International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(12): 1733-1736
www.biochemjournal.com
Received: 20-09-2025
Accepted: 22-10-2025

Pankaj Yadav
M.Sc. Forestry Scholar, Silviculture & Agroforestry, IGKV, Raipur, Chhattisgarh, India

Dr. Sarita Bodalkar
Scientist, Department of Silviculture & Agroforestry, IGKV, Raipur, Chhattisgarh, India

Dr. RK Prajapati
Professor, Department of Silviculture & Agroforestry, IGKV, Raipur, Chhattisgarh, India

Corresponding Author:
Pankaj Yadav
M.Sc. Forestry Scholar, Silviculture & Agroforestry, IGKV, Raipur, Chhattisgarh, India

Performance of Bhilawa (*Semecarpus anacardium*) collected from different seed sources of Chhattisgarh

Pankaj Yadav, Sarita Bodalkar and RK Prajapati

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i12Su.6798

Abstract
The present study was conducted during 2024-25 at IGKV Raipur to evaluate the seedling growth performance of *Semecarpus anacardium* collected from three agroclimatic zones of Chhattisgarh using different potting mixtures. Seeds were collected from Kondagaon (Bastar plateau), Jashpur (Northern hills) and Mohla-Manpur (Chhattisgarh plains). Significant variability was observed among seed sources and treatments. The Kondagaon seed source along with treatment T_1 (Soil + Vermicompost + FYM) exhibited the highest values for nearly all growth parameters, including seedling height (14.50 cm), number of leaves (12.75), root length (15.90 cm), fresh shoot weight (8.30 g), dry shoot weight (2.09 g), fresh root weight (9.24 g), and dry root weight (1.41 g). Collar diameter (2.60 mm) was recorded highest in KT_1 and JT_2. The study confirms strong treatment and seedsource influence on early seedling growth and identifies Kondagaon × T_1 as the most suitable combination for nursery raising of Bhilawa.

Keywords: Bhilawa, seed source, growth, potting mixture, interaction

Introduction
Semecarpus anacardium L., commonly known as Bhilawa or marking nut, is an important dryland fruit and medicinal tree species belonging to the family Anacardiaceae, which comprises over 500 species and 49 genera. This family includes several economically valuable members such as mango, cashew, pistachio, and charoli. *Semecarpus anacardium* is naturally distributed across the Indo-Malayan region and is commonly found in the sub-Himalayan belt from the Beas River to Assam and the Khasi hills, as well as central and western India including Gujarat, Konkan, South Maharashtra, and the deciduous forests of southern India. In Chhattisgarh, it is predominantly found in Jashpur, Kondagaon, and Mohla-Manpur, where climatic conditions favour its natural growth.

This species is a deciduous tree, typically attaining a height of 10-20 meters with a stem girth of 1.0-1.5 m. Flowering occurs during June to August, while fruit maturation takes place from November to March. The tree bears small subsessile greenish-white to yellow flowers arranged in terminal panicles. The fruits are drupes with a characteristic purplish-black seed attached to a fleshy orange, red, or yellow cup-shaped hypocarp. Fruiting begins at around 3-4 years of age. Seed viability is generally low; hence, fresh seeds are preferred for propagation. Significant seed variability is observed within the species due to differences in geography, climate, and ecological factors. Variations in seed size, fruit dimensions, seed weight, and hypocarp characteristics directly influence germination behaviour, seedling vigor, and suitability for nursery and plantation programs. Because the species is mostly found in the wild and not extensively cultivated, natural populations exhibit a wide range of quantitative and qualitative traits.

Beyond its ecological and morphological significance, *Semecarpus anacardium* holds immense medicinal value. The kernels contain approximately 26.4% protein, 36.4% fat, and significant minerals such as 295 mg calcium, 836 mg phosphorus, and 6.1 mg iron per 100 g. Vitamin A content is high, with around 185.50 mg per 100 g. The tree produces a highly vesicant phenolic liquid known as Bhilawa Shell Liquid (BSL), used industrially in paints, varnishes, polymers, and fire-resistant materials. Medicinally, various parts of the plant particularly the fruits are traditionally used to treat cancer, leprosy, hypertension, jaundice, neurological disorders, and snake/scorpion bites.

Gum resins have therapeutic applications, and the wood is used for light furniture and matchboxes. In Chhattisgarh, annual production is about 1350 tons, valued at approximately 0.85 crores, while Maharashtra yields around 1600 tons (Chhattisgarh State Minor Forest Produce (Trading & Development) C0-operative Federation Ltd.). Individual mature trees can yield 30-35 kg of dried hypocarp and 50-60 kg of nuts. Due to its drought tolerance and suitability for semi-arid conditions, the species holds strong potential for agroforestry, social forestry, and afforestation programs, particularly in marginal lands.

Given this ecological, medicinal, and economic significance, studying seed morphological variability across agro-climatic zones is crucial for identifying superior seed sources. Understanding these variations supports improved germination, nursery performance, genetic conservation, and large-scale plantation efforts. *Semecarpus anacardium* (Bhilawa) is known to exhibit poor and irregular germination under natural conditions, which poses a major constraint to its propagation and domestication. Therefore, understanding seed variability is particularly important for overcoming germination-related limitations. The present study aims to evaluate seed variability of *Semecarpus anacardium* collected from three major seed sources of Chhattisgarh Jashpur, Kondagaon, and Mohla-Manpur with a special focus on identifying seed traits that may contribute to improved germination and early seedling performance.

Materials and Methods

Seeds from three locations Kondagaon, Jashpur, and Mohla-Manpur were collected and grown in the Herbal Garden, IGKV Raipur, under the same environmental conditions to ensure uniformity during seedling development. The collected seeds were sown in polybags containing four types of potting mixtures: T_1 (Soil + FYM + Vermicompost in 2:1:1 ratio), T_2 (Soil + Vermicompost in 2:2 ratio), T_3 (Soil + FYM in 2:2 ratio), and T_4 (Control). Observations were recorded at 30, 60, 90, and 120 DAS. The experiment was laid out in a Randomized Block Design (RBD) with appropriate replications, and statistical analysis was carried out using ANOVA to assess the significance of treatment and seed-source effects. Seeds were randomly selected from seed sample collected from three district of Chhattisgarh and pre-sowing seed treatments were adopted in which seeds were soaked in water for 24 hours then seed were removed Immediately and sowing war done just after.

Results and Discussion 1 Seedling Height

Seedling height varied significantly among seed sources, with T_2 (Kondagaon) producing the tallest seedlings (12.61 cm) at all stages, while T_1 (Jashpur) recorded the lowest (11.48 cm) mean height. Among potting mixtures, T_1 (Soil + Vermicompost + FYM) consistently showed the maximum height (13.80 cm), whereas T_4 (Control) produced the minimum (9.87 cm). The interaction effect revealed the highest height in KT_1 (14.50 cm) and the lowest in JT_4 (9.47 cm). Similar findings were reported by Sajana *et al.* (2016) [5, 6] and Negi & Sharma (2023) [16], where vermicompost-based media enhanced seedling height and vigour.

Collar Diameter

Collar diameter differed significantly, with T_2 (Kondagaon) recording the highest overall mean value (2.41 mm) and T_1 (Jashpur) the lowest (2.09 mm). Among potting mixtures, the maximum diameter occurred in T_1 (Soil + Vermicompost + FYM) (2.45 mm) and the minimum in T_4 (2.00 mm). Interaction effects showed the highest collar diameter in KT_1/JT_2 (2.60 mm) and the lowest in MT_4 (1.75 mm). These results align with Sajana *et al.* (2016) [5, 6], who also reported improved stem thickness in nutrient-rich media.

Number of Leaves

Seed sources showed significant variation, with T_2 (Kondagaon) producing the highest mean number of leaves (11.28) and T_1 (Jashpur) the lowest (8.88). Among potting mixtures, T_1 (Soil + Vermicompost + FYM) recorded the maximum (11.36), while T_4 had the minimum (7.71). Interaction effects indicated KT_1 (12.75) showed the highest leaf count and MT_4 (7.25) as the lowest. These results agree with Essien *et al.* (2010) [10], who emphasized the role of nutrient-rich media in leaf production.

Number of Branches

Seed sources significantly influenced branching, with T_2 (Kondagaon) recording the highest mean (5.3) and T_1 (Jashpur) the lowest (4.08). Potting mixtures showed maximum branching in T_1 (Soil + Vermicompost + FYM) (6.02) and the minimum in T_4 (2.68). Interaction effects recorded the highest branching in KT_1 (11.80) and the lowest in MT_4 (4.60). Similar improvements in branching due to enriched media were reported by Haque & Singh (2022) [7] and Sajana *et al.* (2016) [5, 6].

Root Length

Root length varied significantly, with T_2 (Kondagaon) showing the maximum (12.7 cm) and T_1 (Jashpur) the minimum (9.85 cm). Among potting mixtures, T_1 (Soil + Vermicompost + FYM) recorded the highest (13.10 cm) root length, whereas T_4 recorded (9.09 cm) the lowest. Interaction effects showed the maximum root length in KT_1 (15.90 cm) and the minimum in MT_4 (8.34 cm). These results agree with Okunlola & Adegeye (2023), who highlighted the positive role of organic amendments in enhancing root development.

Dry Root Weight

Dry root weight varied significantly among seed sources, with T_1 (Kondagaon) recording the maximum (0.99 g) and T_3 (Jashpur) the minimum (0.70 g). Among potting mixtures, T_1 (Soil + Vermicompost + FYM) showed the highest dry root weight (1.12 g), whereas T_4 (Control) recorded the lowest (0.59 g). Interaction effects revealed KT_1 (1.41 g) as the highest and JT_4 (0.47 g) as the lowest. Similar findings was reported by Sajana *et al.* (2016) [5, 6] and Seyoum *et al.* (2012) [11], who reported enhanced root dry biomass under organic-amended media.

Fresh Root Weight

Fresh root weight varied significantly, with T_1 (Kondagaon) producing the maximum (6.28 g) and T_3 (Jashpur) the minimum (4.16 g) among seed sources. Across potting mixtures, T_1 (Soil + Vermicompost + FYM) recorded the highest fresh root weight (6.86 g), while T_4 (Control) showed the lowest (4.23 g). The interaction effect revealed the maximum fresh root weight in KT_1 (9.24 g) and the minimum in JT_4 (2.96 g). Similar enhancement in root fresh weight with organic amendments was reported by Sharma *et al.* (2018) [12] and Singh & Yadav (2021) [13].

Dry Shoot Weight

Dry shoot weight differed significantly, with T_1 (Kondagaon) recording the highest (1.62 g) and T_3 (Jashpur) the lowest (1.48 g). Among potting mixtures, T_1 (Soil + Vermicompost + FYM) produced the highest dry shoot weight (1.83 g), whereas T_4 (Control) recorded the lowest (1.34 g). Interaction effects showed KT_1 (2.09 g) as the maximum and JT_4 (1.32 g) as the minimum. These results are supported Ghising *et al.* (2022) [14] and Shukla *et al.* (2016) [15], who demonstrated improved shoot biomass under organic-rich media.

Fresh Shoot Weight

Fresh shoot weight varied significantly, with T_2 (Kondagaon) showing the highest (6.82 g) among seed sources and T_1 (Jashpur) the lowest (4.30 g). Across potting mixtures, T_1 (Soil + Vermicompost + FYM) recorded the maximum (6.78 g), while T_4 (Control) showed the minimum (3.80 g). Interaction effects showed the highest fresh shoot weight in KT_1 (8.30 g) and the lowest in JT_4 (3.12 g). These results align with Ghising *et al.* (2022) [14] who reported enhanced shoot biomass under organic media.

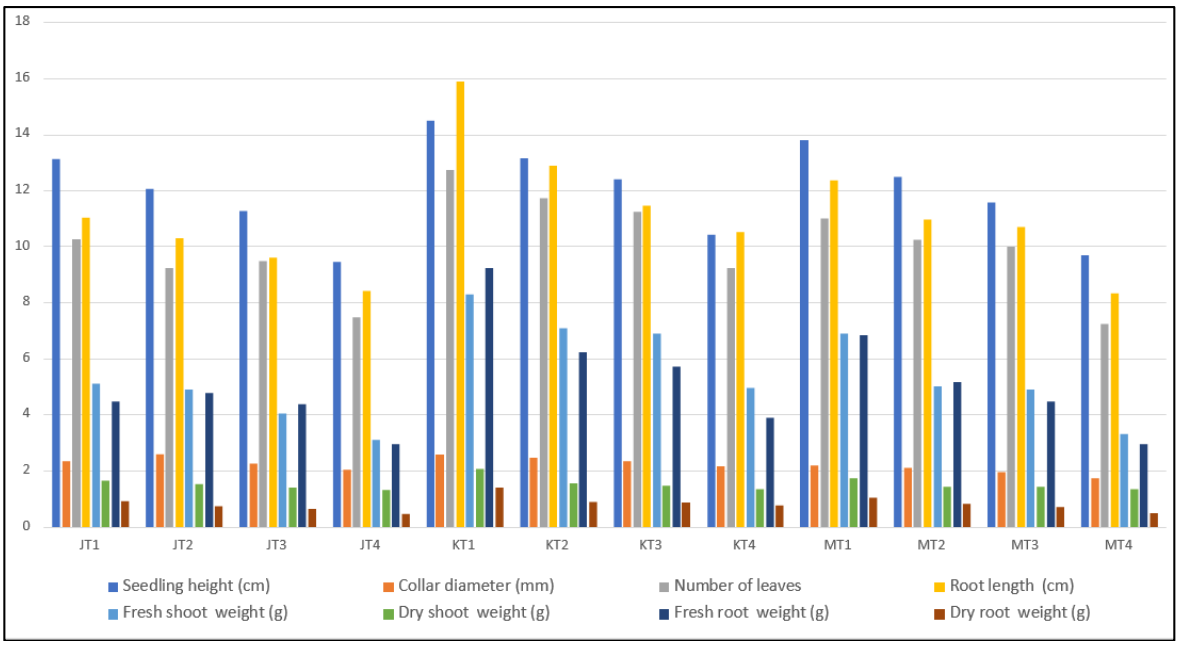
Seedling Vigour Index

Seedling vigour index differed significantly among treatments, with KT_1 (Soil + Vermicompost + FYM) recording the highest value (2598.59), while JT_4 (Control) recorded the lowest (781.43). The highest vigour index is attributed to improved germination, seedling height, and root length, whereas the lowest under control conditions indicates poor nutrient availability. Similar findings were reported by Sharma *et al.* (2023) [12] in *Schleichera oleosa* and Negi *et al.* (2022) [16] in *Pinus gerardiana.*

Table 1: Effect of interaction (seed source and potting mixture) on physical parameters of Bhilawa.

Interaction	Seedling height (cm)	Collar diameter (mm)	Number of leaves	Root length (cm)	Fresh shoot weight (g)	Dry shoot weight (g)	Fresh root weight (g)	Dry root weight (g)
JT1	13.15	2.37	10.25	11.04	5.12	1.67	4.50	0.92
JT2	12.07	2.6	9.25	10.32	4.9	1.53	4.8	0.74
JT3	11.3	2.27	9.5	9.62	4.06	1.41	4.4	0.67
JT4	9.47	2.05	7.5	8.42	3.12	1.32	2.96	0.47
KT1	14.5	2.6	12.75	15.9	8.3	2.09	9.24	1.41
KT2	13.17	2.47	11.75	12.9	7.1	1.58	6.26	0.90
KT3	12.4	2.35	11.25	11.48	6.92	1.48	5.72	0.88
KT4	10.45	2.17	9.25	10.52	4.96	1.35	3.92	0.79
MT1	13.8	2.22	11	12.38	6.92	1.75	6.86	1.05
MT2	12.5	2.12	10.25	10.98	5.02	1.44	5.18	0.84
MT3	11.6	1.97	10	10.7	4.92	1.46	4.5	0.71
MT4	9.72	1.75	7.25	8.34	3.34	1.35	2.98	0.51
CD @ 0.05 %	N/A	N/A	N/A	1.007	0.438	0.16	0.773	0.066
SE(d)	0.554	0.084	0.522	0.498	0.216	0.08	0.382	0.033
SEm ±	0.391	0.059	0.369	0.352	0.153	0.056	0.27	0.023

Note-K-Kondagaon, J-Jashpur, M-Mohla Manpur



Effect of interaction (seed source and potting mixture) on physical parameters of Bhilawa.

Conclusion

The present study clearly demonstrates that both seed source variation and potting mixture composition significantly influence the growth and vigour of *Semecarpus anacardium* seedlings. Among the seed sources, T_2 (Kondagaon) consistently outperformed others by producing the tallest

seedlings, highest collar diameter, highest number of leaves and branches, as well as maximum root and shoot biomass. In contrast, T_1/T_3 (Jashpur) generally recorded the lowest values across most parameters.

Across potting mixtures, T_1 (Soil + Vermicompost + FYM) proved to be the most effective medium, resulting in maximum seedling height, diameter, leaf and branch count, root length, fresh and dry biomass, and the highest Seedling Vigour Index. The control treatment (T_4) consistently produced the lowest growth and vigour, highlighting the crucial role of organic nutrient supplementation.

The interaction effects further revealed that KT_1 was the most suitable combination for optimum seedling performance, producing the highest values for almost all morphological and biomass parameters. Conversely, JT_4 (Jashpur × Control) was the least effective.

Overall, the study confirms that seed source selection combined with organic enriched growing media significantly enhances seedling quality. The use of vermicompost and FYM in the potting mixture greatly improves nutrient availability, root development, and overall vigour. Thus, for large-scale requirement of bhilawa seedlings for afforestation or plantation programme the combination of Kondagaon seed source with T1 treatment is recommended for achieving robust and high-quality planting stock of bhilawa (*Semecarpus anacardium*).

Reference

1. Deshmukh NA, Anandrao N. Studies on variability in marking nut (*Semecarpus anacardium* L.). Parbhani: Vasantrao Naik Marathwada Krishi Vidyapeeth; 2007. p. 1-XX.
2. Deshmukh NA, Waskar DP, Sable PB. Variability in marking nut (*Semecarpus anacardium* L.) accessions from Marathwada region of Maharashtra State. J Hortic Sci. 2010;5(1):71-74.
3. Nagar S. Seed source variation in marking nut (*Semecarpus anacardium* L.) for growth and yield parameters. Int J For Hortic. 2016;2(1):12-16.
4. Panda BM, Hazra S. Seedling culture of *Semecarpus anacardium* L. Seed Sci Biotechnol. 2009;3(1-2):54-59.
5. Sajana S. Studies on effect of plant growth regulators on seed germination and seedling growth of marking nut (*Semecarpus anacardium* L.). Parbhani: Vasantrao Naik Marathwada Krishi Vidyapeeth; 2016. p. 1-XX.
6. Sajana S, Munde GR, Shirsath AH. Effect of growing media on seed germination and seedling growth of marking nut (*Semecarpus anacardium* L.). Plant Arch. 2016;16(1):21-23.
7. Haque F, Singh N. Seed germination of *Semecarpus anacardium* L.f. under various treatments. J Med Plants Stud. 2022;10(2):1-4.
8. Rathiesh P, Negi AK, Singh D. Effect of seed size on germination of *Semecarpus anacardium* (marking nut) in Garhwal Himalaya. Int J Curr Microbiol Appl Sci. 2019;8(9):2590-2596.
9. Ghawade PM, Pimpalpalle LV, Palepad KB. Study of correlation and index ranging of marking nut (*Semecarpus anacardium* L.) genotypes in Parbhani district of Marathwada region. J Pharmacogn Phytochem. 2018;7(2):3336-3339.
10. Essien BA, Essien JB, Ogbu JU, Nwite JC, Anaele UM, Keke CI. Study on nursery media for germination and early seedling growth of *Dennettia tripetala*. Niger J Hortic Sci. 2010;15:9-13.
11. Seyoum Y, Alem D, Getnet F, Kebede B. Nursery growth and biomass of seedlings of nine tree species planted under different potting media in northwest Ethiopia. Ethiop J Biol Sci. 2012;11(2):105-116.
12. Sharma R, Gupta A, Kour R, Bakshi P, Kour K, Jamwal S. Effect of different growing media on germination and seedling growth of walnut (*Juglans regia* L.). Pharma Innov J. 2018;12(12):794-798.
13. Singh S, Yadav R. Effect of different growing media on the growth and biomass of poplar (*Populus deltoides*). Pharma Innov J. 2021;12(6):819-823.
14. Ghising S, Dey AN, Dey A. Growth performance of teak (*Tectona grandis* Linn.) stump under different growing media in nursery. Biol Forum Int J. 2022;14(3):322-330.
15. Shukla A, Patel M, Singh S. Effects of growing media with bioinoculants on quality seedling production of *Eucalyptus tereticornis* in nursery conditions. Eur J Exp Biol. 2016;6(3):86-93.
16. Negi N, Sharma CM. Effect of vermicompost doses on growth and quality of *Juniperus polycarpos* seedlings in nursery. Ann Arid Zone. 2023;62(2):167-174.
17. Sharma A, Sharma R, Sharma S. Effect of vermicompost-enriched medium on seedling vigour index in *Schleichera oleosa*. Pharma Innov J. 2023;12(7):340-345.