

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(2): 451-456
www.biochemjournal.com
Received: 21-11-2025
Accepted: 26-12-2025

Parvati Tamrakar
Ph.D. Scholar, Department of
Forestry, COA, IGKV, Raipur,
Chhattisgarh, India

RK Prajapati
Professor, Department of
Forestry, COA., IGKV,
Raipur, Chhattisgarh, India

Sarita Bodalkar
Scientist, Department of
Forestry, COA., IGKV,
Raipur, Chhattisgarh, India

Akanksha Kesharwani
Ph.D Scholar, Department of
Forestry, COA, IGKV, Raipur,
Chhattisgarh, India

Morphological variation in fruits of *Terminalia chebula* Retz. across the agro-climatic zones of Chhattisgarh

Parvati Tamrakar, RK Prajapati, Sarita Bodalkar and Akanksha Kesharwani

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i2Sf.7650>

Abstract

Terminalia chebula Retz. is an important medicinal tree species widely valued for its therapeutic and commercial significance. The present study was conducted during 2023-24 in the Department of Forestry, Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur (C.G.), to evaluate the influence of different agro-climatic zones of Chhattisgarh, namely the Northern Hills, Chhattisgarh Plains, and Bastar Plateau, on the morphological characteristics of *T. chebula*, with special emphasis on fruit size and dry pulp yield. Significant variation was recorded in fruit characteristics among the candidate plus trees studied across the three zones. In the Northern Hills, fruit area ranged from 34.80 to 87.80 mm², and the maximum dry pulp weight recorded was 6.03 g. In the Chhattisgarh Plains, fruit area ranged from 42.80 to 72.80 mm², with the highest dry pulp weight of 6.20 g observed among all zones. In the Bastar Plateau, fruit area varied from 42.10 to 84.70 mm², and the maximum dry pulp weight recorded was 4.85 g. The Chhattisgarh Plains showed comparatively superior performance in terms of dry pulp yield, indicating greater potential for commercial exploitation. The wide morphological variability observed in fruit traits reflects the combined influence of genetic makeup and environmental conditions prevailing in different agro-climatic zones. This variability provides a strong scientific basis for the identification and selection of superior genotypes. The findings of the present investigation will be useful for future conservation strategies, genetic improvement programmes, and mass multiplication of superior genetic material of *Terminalia chebula* in Chhattisgarh, thereby contributing to commercial productivity and utilization of this important medicinal tree species.

Keywords: *Terminalia chebula*, fruit morphology, agroclimatic zones, dry pulp weight, phenotypic variation, genetic improvement

Introduction

Terminalia chebula Retz. is an important medicinal tree species widely used in traditional systems of medicine and valued for its therapeutic and commercial significance. The fruits contain several bioactive compounds such as tannins, polyphenols, and flavonoids, which exhibit antioxidant, antimicrobial, anti-inflammatory, and antidiabetic properties (Bag *et al.*, 2013; Wang *et al.*, 2024) ^[1, 33]. Due to these pharmacological activities, *T. chebula* is extensively utilized in pharmaceutical, nutraceutical, and herbal industries.

The fruits of *T. chebula* form a major component of Triphala, a well-known Ayurvedic formulation prepared from *Terminalia chebula*, *Terminalia bellirica*, and *Embolica officinalis*. Triphala is widely used for treating digestive disorders, improving metabolism, and enhancing overall health (Singh *et al.*, 2023) ^[29]. Traditionally, the fruits are valued for their laxative, astringent, stomachic, and tonic properties and are commonly prescribed for gastrointestinal and metabolic ailments (Bag *et al.*, 2013; Jaiswal *et al.*, 2016) ^[1, 11].

Chhattisgarh exhibits diverse agroclimatic conditions that influence plant growth, development, and fruit characteristics. Variations in temperature, rainfall, soil type, and altitude across different zones affect morphological traits, resulting in significant differences in fruit size, shape, and weight due to genotype × environment interactions (Fitter and Hay, 2002) ^[8]. Such environmental heterogeneity plays a crucial role in determining phenotypic expression in forest tree species.

Corresponding Author:
Parvati Tamrakar
Ph.D. Scholar, Department of
Forestry, COA, IGKV, Raipur,
Chhattisgarh, India

Morphological evaluation of fruit traits is essential for identifying superior genotypes for tree improvement and commercial production, particularly in economically important medicinal species. Larger fruit size and higher pulp content are considered desirable traits for both therapeutic and commercial purposes (Rajini, 2014) [25]. However, limited information is available on the agroclimatic influence on fruit morphology of *T. chebula* in Chhattisgarh. Therefore, the present study was undertaken to assess the effect of different agroclimatic zones on fruit morphological traits and to identify promising genotypes for future tree improvement programmes.

Methodology

The study was conducted during 2023-2024 across three major agroclimatic zones of Chhattisgarh, namely the Northern Hills, Chhattisgarh Plains, and Bastar Plateau. Two representative locations were selected from each zone: Baikunthpur and Manendragarh (Northern Hills), Dhamtari and Gariyaband (Chhattisgarh Plains), and Dantewada and Jagdalpur (Bastar Plateau). These zones differ in climate, rainfall, temperature, and vegetation, providing diverse environmental conditions for evaluating fruit morphology. For fruit sampling, three sites were selected within each study area. Mature fruits of *Terminalia chebula* were collected during the natural maturity period from mid-October to mid-December in 2023 and 2024. At each site, ten healthy trees were randomly chosen from different forest stands, maintaining a minimum distance of 1 km between tree clusters to minimize genetic similarity. From each selected tree, 10 to 30 fruits were collected for morphological evaluation. Collected fruits were cleaned and air-dried before analysis. Important morphological traits, including fruit length, fruit diameter, fruit weight, pulp weight, seed weight, and pulp-to-seed ratio, were measured using standard procedures. Fruit length and diameter were recorded with a digital vernier calliper, while weights were measured using an electronic balance. The recorded data were subjected to statistical analysis to assess variation among agroclimatic zones and genotypes. Mean values, range, and standard deviation were calculated for each trait.

Results

A comprehensive survey conducted during 2023 and 2024 across the three major agroclimatic zones of Chhattisgarh revealed considerable variation in fruit and tree characteristics of *Terminalia chebula*. Significant differences were observed in fruit shape, colour, size, fresh and dry weight, pulp content, and seed weight, along with tree height and girth at breast height, indicating wide phenotypic diversity within and among the studied populations.

Northern Hills Zone

In the Northern Hills zone, fruit length ranged from 20.25 to 46.25 mm with a mean of 30.70 ± 5.74 mm, while fruit breadth varied between 12.45 and 33.55 mm, averaging 19.81 ± 3.56 mm. Fruit area ranged from 34.80 to 87.80 mm² with a mean of 50.46 ± 9.33 mm². Fresh fruit weight varied from 4.51 to 17.10 g, with an average of 7.61 ± 2.48 g, whereas dry fruit weight ranged from 2.09 to 11.66 g, with a mean of 4.16 ± 1.57 g. Dry pulp weight and dry seed weight ranged from 1.15 to 6.03 g and 0.54 to 5.63 g, with mean values of 2.58 ± 0.99 g and 1.55 ± 0.82 g, respectively. The pulp-to-seed ratio ranged from 0.95 to 3.38, averaging

1.94 ± 0.60 . Moisture content varied between 1.23% and 2.37%, with a mean of $1.86 \pm 0.25\%$. Tree height ranged from 6.0 to 17.0 m with an average of 11.87 ± 2.70 m, while girth at breast height varied from 46.0 to 226.0 cm, averaging 138.28 ± 36.25 cm.

Chhattisgarh Plains Zone

In the Chhattisgarh Plains zone, fruit length ranged from 25.80 to 47.30 mm with a mean of 34.57 ± 4.93 mm, while fruit breadth averaged 22.17 ± 2.00 mm. Fruit area ranged from 42.80 to 72.80 mm² with a mean of 56.76 ± 6.36 mm². Fresh fruit weight varied from 5.44 to 16.30 g, averaging 9.68 ± 2.86 g. Dry fruit weight ranged from 2.98 to 9.04 g, with a mean of 5.03 ± 1.34 g. Dry pulp and seed weights ranged from 1.93 to 6.20 g and 0.50 to 4.18 g, with mean values of 2.96 ± 0.83 g and 2.07 ± 0.80 g, respectively. The pulp-to-seed ratio varied from 0.58 to 3.26, averaging 1.76 ± 0.53 . Moisture content ranged from 1.06% to 2.75%, with a mean of $1.99 \pm 0.25\%$. Tree height ranged from 5.0 to 19.0 m with an average of 11.45 ± 4.20 m, while girth varied from 37.0 to 246.0 cm, averaging 132.64 ± 53.27 cm.

Bastar Plateau Zone

In the Bastar Plateau zone, fruit length ranged from 23.15 to 63.00 mm with a mean of 33.70 ± 6.28 mm, while fruit breadth averaged 19.90 ± 2.35 mm. Fruit area ranged from 42.10 to 84.70 mm² with a mean of 53.40 ± 7.52 mm². Fresh fruit weight varied from 3.77 to 14.80 g, averaging 7.33 ± 2.23 g. Dry fruit weight ranged from 1.98 to 6.89 g, with a mean of 4.12 ± 1.27 g. Dry pulp and seed weights ranged from 0.95 to 4.85 g and 0.37 to 3.86 g, with mean values of 2.42 ± 1.00 g and 1.67 ± 0.68 g, respectively. The pulp-to-seed ratio ranged from 0.77 to 7.74, averaging 1.85 ± 1.21 . Moisture content varied from 1.26% to 3.16%, with a mean of $1.84 \pm 0.38\%$. Tree height ranged from 5.0 to 22.0 m with an average of 11.13 ± 4.46 m, while girth varied from 18.0 to 266.0 cm, averaging 119.16 ± 50.46 cm.

Discussion

The present study revealed substantial morphological variation in fruit and tree traits of *Terminalia chebula* across the three agroclimatic zones of Chhattisgarh, indicating wide phenotypic diversity within the species. Variations observed in fruit size, weight, dry pulp content, seed characteristics, tree height, and girth at breast height clearly demonstrate the influence of both environmental conditions and genetic factors on trait expression. Such extensive variability offers valuable opportunities for selection of superior genotypes and genetic improvement programmes.

The pronounced differences in fruit area and dry pulp weight among the agroclimatic zones highlight the role of local environmental regimes in determining fruit development and dry matter accumulation. The comparatively higher mean fruit area and dry pulp weight recorded in the Chhattisgarh Plains suggest more favourable conditions for pulp formation and fruit growth, whereas the wider ranges observed in the Northern Hills and Bastar Plateau indicate the presence of diverse genotypes adapted to varied ecological conditions. Similar variability in pulp yield has been recognized as an important criterion for identifying elite trees in medicinal species.

The morphological differences recorded in the present investigation are consistent with earlier findings. Gowda (2002) [9] reported significant variation in fruit dimensions

among different provenances, with the Shimoga source producing fruits of maximum weight, length, and breadth. Dhiman (2003) ^[6] also documented wide diversity in fruit size and shape, including ovoid and ellipsoid forms. Thakur and Rana (2008) ^[31] and Thakur *et al.* (2008) ^[32] further highlighted pronounced differences in fruit morphology, chemical attributes, and seed-to-pulp ratio, which closely align with the variability observed in the current study. Comparable patterns of fruit trait variability have been reported by Navhale *et al.* (2011) ^[18] and Gowda *et al.* (2011) ^[10]. Sanjeewa *et al.* (2013) ^[27], while examining *T. chebula* populations across Sri Lanka, observed considerable regional differences in morphological traits, indicating broad ecological adaptability of the species. Rajini (2014) ^[25] emphasized the existence of elite genotypes, identifying accession IIHRTc10 as highly superior in fruit size, volume, and weight, thereby demonstrating the potential for selecting high-yielding planting material. Khan *et al.* (2015) ^[14] provided detailed descriptions of fruit and seed characteristics, reporting variations in fruit shape, surface texture, and dimensions, which correspond with the diverse fruit forms observed in the present investigation. Phukan (2019) ^[21] also recorded significant differences in fruit length, breadth, and weight across locations, further supporting the presence of substantial intra-specific variation. In Chhattisgarh, Prajapati *et al.* (2020) ^[24] documented natural variation in fruit pulp weight from Kondagaon and Kanker districts, which is comparable to the wide range of dry pulp weight recorded in this study. Nakandalage *et al.*

(2021) ^[17] also confirmed extensive morphological diversity in *T. chebula* germplasm, identifying multiple fruit shapes, thereby reinforcing the present findings.

Similar patterns of variation have been reported across other species, including *Acacia* (Bagchi *et al.*, 1991; Kumar A.S., 2016; Mayavel *et al.*, 2023; Panjoria O., 2023) ^[2, 15, 16, 19], *Azadirachta indica* (Prabakaran *et al.*, 2019) ^[22], *Terminalia bellerica* (Sood *et al.*, 2009; Dangi *et al.*, 2012; Das *et al.*, 2020) ^[30, 4, 5], *Dalbergia sissoo* (Dubey and Tripathi, 2018; Dhiman *et al.*, 2020) ^[7, 6], *Diospyros melanoxylon* (Patel *et al.*, 2021) ^[20], *Jatropha curcas* (Kaushik *et al.*, 2007a) ^[12], *Pongamia pinnata* (Kaushik *et al.*, 2007b) ^[13], *Phyllanthus emblica* (Choudhary *et al.*, 1995; Singh *et al.*, 2012) ^[3, 28] and *Tamarindus indica* (Prabhushankar and Melanta, 2004). These studies collectively indicate that morphological diversity is a common characteristic of tree species distributed across diverse ecological regions, reflecting adaptive responses to varying environmental conditions.

Overall, the findings of the present study reinforce and expand existing knowledge on morphological diversity in *Terminalia chebula*. The observed variability across agroclimatic zones is likely influenced by environmental heterogeneity, genetic makeup, and ecological adaptation. This diversity underscores the importance of systematic evaluation and selection of superior genotypes for conservation, domestication, and commercial utilization. Continued research integrating morphological, molecular, and environmental approaches will further strengthen tree improvement programmes and promote sustainable utilization of this valuable medicinal species.

Table 1: Effect of different Agroclimatic zones of Chhattisgarh on Morphological variations in fruit and tree parameters of *Terminalia chebula*.

Agroclimatic Zone	Parameters	Fruit Length (mm)	Fruit Breadth (mm)	Fruit area (mm ²)	Fresh Fruit Wt. (g)	Dry Fruit Wt. (g)	Dry Pulp Wt. (g)	Dry Seed Wt. (g)	Dry Pulp/Dry Seed Ratio	Moisture %	Tree Ht. (m)	Tree Girth (cm)
Northern hills zone	Maximum	46.25	33.55	87.80	17.10	11.66	6.03	5.63	3.38	2.37	17.0	226.0
	Minimum	20.25	12.45	34.80	4.51	2.09	1.15	0.54	0.95	1.23	6.0	46.0
	Mean	30.70	19.81	50.46	7.61	4.16	2.58	1.55	1.94	1.86	11.87	138.28
	Standard Deviation	5.74	3.56	9.33	2.48	1.57	0.99	0.82	0.60	0.25	2.70	36.25
Chhattisgarh Plains zone	Maximum	47.30	27.55	72.80	16.30	9.04	6.20	4.18	3.26	2.75	19.0	246.0
	Minimum	25.80	18.00	42.80	5.44	2.98	1.93	0.50	0.58	1.06	5.0	37.0
	Mean	34.57	22.17	56.76	9.68	5.03	2.96	2.07	1.76	1.99	11.45	132.64
	Standard Deviation	4.93	2.00	6.36	2.86	1.34	0.83	0.80	0.53	0.25	4.20	53.27
Bastar Plateau zone	Maximum	63.00	28.55	84.70	14.80	6.89	4.85	3.86	7.74	3.16	22.0	266.0
	Minimum	23.15	15.20	42.10	3.77	1.98	0.95	0.37	0.77	1.26	5.0	18.0
	Mean	33.70	19.90	53.40	7.33	4.12	2.42	1.67	1.85	1.84	11.13	119.16
	Standard Deviation	6.28	2.35	7.52	2.23	1.27	1.00	0.68	1.21	0.38	4.46	50.46

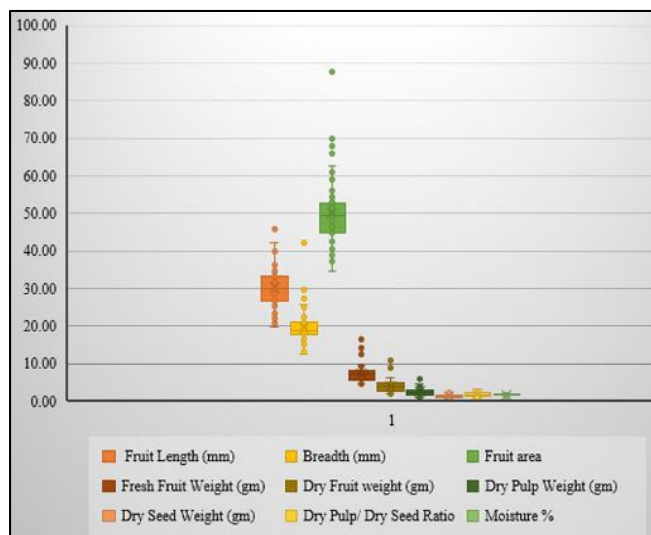


Fig 1: Box Chart representing the variations in Fruit parameters of *Terminalia chebula* in Northern Hills zone.

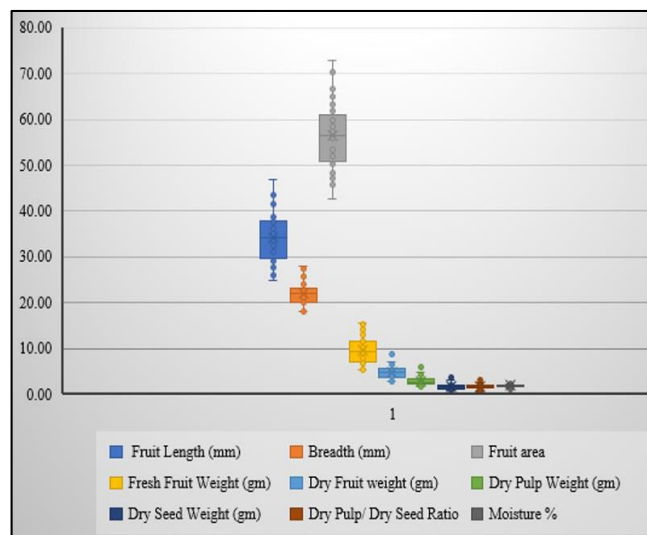


Fig 2: Box chart representing variations in fruit traits of *Terminalia chebula* in the Chhattisgarh Plains zone.

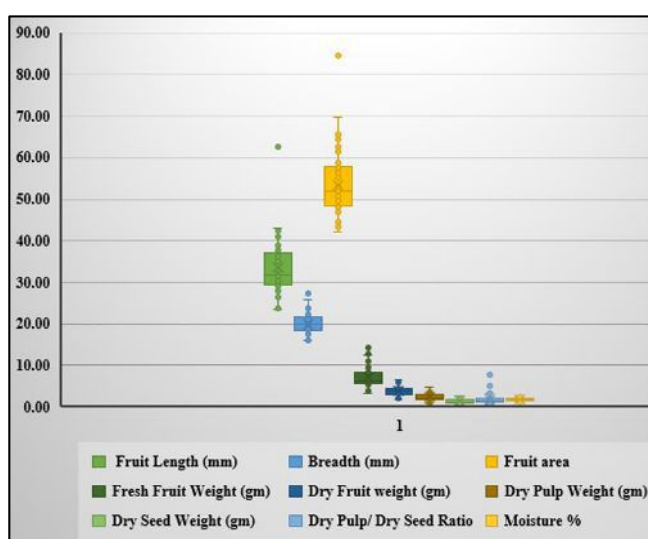


Fig 3: Box chart representing variations in fruit traits of *Terminalia chebula* in the Bastar Plateau zone.



Fig 4: Fruit collection and measurement of tree parameters of *Terminalia chebula*.



Fig 5: Variations in fruit traits of *Terminalia chebula* from different sites (a) Northern hills, (b) Chhattisgarh plains, (c) Bastar Plateau.



Fig 6: Morphological variation in the fruits of *Terminalia chebula* from three Agroclimatic zones of Chhattisgarh.

Conclusion

The present study revealed considerable morphological variation in fruit and tree traits of *Terminalia chebula* across the three major agroclimatic zones of Chhattisgarh, indicating wide phenotypic diversity within the species. Significant differences in fruit size, weight, pulp content, seed characteristics, and tree growth parameters reflect the combined influence of genetic and environmental factors. The Chhattisgarh Plains showed comparatively higher mean values for fruit area and dry pulp weight, suggesting favourable conditions for fruit development, while the Northern Hills and Bastar Plateau exhibited wider ranges, indicating diverse adaptive genotypes. This variability provides valuable opportunities for the selection of superior planting material. The findings highlight the importance of systematic evaluation, conservation, and utilization of diverse germplasm for genetic improvement, domestication, and mass multiplication of superior quality planting material of *Terminalia chebula* for afforestation programme.

Acknowledgement

I express my sincere gratitude to my respected guide Professor R. K. Prajapati for his valuable guidance, constant encouragement, and scholarly support throughout the course of this research work. His expertise and motivation greatly contributed to the successful completion of this study. I am also deeply thankful to the Forest Department of Chhattisgarh for their kind cooperation and support in every area of research, especially in assisting with fieldwork for identifying and studying the morphological variation of fruits.

References

1. Bag A, Bhattacharyya SK, Chattopadhyay RR. The development of *Terminalia chebula* Retz. (Combretaceae): phytochemistry and pharmacological activities. Biomed Res Int. 2013;2013:1-12.
2. Bagchi SK, Dobriyal ND. Provenance variation in seed parameters of *Acacia nilotica*. Indian For. 1991;116(12):958-961.
3. Choudhary SM, Sheje MB, Desai UT. Seedling selection in amla. J Maharashtra Univ Agric Sci. 1995;11(2):174-175.
4. Dangi B, Jain R, Kachhwaha S, Kothari SL. Assessment of diversity in *Terminalia bellerica* Roxb. using morphological, phytochemical and molecular markers. Nat Acad Sci Lett. 2012;35(1):135-144.
5. Das H, Nayak S, Sadangi D. Variation in morphometric characters, germination and oil content of *Terminalia bellirica* seeds collected from different provenances of Odisha, India. J Appl Nat Sci. 2020;12:319-327.
6. Dhiman AK. Sacred plants and their medicinal uses. New Delhi: Daya Publishing House; 2003. p. 27-189.
7. Dubey S, Tripathi S. Studies on fifteen seed source variations in seed traits of *Dalbergia sissoo* Roxb. Int J Sci Res. 2018;7(9):197-200.
8. Fitter AH, Hay RKM. Environmental physiology of plants. 3rd ed. London: Academic Press; 2002. p. 1-432.
9. Gowda M. Studies on variability and standardization of propagation techniques in *Terminalia chebula* Retz. [PhD thesis]. Bangalore: University of Agricultural Sciences; 2002. p. 1-215.

10. Gowda M, Narayanaswamy M, Ravi CS. Morphological variability in tree and fruit characters of *Terminalia chebula* in different geographical locations of Karnataka. *Res J Agric Sci.* 2011;2(3):745-746.
11. Jaiswal Y, Liang Z, Zhao Z. Botanical drugs in Ayurveda and traditional Indian medicine. *J Ethnopharmacol.* 2016;194:245-259.
12. Kaushik N, Kumar K, Kumar S, Kaushik N, Roy S. Genetic variability and divergence studies in seed traits and oil content of *Jatropha curcas* L. accessions. *Biomass Bioenergy.* 2007;31(7):497-502.
13. Kaushik N, Kumar S, Kumar K, Beniwal RS, Roy S. Genetic variability and association studies in pod and seed traits of *Pongamia pinnata* (L.) Pierre in Haryana, India. *Genet Resour Crop Evol.* 2007;54:1827-1832.
14. Khan MU, Khalilullah H, Akhtar J, Elhasan GO. *Terminalia chebula*: An ephemeral glance. *Int J Pharm Pharm Sci.* 2015;7(2):40-43.
15. Kumar AS. Morphological variations in seed and seedling characteristics of different seed sources of *Acacia nilotica* [MSc thesis]. Bhubaneswar: Orissa University of Agriculture and Technology; 2016. p. 1-120.
16. Mayavel A, Krishnan S, Warriar RR, Lingeshwaran PK, Raj JS, Sivakumar V. Provenance variation in seed biometry, germination and seedling traits in *Azadirachta indica*. *Int J Bioresour Stress Manag.* 2023;14(1):1-11.
17. Nakandalage N, De Silva MA, Anuruddi HIGK, Priyadarshani HLI, Kumarasinghe HKMS, Subasinghe S. Morphological characterization of *Terminalia chebula* and their propagation techniques. *Int J Minor Fruits Med Aromat Plants.* 2021;7(1):84-88.
18. Navhale VC, Sonone NG, Jangam PS, Jadhav ST, Bhawe SG. Genetic variability and selection of candidate plus trees in chebolic myrobalan (*Terminalia chebula*). *Electron J Plant Breed.* 2011;2(1):157-163.
19. Panjoria O. Variability and genetic divergence studies in seed and seedling traits of candidate plus trees of *Acacia catechu* Willd. [MSc thesis]. Nauni, Solan: Dr YS Parmar University of Horticulture and Forestry; 2023. p. 1-145.
20. Patel C, Prajapati RK, Nayak AP. Morphological characterization of tendu fruit (*Diospyros melanoxylon* Roxb.) and selection of plus trees. *Pharma Innov J.* 2021;10(9):14-23.
21. Phukan PT. Morpho-physiological and biochemical characterization of some minor fruits of Assam [PhD thesis]. Jorhat: Assam Agricultural University; 2019. p. 1-210.
22. Prabakaran P, Kumaran K, Baburaj LK, Balaji S, Mageshram S, Balakumar C, *et al.* Variability studies on seed parameters, oil and azadirachtin content of neem. *Int J Curr Microbiol Appl Sci.* 2019;8(5):339-346.
23. Prabhushankar DS, Melanta KR. Variability in fruit characteristics of *Tamarindus indica* clones. *Karnataka J Agric Sci.* 2004;17(2):365-367.
24. Prajapati RK, Nayak AP, Patel C, Verma Y, Samal B. Morphological characterization of *Terminalia chebula* and selection of plus trees. *Int J Chem Stud.* 2020;8(4):1074-1082.
25. Rajini PS. Evaluation of morphological variability in *Terminalia chebula* accessions. *Indian J For.* 2014;37(3):289-295.
26. Rajini TN. Characterization and seed germination studies in Indian myrobalan (*Terminalia chebula*) [MSc thesis]. Bagalkot: University of Horticultural Sciences; 2014. p. 1-132.
27. Sanjeeva TABD, Pushpakumara DKN, Sangakkara UR. Morphological characterization of *Terminalia chebula* in Sri Lanka. *Trop Agric Res.* 2013;25(1):127-132.
28. Singh B, Uniyal AK, Rawat JS, Rana DK. Estimation of genetic variability in *Phyllanthus emblica* L. *J Horticult For.* 2012;4(5):92-95.
29. Singh P, Tripathi PK, Singh RL. Biochemistry and phytochemistry of Triphala and therapeutic potential. In: *Encyclopedia of Life Support Systems (EOLSS)*. Oxford: UNESCO; 2023. p. 1-25.
30. Sood KK, Saleem M, Singh P. Variability studies on fruit characteristics of *Terminalia bellirica*. *J Res SKUAST-J.* 2009;8(1):86-91.
31. Thakur M, Rana RC. Physico-chemical evaluation of *Terminalia chebula* fruits. *Timber For Prod.* 2008;15(1):37-42.
32. Thakur S, Sharma K, Gupta A. Assessing natural variation in fruits and seeds of harar (*Terminalia chebula*). *Indian J Agrofor.* 2008;10(2):66-70.
33. Wang C, Zhang H, Wang X, Wang X, Li X, Li C, *et al.* Comprehensive review on fruit of *Terminalia chebula*. *Molecules.* 2024;29(23):5547.