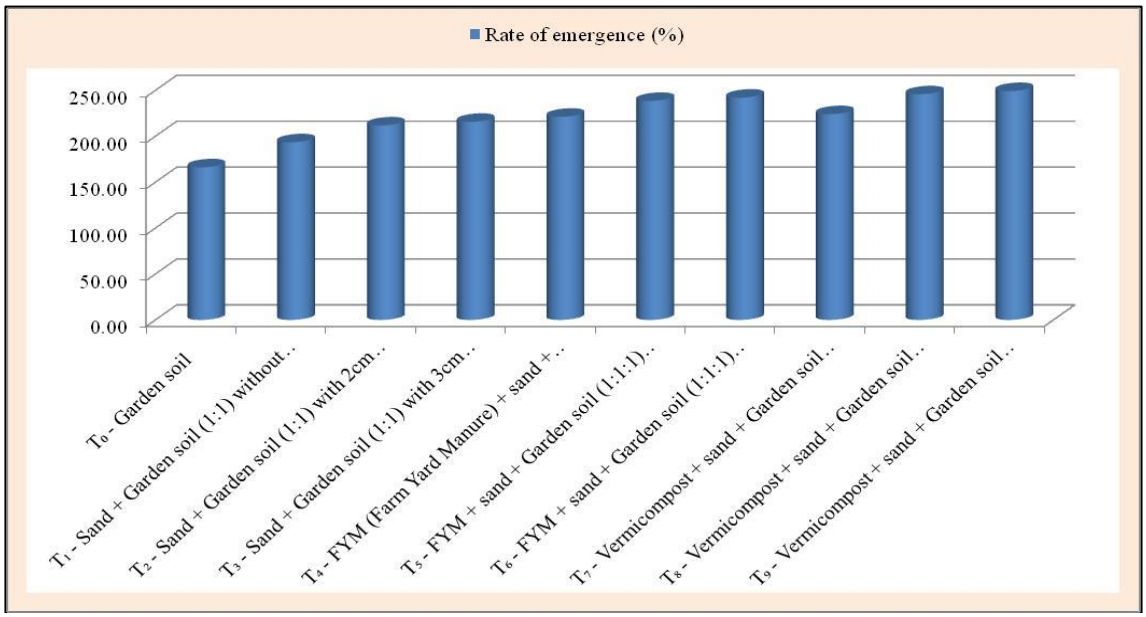

Fig 2: Effect of different growing media on rate of emergence (%) of papaya

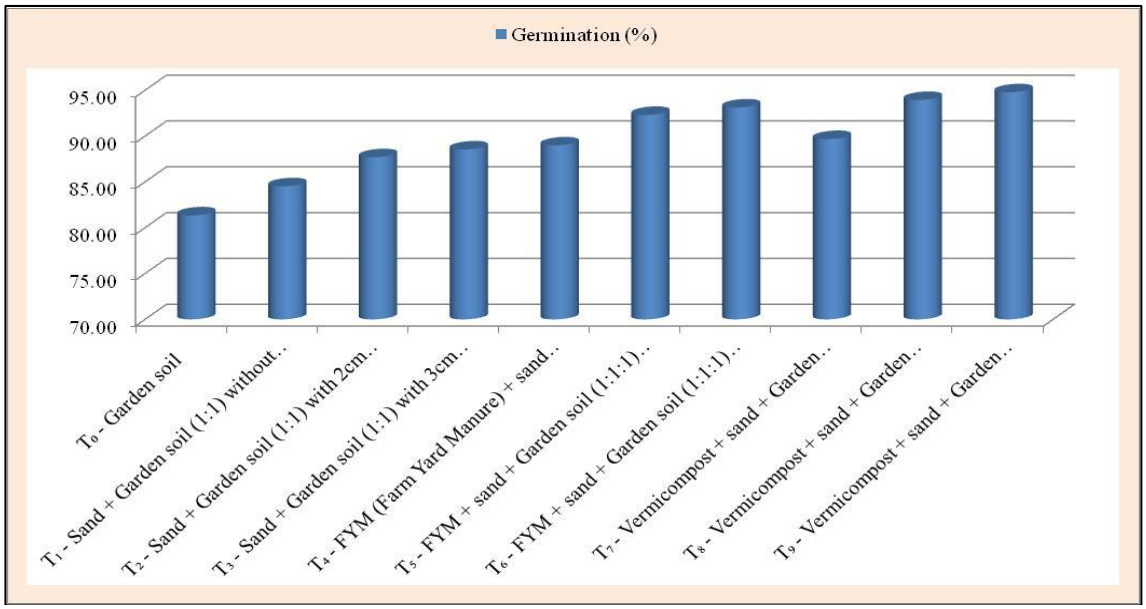

Fig 3: Effect of different growing media on germination (%) of papaya

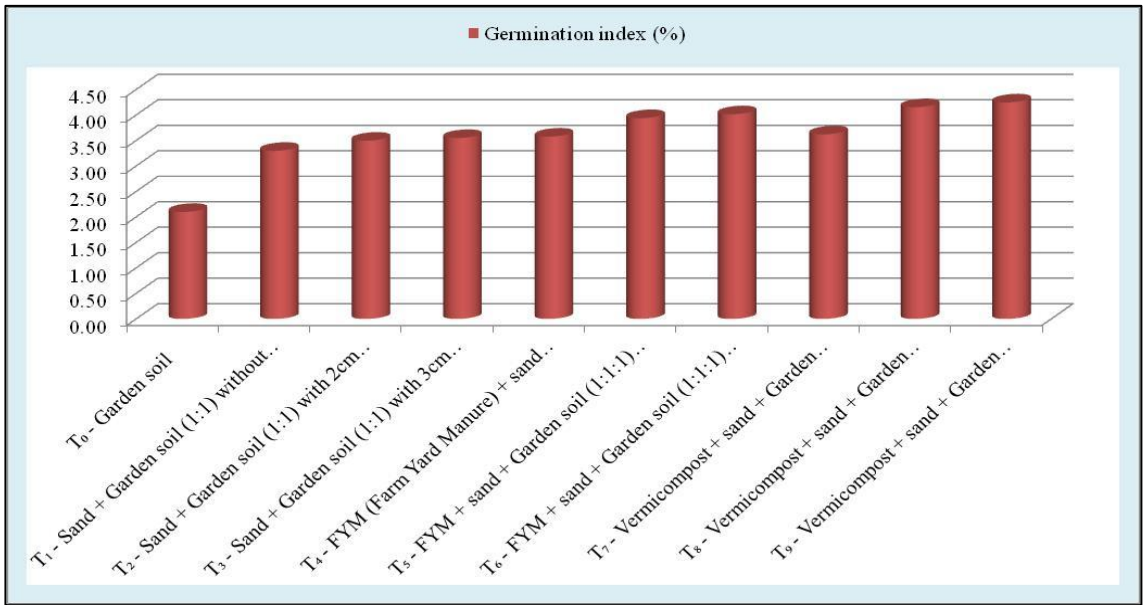

Fig 4: Effect of different growing media on germination index (%) of papaya

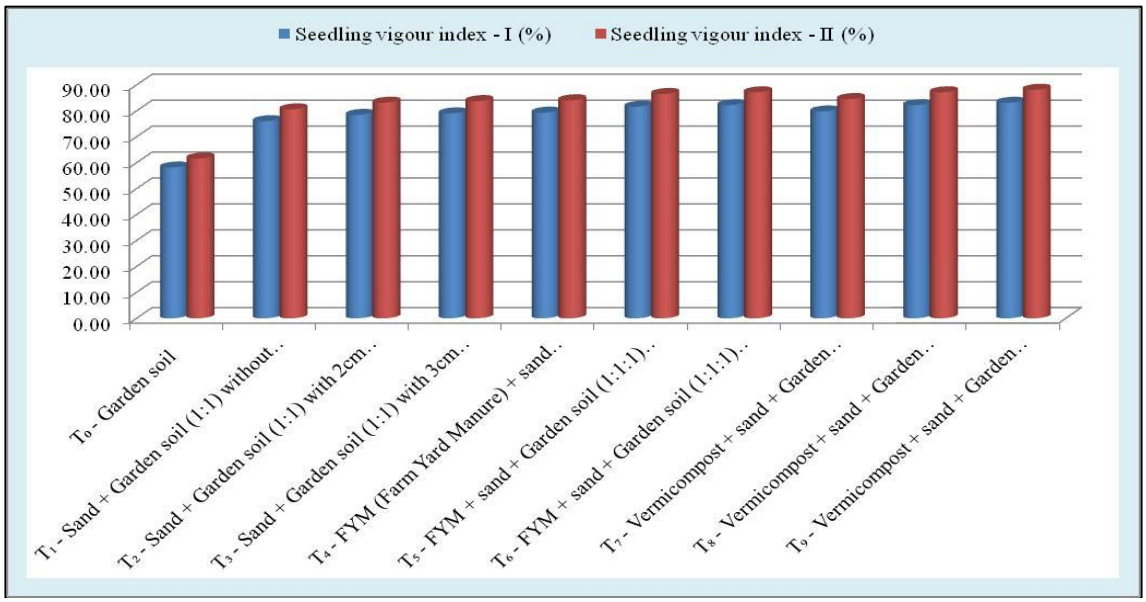

Fig 5: Effect of different growing media on seedling vigour index-I (%) and seedling vigour index-II (%) of papaya

Conclusion

The study revealed that seed germination of papaya was significantly influenced by different growing media combinations. Among all treatments, vermicompost + sand + garden soil (1:1:1) with 3 cm cocopeat (T_9) recorded the earliest initiation of germination, highest rate of emergence, maximum germination percentage and superior germination index, indicating faster and more uniform germination. The enhanced performance under this treatment may be attributed to improved moisture retention, aeration, nutrient availability and microbial activity provided by vermicompost and cocopeat. In contrast, garden soil alone resulted in delayed and poor germination. Therefore, the use of vermicompost-based growing media supplemented with cocopeat is recommended for achieving improved seed germination of papaya under the agro-climatic conditions of Bemetara district of Chhattisgarh.

References

1. Anonymous. Directorate of Horticulture and Farm Forestry annual report. Raipur (India): Department of Horticulture, Chhattisgarh; 2023.
2. Bhagat S, Thakur A, Dhaliwal HS. Organic amendments influence growth, buddability and budding success in rough lemon (*Citrus jambhiri* Lush.). Biological Agriculture & Horticulture. 2013;29(1):46-57.
3. Bhardwaj RL. Effect of nine different propagation media on seed germination and the initial performance of papaya (*Carica papaya* L.) seedlings. Journal of Horticultural Science & Biotechnology. 2013;88(5):531-536.
4. Dash BP, Dipanshu, Singh D. Effect of different growing media on seed germination and subsequent seedling growth of papaya (*Carica papaya* Linn.) cv. Pusa Nanha under Prayagraj agro-climatic conditions. Journal of Pharmacognosy and Phytochemistry. 2019;8(5):141-143.
5. Gomez KA, Gomez AA. Statistical procedures for agricultural research. 2nd ed. New York: John Wiley & Sons; 1984.
6. Kumari S, Bahadur V, Joseph AV. Effect of different growing media on seed germination and seedling growth of papaya (*Carica papaya* L.) cv. Pusa Nanha and establishment percentage in high density planting under Prayagraj agro-climatic condition. International Journal of Advanced Biochemistry Research. 2024;8(5):617-622.
7. Patel SJ, Kumar S, Kaur P, Sharma K, Mehta K, Singh S. Seed germination, seedling vigor and survival of papaya (*Carica papaya* L.) cv. Red Lady under GA_3 treatment and different nursery growing media. Plant Science Today. 2025;12(2):232-236.
8. Singh P, Dhaduk BK, Chawla SL. Standardization of growing medium for *Anthurium* cv. Flame under protected conditions. Indian Journal of Horticulture. 2009;68(1):86-90.