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Influence of different growing media on seed germination of papaya (*Carica papaya* L.)

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Abstract

The experiment entitled “Influence of different growing media on seed germination of papaya (*Carica papaya* L.)” was conducted at the Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon (C.G.) during the year 2024-25. The experiment was laid out in Completely Randomized Design (CRD) with 9 treatments. From the present investigation, it was revealed that there was significant influence among different treatments in terms of seed germination and growth parameters of papaya. Among the various treatments, application of T₉: Vermicompost + Sand + Soil (1:1:1) with 2 cm cocopeat took shortest days to seed germination (12.76 days) and performed better in parameter like days taken to 50% germination (15.66 days), germination percentage (90.17%) respectively.

Keywords: Papaya, seed germination, vermicompost, farm yard manure, cocopeat

Introduction

Papaya (*Carica papaya* L.) is an important tropical fruit crop known as wonder fruit of tropics. It belongs to the family Caricaceae. It is originated in Tropical America (Hafmer, 1990) [7]. It is diploid in nature having chromosome number $2n = 18$. Papaya introduced in India during 16th century from Malacca. Papaya plant is also called as “Kalpa Vriksha” as its various parts of the crop are used either for human consumption or for animals or as raw materials for many agro-based industries. It is grown in almost all tropical and subtropical countries of the world and occupies a unique place amongst the fruit crops grown in India. It can be cultivated in a temperature range of 25-35 °C. The papaya grows well under wide range of soils. However, very shallow and very deep black soils are not suitable; medium, fertile, well drained and lime free soils are preferred for papaya cultivation.

Papaya is an evergreen plant with a single hollow and typically unbranched softwood stem. Naturally developing plants are erect and fruits of different shapes such as spherical to oblong grows from axil of the leaves. There is significant number of seeds within the central fruit cavity remain attached to placenta. Sometimes, a fruit has no seeds. It gives one of the highest productions of fruits per hectare and an income next to banana as well as it is cheaper source of vitamin A and minerals. Yellow papaya pigment is due to caricaxanthin precursor of vitamin A, which has a high calorific value.

India ranks first among papaya producing countries (52.34 lakh MT) in the world followed by Dominican Republic (12.81 lakh MT) and Mexico (11.39 lakh MT). In India, papaya is grown widely in the states like Andhra Pradesh, Tamilnadu, Assam, Bihar, Maharashtra, Gujarat, Chhattisgarh, Haryana, Madhya Pradesh, etc., occupying an area approximately 147.87 thousand hectares with an annual production of 5353.62 thousand metric tons of fruits with a productivity of 39.96 mt/ha (Anon., 2025) [3]. In Chhattisgarh, papaya is cultivated in an area around 13.940 thousand hectares with the production of 367.793 thousand metric tons (Anon., 2024) [4].

Various kinds of Growing media having seepage, water holding limit, appropriate porosity and air circulation are essential source of nutrition for plants (Khan *et al.*, 2006) [9]. A good growth medium provides sufficient anchorage or support to the plant, serves as a reservoir for nutrients and water, allows oxygen diffusion to the roots and permits gaseous exchange between roots and the atmosphere outside root substrate (Abad *et al.*, 2002) [1].

Keeping in view, the present study entitled “Influence of different growing media on seed germination of papaya (*Carica papaya* L.)” was carried out to study the effect of different media viz., sand, soil, Farm Yard Manure, vermicompost and cocopeat on seed germination, seedling growth and vigour of papaya seedlings.

Materials and Methods

The experiment was laid out in Completely Randomized Design (CRD) with three replications and nine treatments. The treatments comprised of five growing media with varied levels viz. T₁: Control (Sand + Soil (1:1) without cocopeat), T₂: Sand + Soil (1:1) with 1 cm cocopeat, T₃: Sand + Soil (1:1) with 2 cm cocopeat, T₄: FYM + Sand + Soil (1:1:1) without cocopeat, T₅: FYM + Sand + Soil (1:1:1) with 1cm cocopeat, T₆: FYM + Sand + Soil (1:1:1) with 2 cm cocopeat, T₇: Vermicompost + Sand + Soil (1:1:1) without cocopeat, T₈: Vermicompost + Sand + Soil (1:1:1) with 1 cm cocopeat, T₉: Vermicompost + Sand + Soil (1:1:1) with 2 cm cocopeat.

Preparations of growing media

The growing media mixtures were prepared in advance prior to sowing the seed into poly bags. As a preventive measure against fungal infections, carbendazim was added to the media at a rate of 1 g per cubic meter to reduce the risk of fungal diseases.

- **Soil + Sand (T₁):** Soil and sand were mixed in equal ratio of 1:1 by volume after proper cleaning and sieving.
- **Soil + Sand with 1 cm cocopeat (T₂):** soil and sand were thoroughly cleaned, sieved, and mixed in an equal ratio of 1:1 by volume. With a 1 cm layer of cocopeat was added.
- **Soil + Sand with 2 cm cocopeat (T₃):** soil and sand were thoroughly cleaned, sieved, and mixed in an equal ratio of 1:1 by volume. With a 2 cm layer of cocopeat was added.
- **FYM + Sand + Soil (T₄):** All these three media ingredients were cleaned and sieved separately, then mixed in the ratio of 1:1:1 by volume.
- **FYM + Sand + Soil with 1 cm cocopeat (T₅):** All three components were cleaned and sieved separately, then mixed in a 1:1:1 ratio by volume. With a 1 cm layer of cocopeat was added.
- **FYM + Sand + Soil with 2 cm cocopeat (T₆):** All three components were cleaned and sieved separately, then mixed in a 1:1:1 ratio by volume. With a 2 cm layer of cocopeat was added.
- **Vermicompost + Sand + Soil (T₇):** All these three media ingredients were cleaned and sieved separately, then mixed in the ratio of 1:1:1 by volume.
- **Vermicompost + Sand + Soil with 1 cm cocopeat (T₈):** All three components were cleaned and sieved separately, then mixed in a 1:1:1 ratio by volume. A 1 cm layer of cocopeat was added to the mixture.
- **Vermicompost + Sand + Soil with 2 cm cocopeat (T₉):** All three components were cleaned and sieved separately, then mixed in a 1:1:1 ratio by volume. A 2 cm layer of cocopeat was added to the mixture.

Aftercare

Irrigation

Irrigation was done immediately after sowing of seeds in polythene bags using rose can and proper moisture level is maintained throughout the experimental period.

Weeding

Hand weeding was done at regular intervals to keep the experimental site *i.e.* polybags clean and free from weeds.

Plant protection measures

To protect the papaya saplings from insect pest, spraying of insecticide imidacloprid @ 0.5 ml per litre of water was done regularly at 15 days intervals. Similarly, to protect the plants from fungal diseases different fungicides *i.e.* Mancozeb or copper oxychloride @ 1g/litre of water was sprayed during experimental period.

Results and Discussion

Days taken to 1st germination

Among all the treatments mixed in Vermicompost + Sand + Soil (1:1:1) with 2 cm cocopeat (T₉) recorded the minimum number of days taken for first germination (12.76 days) and the maximum number of days taken for first germination (18.15 days) was recorded in the control (T₁) Sand + Soil (1:1) without cocopeat. It might be due to retention of more water and air which helped in quick and early enzymatic action for synthesis of metabolites for cell multiplication and also enhanced the breakdown of the seed coat resulting in the transformation of embryo into a seedling early enough (Hasan *et al.* 2010) [8]. Similar results were also obtained by (Bhardwaj 2013) [6].

Days to 50% germination

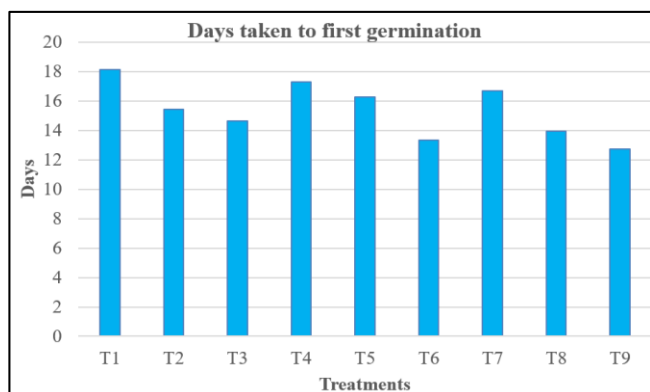
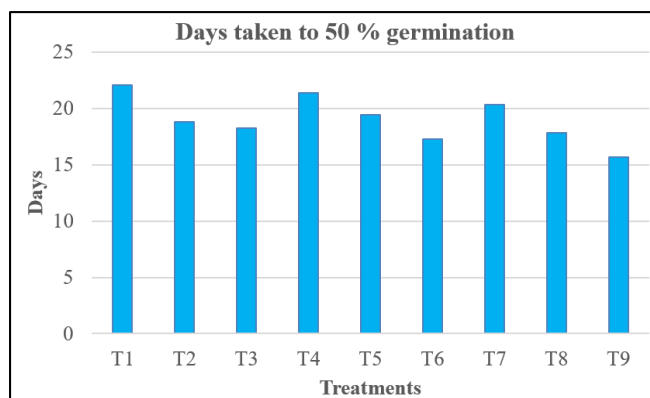
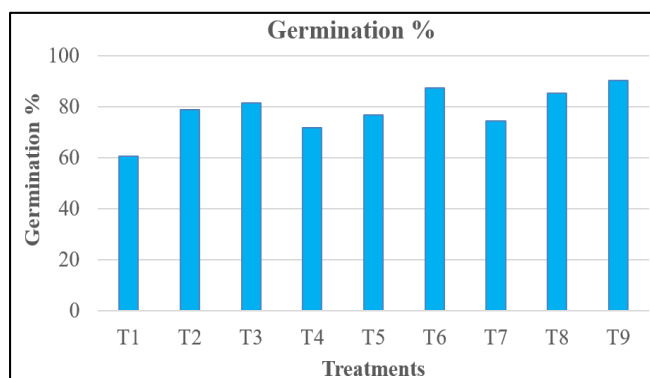
Among the treatments, (T₉) Vermicompost + Sand + Soil (1:1:1) with 2 cm cocopeat recorded the minimum number of days taken for 50% germination (15.66 days). The maximum number of days required for seed germination (22.12 days) was recorded in the treatment (T₁) Sand + Soil (1:1) without cocopeat (control). It might be due to retention of more water and air which helped in quick and early enzymatic action for synthesis of metabolites for cell multiplication and also enhanced the breakdown of the seed coat resulting in the transformation of embryo into a seedling early enough (Hasan *et al.* 2010) [8]. Similar results were also obtained by (Arvind *et al.* 2015) [5] in papaya.

Germination (%)

The highest germination percentage (90.17%) was recorded with (T₉) Vermicompost + Sand + Soil (1:1:1) with 2 cm cocopeat, followed by (T₆) FYM + Sand + Soil (1:1:1) with 2 cm cocopeat (87.41%), (T₈) Vermicompost + Sand + Soil (1:1:1) with 1 cm cocopeat (85.36%), and (T₃) Sand + Soil (1:1) with 2 cm cocopeat (81.42%). In contrast, the lowest germination percentage (60.57%) was observed in the control (T₁) Sand + Soil (1:1) without cocopeat. Vermicompost provides adequate nutrients and enhances both physical properties and water holding capacity. Combined application of vermicompost and cocopeat have too showed significant effect on seedling growth and plant biomass, perhaps due to the synergistic effect of both these factors. This result is in line with findings of Campos Mota *et al.* (2009) [10] and Abirami *et al.* (2010) [2].

Table 1: Effect of different growing media on different parameters of papaya (*Carica papaya* L.)

Notation	Treatments	Days taken to 1 st germination	Days taken to 50% germination	Germination (%)
T ₁	Sand + Soil (1:1) without cocopeat	18.15	22.12	60.57
T ₂	Sand + Soil (1:1) with 1 cm cocopeat	15.42	18.79	78.88
T ₃	Sand + Soil (1:1) with 2 cm cocopeat	14.66	18.24	81.42
T ₄	FYM + Sand + Soil (1:1:1) without cocopeat	17.29	21.41	71.64
T ₅	FYM + Sand + Soil (1:1:1) with 1cm cocopeat	16.27	19.44	76.75
T ₆	FYM + Sand + Soil (1:1:1) with 2 cm cocopeat	13.34	17.27	87.41
T ₇	Vermicompost + Sand + Soil (1:1:1) without cocopeat	16.71	20.35	74.22
T ₈	Vermicompost + Sand + Soil (1:1:1) with 1 cm cocopeat	13.94	17.83	85.36
T ₉	Vermicompost + Sand + Soil (1:1:1) with 2 cm cocopeat	12.76	15.66	90.17
	C.D. at 5%	1.156	1.414	4.939
	SE(m)±	0.386	0.472	1.65
	C.V.%	4.344	4.304	3.64

**Fig 1:** Days taken to first germination**Fig 2:** Days taken to 50% germination**Fig 3:** Germination %

Conclusion

- Treatment T₉ (vermicompost + sand + soil, 1:1:1 with 2 cm cocopeat) showed the best results for papaya seed germination.

- Hence, T₉ is recommended for papaya seed germination and nursery raising.
- It was also observed that treatment T₆ (FYM + sand + soil (1:1:1) with 2 cm cocopeat) also performed better as compared to other treatments making it second best treatment for the papaya seed germination.

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