International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(6): 236-239
www.biochemjournal.com
Received: 09-03-2024
Accepted: 16-05-2024

Prasoon Kumar Rai
M.Sc., Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Dr. Saket Mishra
Assistant Professor, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Dr. Vijay Bahadur
Associate Professor and Head, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Dr. Ram Bharoshe
Associate Professor, Department of Soil Science and Agriculture Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Dr. Satyendra Nath
Associate Professor and Head, Department of Environment Sciences And Natural Resources Management, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Dr. Vaidurya Pratap Sahi
Associate Professor and Head, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Akhilesh Kushwaha
Ph.D. Scholar, Department of Horticulture Fruit Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Prasoon Kumar Rai
M.Sc., Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Effect of different growing media and biocapsules on seed germination, seedling growth and survivability percentage of phalsa (*Grewia asiatica* L.) under greenhouse condition

Prasoon Kumar Rai, Dr. Saket Mishra, Dr. Vijay Bahadur, Dr. Ram Bharoshe, Dr. Satyendra Nath, Dr. Vaidurya Pratap Sahi and Akhilesh Kushwaha

DOI: https://doi.org/10.33545/26174693.2024.v8.i6c.1306

Abstract
My research work accomplished during August 2023 to November 2023 in green house, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and sciences (SHUATS), Prayagraj, Uttar Pradesh. The research work is based on “Effect of different growing media and biocapsules on seed germination, seedlings growth and survivability percentage of phalsa (*Grewia asiatica* L.) Under greenhouse condition”. And this experiment was conducted with nine treatments and three replications in Randomized Block Design (RBD). The treatments were T_0 (Control), T_1 {(Soil + FYM) + Bio capsule @ 250 ppm (1:1)}, T_2 {(Soil + Cocopeat) + Bio capsule @ 250 ppm (1:1), T_3 {(Soil + Vermicompost) + Bio capsule @ 250 ppm (1:1)}, T_4 {(Soil + FYM + Cocopeat) + Bio capsule @ 250 ppm (1:1:1)}, T_5 {(Soil + FYM + Vermicompost) + Bio capsule @ 250 ppm (1:2:1)}, T_6 {(Soil + FYM + Cocopeat) + Bio capsule @ 250 ppm (1:2:1)}, T_7 {(Soil + Vermicompost + Cocopeat) + Bio capsule @ 250 ppm (1:2:1)}, T_8 {(Soil + FYM + Cocopeat + Vermicompost) + Bio capsule @ 250 ppm (1:1:1:1)}. The treatment T_5 (Soil + FYM + Vermicompost) + Bio capsule @ 250 ppm (1:2:1) gives the best result in terms of days of Germination (13.56 days),Germination Percentage (82.56%), number of leaves per seedling (4.79, 6.87, 9.67 and 11.00 at 20 DAS, 40 DAS, 60 DAS and 80 DAS respectively), Shoot length (2.32, 6.14, 10.75 and 16.15 at 20 DAS, 40 DAS, 60 DAS and 80 DAS respectively), seedling length (4.32, 7.72, 16.05 and 20.12 at 20 DAS, 40 DAS, 60 DAS and 80 DAS respectively), Seedling girth (4.55, 7.7.2,10.65 and 12.86 at 20 DAS, 40 DAS, 60 DAS and 80 DAS respectively), fresh weight of seedling(19.05 g), leaf area (38.12, 48.89 and 58.99 at 40 DAS, 60 DAS and 80 DAS respectively), Seedling vigor index (1251.03),Chlorophyll content (40.09) and survival % (84.67%).

Keywords: Biocapsule, cocopeat, FYM, soil, vermicompost, etc.

Introduction

Phalsa (*Grewia asiatica* L.), a resilient fruit plant from the family Tilliaceae, is considered highly promising. Indigenous to India, it is also noted by Ahmed and Ghaffor (1961) as native to the Indo-Pak subcontinent. Globally, phalsa thrives in tropical and subtropical regions. In India, it is widespread and commercially cultivated in various states.

Phalsa is either a big, straggling shrub or a tiny tree. Its bark is rough and grey, and its leaves range in shape from widely cordate to oval with an angled base. 1-2 seeded, drupe globose, edible, flowers in yellow clusters along the axilla, indistinctly lobed, irregularly serrated (Anonymous, 1958) [2].

Phalsa is a promising crop for the development of dryland horticulture, particularly well-suited for arid regions. As a hardy plant, phalsa can thrive in a variety of soil types and climates. It is less demanding in terms of soil, water, and cultural requirements compared to other fruits.

Commercially, phalsa is propagated by seed, and the seedlings tend to remain true to type. Freshly extracted seeds are used for raising these seedlings. Under ordinary storage conditions, the seeds remain viable for 90-100 days, while cold storage extends their viability to 6 months.

Seeds stored in a sealed glass jar at 5.8 °C or at room temperature maintain maximum viability, compared to those stored openly at the same temperatures (Chacko and Singh, 1971) [6].

The phalsa plant is deciduous, shedding its leaves slowly in regions with mild winters. The fruit develops in the axils of the leaves on the current year's growth. Pruning is carried out annually in December or January, with new growth beginning almost immediately thereafter.

The fruits reach the market in May and June (Singh, 1974) [17].

Soil

Growing media soil is essential for plant growth, providing nutrients, water retention, and physical support to roots. Its porous structure ensures proper aeration, vital for root respiration and nutrient uptake. Soil hosts beneficial microbes, regulates pH levels, and promotes environmental sustainability, forming the foundation for thriving ecosystems.

FYM: Farmyard manure (FYM) is vital in growing media as it enriches soil with organic matter, nutrients, and beneficial microbes. FYM enhances soil structure, water retention, and nutrient availability, fostering healthy plant growth. Its sustainable use reduces chemical dependency and promotes soil health, contributing to resilient and sustainable agriculture.

Vermicompost: Vermicompost enriches growing media by enhancing microbial activity, expanding nutrient availability, and strengthening soil structure. Its organic composition enhances plant growth, reduces the need for synthetic fertilizers, and fosters sustainable agriculture practices. Vermicompost contributes to healthy soils, robust plant growth, and environmental sustainability.

Cocopeat: It is a versatile growing medium, offers excellent water retention and aeration properties, fostering optimal root development and nutrient uptake. Its high organic content enhances soil structure and microbial activity, promoting healthy plant growth. Cocopeat is sustainable, renewable, and reduces the need for traditional soil, making it ideal for eco-friendly agriculture.

Biocapsule: This eliminates the need for farmers to transport sacks of biofertilizers. The most attractive feature of the bio-capsule is that a single capsule can be diluted with approximately 100-200 liters of water, making it convenient for farmers to apply as needed. By facilitating the absorption of nutrients found in the applied organic manures, it performs a very significant role.

Materials and Methods

The research titled "Effect of different growing media and biocapsules on seed germination, seedling growth, and survival percentage of phalsa (*Grewia asiatica* L.) under greenhouse conditions" was conducted within the Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj in 2023. And for this the experiment was conducted with nine treatments and three replications in Randomized Block Design (RBD). The treatments were T_0 (Control), T_1 {Soil + FYM) + Bio capsule @ 250 ppm (1:1)}, T_2 {(Soil + Cocopeat) + Bio capsule @ 250 ppm (1:1), T_3 {(Soil + Vermicompost) + Bio capsule @ 250 ppm (1:1)}, T_4 {(Soil + FYM + Cocopeat) + Bio capsule @ 250 ppm (1:1:1)}, T_5 {(Soil + FYM + Vermicompost) + Bio capsule @ 250 ppm (1:2:1)}, T_6 {(Soil + FYM + Cocopeat) + Bio capsule @ 250 ppm (1:2:1)}, T_7 {(Soil + Vermicompost + Cocopeat) + Bio capsule @ 250 ppm (1:2:1)}, T_8 {(Soil + FYM + Cocopeat + Vermicompost) + Bio capsule @ 250 ppm (1:1:1:1)}. The growth, development and Germination parameters of the seedling were recorded at 20, 40, 60 and 80 days of research period. With 3 replications in Randomized Block Design (RBD).

Results and Discussion

Number of days required for germination: Recorded data depicted in Table no-1 showed that in treatment T_5, which included soil (1) + FYM (2) + Vermicompost (1) + Bio capsule @ 250 ppm, the minimal amount of time required for germination start was 13.56 days. Treatment T_4 was closely behind, requiring 14.89 days for germination and using Soil (1) + FYM (1) + Cocopeat (1) + Bio capsule @ 250 ppm. under comparison, under treatment T_0, where soil was the only control, the maximum time for germination initiation was 21.36 days.

It is evident that using FYM, Vermicompost, and bio capsules together shortened the time it took for papaya to begin germination. Rich in nutrients and advantageous microbes, vermi-compost improved soil fertility and created an atmosphere that was ideal for seed development. Biocapsules allowed faster seed activation and germination since they contained vital nutrients and chemicals that promote growth. This was supported by (Singh. 1974) [17].

Germination percentage: Data depicted in Table-1 showed that under treatment T_5, which included soil (1) + FYM (2) + Vermicompost (1) + Bio capsule @ 250 ppm, the maximum germination percentage was 82.56%. Closely trailing behind was treatment T_4, which used soil (1) + FYM (1) + Cocopeat (1) + Bio capsule @ 250 ppm, requiring 78.89% for germination. In comparison, in treatment T_0, when soil was the only control, the minimum germination percentage was 51.36% days.

This mixture produced the ideal conditions for phalsa seeds to fully germinate, increasing the likelihood of successful germination. The congruent findings of (Bhardwaj, 2014) [5].

Number of leaves per seedling: It is clearly evident from the table-1 In treatment T_5, which included soil (1) + FYM (2) + Vermicompost (1) + Bio capsule @ 250 ppm, the maximum number of leaves per seedling (4.79, 6.87, 9.67, and 11 correspondingly) was seen at 20,40,60,80 Days after Sowing (DAS).Treatment T_4, which included Soil (1) + FYM (1) + Cocopeat (1) + Biocapsule @ 250 ppm, demonstrated a somewhat reduced number of leaves (4.7, 6.77, 9.49, and 10.89,respectively),in line with this trend. On the other hand, treatment T_0, which used only soil as a control, had the fewest number of leaves (3.9, 5.42, 8.26, and 10.01respectively).

This clearly shows that integrated nutrient use aids in leaf cell elongation, cell development, and rapid cell division and elongation in the meristematic region of the plant due to the production of plant growth substance. These findings are corroborated by the similar conclusions drawn by Dash *et al.* (2019) [8].

Leaf Area (cm^2): The data on the area of leaves (cm2) under the influence of different combinations are shownin Table 1. The treatment T_5, comprising of Soil (1) + FYM (2) + Vermicompost (1) + Bio capsule @ 250 ppm, had the largest leaf area (27.65, 38.12, 48.89, and 58.99, respectively) at 20,40,60,80 days after sowing (DAS). Treatment T_4, which included Soil (1) + FYM (1) + Cocopeat (1) + Bio capsule @ 250 ppm, demonstrated a somewhat reduced number of leaves (25.78, 36.09, 46.65, and 57.98, respectively), in line with this trend. On the other hand, treatment T_0, which used simply soil as a control, recorded the minimum leaf area (12.01, 22.06, 33.64, and 43.87, respectively).

These findings are corroborated by the similar conclusions drawn by Bhagat *et al.* (2013) [4].

Seedling Height (cm): It is clearly evident from the table-1The treatment T_5, which included Soil (1) + FYM (2) + Vermi-compost (1) + Bio capsule @ 250 ppm, had the largest seedling heights at 20,40,60,80 days after sowing (DAS) at 4.32, 7.72, 16.05, and 20.12 cm, respectively. Treatment T_4, which included Soil (1) + FYM (1) + Cocopeat (1) + Bio capsule @ 250 ppm, demonstrated a somewhat reduced amount of leaves (4.12, 7.08, 15.89,and 19.98 cm, respectively), in line with this trend. By using simply soil as a control, treatment T_0 yielded the shortest seedling height (2.08, 5.03, 13.78, and 16.9 cm, respectively).

This amalgamation not only supplies vital nutrients but also maintains optimal soil moisture levels, facilitating efficient nutrient uptake, thereby promoting enhanced vertical plant growth. These findings are corroborated by the similar conclusions drawn by Barche *et al.* (2010) [3].

Seedling Girth (mm)

Table 1 presents the data regarding seedling girth (mm) under various combinations At 20, 40, 60, 80 Days after sowing (DAS) maximum seedling girth (4.55 mm, 7.72 mm, and 10.65 mm respectively) were observed in treatment T_5, comprising Soil (1) + FYM (2) + Vermicompost (1) + Bio capsule @ 250 ppm. Following this trend, treatment T_4, consisting of Soil (1) + FYM (1) + Cocopeat (1) + Bio capsule @ 250 ppm, exhibited slightly lower heights (4.52 mm, 7.7 mm, 10.62 mm respectively). In contrast, minimum seedling girth (2.34 mm, 5.57 mm, 7.2 mm respectively) were recorded in treatment T_0, utilizing only soil as a control. Similar findings regarding vegetative growth were reported by Pareek *et al.* (1981) [12].

Chlorophyll Content: Table.1 presents the chlorophyll content data resulting from different combinations Treatment T_5 showcased the highest chlorophyll content at 40.09, characterized by a combination of Soil (1), FYM (2), Vermi-compost (1), and Bio capsule @ 250 ppm. Following closely, treatment T_4 displayed a chlorophyll content of 39.89, comprising Soil (1), FYM (1), Cocopeat (1), and Bio capsule @ 250 ppm. In contrast, the lowest chlorophyll content of 30.71 was recorded in treatment T_0, which solely employed soil as a control.

Biocapsules, by introducing beneficial microbes and enhancing nutrient availability, optimize nutrient absorption, thereby promoting chlorophyll production. This study is supported by Bhardwaj, (2014) [5].

Seedling Vigor Index: Table.1 present the highest seedling vigor index, 1251.03, was observed in treatment T_5, which consisted of Soil (1), FYM (2), Vermicompost (1), and Bio capsule @ 250 ppm. Following closely, treatment T_12 exhibited a seedling vigor index of 1149.23, composed of Soil (1), FYM (1), Cocopeat (1), and Bio capsule @ 250 ppm. Conversely, the lowest seedling vigor index, 613.23, was recorded in treatment T_0, utilizing only soil as a control.

The presence of organic-rich media can bolster nutrient absorption and microbial activity, resulting in strengthened root systems and overall vitality. This research aligns with the findings of Gawankar *et al.* (2019) [9].

Survival percentage

It is clearly evident from the table-1 The highest survival percentage, reaching 84.67%, was achieved with a combination of Soil (1), FYM (2), Vermicompost (1), and Bio capsule @ 250 ppm. Close behind, with 82.75%, was the treatment consisting of Soil (1), FYM (1), Cocopeat (1), and Bio capsule @ 250 ppm. In contrast, the control group displayed the lowest survival percentage at 47.54%.

The presence of organic-rich media can bolster nutrient absorption and microbial activity, resulting in strengthened root systems and overall vitality and increases survival percentage. This research aligns with the findings of Barche *et al.* (2010) [3].

Table 1: Effect of different growing media and bio capsule on the seed germination, seedling growth and survivability percentage of phalsa (*Grewia asiatica* L.)

Notion	Germination parameters		Growth and development parameters at 20 DAS.				Growth and development parameters at 40 DAS.				Growth and development parameters at 60 DAS.			
	Days to Germination	Germination percentage	Leaves number per seedling	Leaf Area (cm2)	Seedling Height (cm)	Seedling Girth (mm)	Leaves number per seedling	Leaf Area (cm2)	Seedling Height (cm)	Seedling girth (mm)	Leaves number per seedling	Leaf Area (cm2)	Seedling Height (cm)	Seedling girth (mm)
T_0	21.36	51.36	3.9	12.01	2.08	2.34	5.42	22.06	5.03	5.57	8.26	33.64	13.78	7.2
T_1	17.23	67.23	4.6	14.98	2.65	3.42	5.91	26.35	6.91	6.61	8.53	39.73	15.07	9.49
T_2	18.31	68.31	4.44	18.65	3.78	3.44	6.23	30.68	6.92	6.65	8.66	40.24	15.45	9.56
T_3	17.65	68.65	4.32	21.98	3.89	3.49	6.34	31.25	6.89	6.68	8.89	41.43	15.35	9.58
T_4	14.89	78.89	4.7	25.78	4.12	4.52	6.77	36.09	7.08	7.7	9.49	46.65	15.89	10.62
T_5	13.56	82.56	4.79	27.65	4.32	4.55	6.87	38.12	7.72	7.72	9.67	48.89	16.05	10.65
T_6	18.45	69.45	4.66	16.39	3.98	3.5	6.54	30.62	6.67	6.71	8.76	40.55	15.67	9.6
T_7	18.05	70.05	4.64	22.36	3.67	3.48	6.62	31.8	6.87	6.69	8.56	41.46	15.54	9.59
T_8	17.89	75.89	4.54	23.45	2.54	3.38	6.59	33.15	6.9	6.67	8.34	43.43	15.35	9.57
S-Ed (±)	1.36	1.87	0.09	0.41	0.49	0.19	0.1	0.64	0.6	0.28	0.07	1.14	0.63	0.53
$CD_{5\%}$	2.72	3.75	0.183	1.02	1.5	0.38	0.245	1.88	1.79	0.58	0.14	2.36	1.88	1.06
CV	5.44	7.50	0.382	1.42	3.03	0.78	0.483	2.31	3.58	1.12	0.31	4.72	3.76	2.12

Notion	Growth and development parameters at 80 DAS.				At 45 DAS			
	Leaves number per seedling	Leaf Area (cm2)	Seedling Height (cm)	Seedling girth (mm)	Chlorophyll content	Fresh Weight of Shoot (gm)	Seedling Vigour Index	Survival percentage (%)
T_0	10.01	43.87	16.9	9.30	30.71	11.98	613.23	47.54
T_1	10.53	48.16	18.67	10.75	35.81	13.67	889.45	56.78
T_2	10.23	50.69	18.78	10.77	38.85	14.78	956.54	59.77
T_3	10.45	51.31	19.06	11.79	38.87	15.39	1026.32	77.32
T_4	10.89	57.98	19.98	12.82	39.89	18.98	1149.23	82.75
T_5	11	58.99	20.12	12.86	40.09	19.05	1251.03	84.67
T_6	10.27	50.45	19.35	11.72	37.86	15.23	942.78	76.53
T_7	10.32	51.2	19.65	11.69	38.8	16.26	1039.56	68.89
T_8	10.12	53.82	18.98	10.70	37.79	16.09	940.38	73.98
S-Ed(±)	0.12	2.69	2.22	0.67	0.11	1.18	56.18	2.74
$CD_{5\%}$	0.25	4.52	6.72	1.34	0.23	2.35	168.21	5.49
CV	0.49	6.71	13.44	2.68	0.48	4.70	224.72	10.97

Conclusion

Based on the results of research trial, it can be said that the treatment T_5 (Soil + FYM + Vermicompost) + Bio capsule @ 250 ppm (1:2:1) was discovered to have highest germination percentage, growth parameters and survival percentage of phalsa with (4.60) B: C ratio, which was followed by T_4 comprising of (Soil + FYM + Cocopeat) + Bio capsule @ 250 ppm (1:1:1). Conversely, the least favourable results were observed with T_0, which utilized only Soil as a control.

References

1. Ahmed S, Ghaffor MA. Phalsa (*Grewia asiatica* L.) cultivation in West Pakistan. Agric Pakist. 1961;12:762-768.
2. Anonymous. The wealth of India. Raw materials. 1958;4:262-266.
3. Barche S, Singh Kirad K, Singh DB. Response of seed treatment on germination, growth, survivability and economics of different cultivars of papaya (*Carica papaya* L.). Acta Hort. 2010;851:279-284.
4. Bhagat S, Thakur A, Dhaliwal HS. Organic amendments influence growth, buddability and budding success in rough lemon (*Citrus jambhiri* Lush.). Biological Agriculture & Horticulture: An International Journal for Sustainable Production Systems. 2013;29(1):46-57.
5. Bhardwaj RL. Effect of growing media on seed germination and seedling growth of papaya cv. 'Red lady'. African Journal of Plant Science. 2014;8(4):178-184.
6. Chacko EK, Singh RN. Studies on the longevity of papaya, phalsa, guava and mango seeds. Proc Int Seed Test Ass. 1971;36:147-58.
7. Dass HC, Randhawa GS. Vascular anatomy of the flowers of Grewia asiatica L. Phyton. 1962;19:185-93.
8. Dash BP, Deepanshu, 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.
9. Gawankar MS, Haldankar PM, Haldavanekar PC, Salvi BR, Jamadagni BM. Studies on seed germination and seedling growth in Jackfruit (*Artocarpus heterophyllus* Lam.) as influenced by media. International Journal of Chemical Studies. 2019;7(5):1699-1705.
10. Hayes WB. Fruit growing in India. Allahabad: Kitabisthan; c1960.
11. Nehra NS, Godara NR, Dabas AS. A note on evaluation of two variants in phalsa (*Grewia subinaequalis* DC). Haryana J. Hort. Sci. 1985;14(1-2):58-60.
12. Pareek OP, Panwar HS. Vegetative, floral and fruit characteristics of two phalsa (*Grewla sublnaequalis* DC) types. Annuals of Arid Zone. 1981;20(4):281-290.
13. Sharon PT, Anita K, Samir TE, Gouse MS, Pratyasha T. Effect of Nano Zeolite, Nano Micronutrients and Biocapsules on Plant Growth, Head Yield and Quality of Broccoli *(Brassica oleracea* var Italica). International Journal of Environment and Climate Change. 2022;12(11):58-65. Article no. IJECC.88834. ISSN: 2581-8627.
14. Randhawa GS, Dass HC. Studies on floral biology of phalsa (*Grewia subinaequalis* DC.). Indian J. Hort. 1962;19:8-24.
15. Sarkar AK, Datta N, Chatterjee U. Bulletin of the Botanical survey India. 1979;15(2):148.
16. Singh BD. Selection in cross pollinated crops. In: Plant breeding - principles and method. New Delhi: Kalyani Publishers; 1968. Third Edn.
17. Singh JP. The phalsa. Ind. Hort. 1974;19:15-16.
18. Singhal VK. Cytology of some Indian species of Grewia Linn (Tilliaceae). J. Tree. Sci. 1982;1(1-2):88-97.