

Phytosociological Studies on Natural Populations of *Terminalia chebula* Retz. in Malghat Area of Western Vidarbha Region of Maharashtra, India

A. J. Deshmukh, K. Upadhyaya, Y. B. Taide, H. K. Deshmukh

Received 4 April 2025, Accepted 6 May 2025, Published on 30 May 2025

ABSTRACT

The present study was done on the phytosociological status of *Terminalia chebula* Retz. in Malghat area of Western Vidarbha region of Maharashtra. The ten natural populations of *T. chebula* distributed in study area was selected with the objective to study distribution pattern and associative tree species of *T. chebula* in these 10 populations. The vegetation survey was conducted wherein, 10 quadrats of size 20 m × 20 m (400 m²) size was laid down randomly. The result shows that all the individuals of *T. chebula* are in the range of 80-220 cm GBH with a density

of 45 trees/ha and more than 55% of the individual trees of *T. chebula* are in the girth class of 160-180 cm. There was complete absence of natural regeneration of *T. chebula* in study area. Further, the most of the individuals of *T. chebula* adult trees was found to be almost of the same size producing flowers and fruits but no seedlings were successfully established. The major associate tree species found to be *Tectona grandis*, *Madhuca longifolia*, *Dyospyros melanoxylon*, *Butea monosperma*, *Terminalia bellirica*, *Buchanania lanzan* and *Pongamia pinnata*. The complete absence of natural regeneration of *T. chebula* confirm the urgency of propagation of the species with the help of artificial techniques, and reduction in destructive harvesting methods such as hacking tree branches and looping pressure.

Keywords Phytosociology, *Terminalia chebula*, Natural population, Natural regeneration, Girth Class, Associate species.

A. J. Deshmukh^{1*}, Y. B. Taide³, H. K. Deshmukh⁴

¹Senior Research Assistant, ^{3,4}Professor
College of Forestry, Dr. Panjabrao Deshmukh Krishi Vidyapeeth,
Akola 444104, Maharashtra, India

K. Upadhyaya²

Professor, Department of Forestry,
Mizoram University, Aizawl 796004, Mizoram, India

Email: anantadeshmukh@rediffmail.com

*Corresponding author

INTRODUCTION

Malghat area in Western Vidarbha region of Maharashtra has been regarded as a veritable emporium of plant resources. *Terminalia chebula* Retz. belonging to the plant family combretaceae is one of the highly used medicinal plants worldwide. It is also known as, “King of Medicine” and is native to India and

south East Asia Dymock *et al.* (1976). It is routinely used as household remedy throughout sub-continent. The fruit pulp is used in many standard preparations such as 'triphalā' and 'chayvanprash' which is used as a food supplement. *T. chebula* is rarely found with scattered distribution in Malghat area of western Vidarbha region of Maharashtra. The forest type in Malghat area is dry deciduous forest. The actual population of *T. chebula* in Malghat area of Western Vidarbha region of Maharashtra are limited to a few areas. Moreover, natural regeneration of *T. chebula* is a problem Singh *et al.* (2020) as the nuts that contain seeds are enclosed in horny endocarp and germinate poorly. As the fruit of *T. chebula* is a drupe with a hard endocarp it requires a long period of time for the seeds to germinate which is only possible with adequate soil moisture and humus. As there is economic value the immature and matured fruits of *T. chebula* are collected by the local people. Most of the time they lopped the well-established trees in the area for the collection of the fruits. The comprehensive literature search failed to discover any useful information on phytosociology and regeneration status of *T. chebula* in Malghat region. Keeping in view the socio-economic importance of the species, the phytosociological study was done in Malghat area of Western Vidarbha region of Maharashtra.

MATERIALS AND METHODS

Study area

The present study was conducted in Malghat area of Western Vidarbha region of Maharashtra. The study site lies between 21° 24.934'N, 77° 27.524'E and 21° 38.174', 77° 29.717'E. The climate of the study site is tropical with high temperature in summer which rises up to 45°C. The rainfall ranges from 950-1400 mm per annum.

Data collection

To study the phytosociology and natural regeneration status of *T. chebula* along with the girth class distribution in its natural population ten quadrates of size 20 m × 20 m (400 m²) were laid randomly. Table 1 shows the location details of the quadrates laid. The status of sampled species was assessed based on

Table 1. Description of the ten quadrat sites.

Location	Altitude (Ft)	Latitude (N)	Longitude (E)
QL-1	3232	N - 21°. 33.156'	E - 077°. 23.732'
QL-2	1850	N - 21°. 24.934'	E - 077°. 27.524'
QL-3	2341	N - 21°. 27.265'	E - 077°. 26.495'
QL-4	2670	N - 21°. 27.137'	E - 077°. 27.131'
QL -5	2640	N - 21°. 27.454'	E - 077°. 27.604'
QL -6	2948	N - 21°. 31.034'	E - 077°. 21.910'
QL-7	3684	N - 21°. 29.659'	E - 077°. 27.655'
QL-8	3253	N - 21°. 31.341'	E - 077°. 33.486'
QL-9	2490	N - 21°. 38.174'	E - 077°. 29.717'
QL-10	2510	N - 21°. 37.839'	E - 077°. 30.237'

one-time phyto-sociological data. Size of quadrat was determined by the species area curve method. The number of trees species present in the quadrats was measured by the wooden calipers respectively. The density of plant was determined by counting the number of individuals of each tree species present in the quadrat. Vegetation data for density, frequency and abundance were quantitatively analyzed. The Importance Value Index (IVI) was calculated by using the formulae of Curtis (1959) and Mishra (1989). To find population structure of *T. chebula* the individual trees was categorized into different girth classes such as 0 to 300 cm with a class interval of 20 cm and the distribution of the species as per the girth classes was recorded accordingly.

RESULTS AND DISCUSSION

The size class distribution of tree has often been used to represent the population structure of forests. The girth class distribution confirmed a J-shaped GBH density distribution in our study depicting the lower girth class up to 80 cm containing zero individuals. It means that there is no natural regeneration in the Malghat area of Western Vidarbha region of Maharashtra. The result shows that all the individuals of *T. chebula* are in the range of 80-220 cm GBH and more than 55% of the individual trees of *T. chebula* are in the girth class of 160-180 cm (Fig. 1). The girth class distribution with reverse J-shaped population curve depicts an expanding, evolving and healthy population Sahu *et al.* (2012), Byakagaba *et al.* (2011). Contrarily, we found a J-shaped population curve which suggests an unhealthy population of *T. chebula* in the region with severe problem of natural

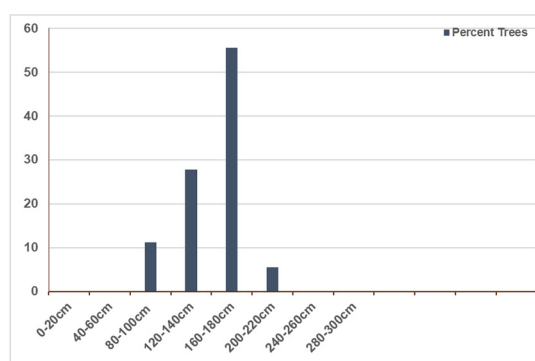


Fig. 1. Girth class distribution of *T. chebula* trees in Malghat region.

regeneration. The life criteria of a species must be by its effectiveness in recruiting new individuals into the population of concerned species. The more effective this strategy the longer the population will be able to maintain itself in natural population Singh *et al.* (2020). The reasons for the absence of natural regeneration may be the collection of the fruit at maturity

as the fruits get more economic value when almost all seeds are collected usually *T. chebula* fruit gets matured at the end of the rainy season and the left over seed after collection find difficulty in germination due to its horny endocarp Kusuma *et al.* (2024). These results are supported by the findings of Talwar and Bhatnagar (2014), Singh *et al.* (2003) and Chauhan *et al.* (2010) who also reported absence of natural regeneration of Harar in its natural populations. The scanty/failure of natural regeneration of *Terminalia chebula* in Himachal Pradesh has also been reported by Sharma and Thakur (2016). Similarly, Sharma *et al.* (2018) recorded complete absence of natural regeneration of dominant tree species like *Pinus roxburghii* and *Acacia catechu* in natural forest of Pong Dam wildlife Sanctuary, Himachal Pradesh.

The tree composition in the study area revealed that *T. chebula* dominated the study site with an IVI of 45.38. A total of 24 associate tree species belonging to 13 families and 20 genera were recorded of which the

Table 2. Phytosociological attributes of study area.

Sl. No.	Common name	Scientific name	Family	Density	Frequency	Abundance	Relative density	Relative frequency	Relative abundance	IVI
1	Hirda	<i>Terminalia chebula</i>	Combretaceae	1.8	1	1.8	22.22	17.54	5.62	45.38
2	Behada	<i>Terminalia bellirica</i>	Combretaceae	0.4	0.2	2.0	4.94	3.51	6.24	14.69
3	Charodi	<i>Buchanania lanzan</i>	Anacardiaceae	0.4	0.2	2.0	4.94	3.51	6.24	14.69
4	Biba	<i>Semecarpus anacardium</i>	Anacardiaceae	0.2	0.1	2.0	2.47	1.75	6.24	10.47
5	Aonla	<i>Phyllanthus emblica</i>	Phyllanthaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
6	Jamun	<i>Syzygium cumini</i>	Myrtaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
7	Kassod	<i>Senna siamea</i>	Fabaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
8	Mahua	<i>Madhuca longifolia</i>	Sapotaceae	0.8	0.7	1.14	9.88	12.28	3.56	25.72
9	Mango	<i>Mangifera indica</i>	Anacardiaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
10	Jatropha	<i>Jatropha curcas</i>	Euphorbiaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
11	Teak	<i>Tectona grandis</i>	Lamiaceae	1.2	0.8	1.5	14.81	14.04	4.68	33.53
12	Manila	<i>Pithecellobium dulce</i>	Fabaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
Tamarind										
13	Shisam	<i>Dalbergia sisso</i>	Fabaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
14	Karanj	<i>Pongamia pinnata</i>	Fabaceae	0.4	0.2	2.0	4.94	3.51	6.24	14.69
15	Umber	<i>Ficus racemosa</i>	Moraceae	0.3	0.3	1.0	3.70	5.26	3.12	12.09
16	Palas	<i>Butea monosperma</i>	Fabaceae	0.5	0.3	1.6	6.17	5.26	4.99	16.43
17	Pimpal	<i>Ficus religiosa</i>	Moraceae	0.2	0.2	1.0	2.47	3.51	3.12	9.10
18	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae	0.5	0.3	2.0	6.17	5.26	6.24	17.68
19	Ber	<i>Ziziphus mauritiana</i>	Rhamnaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
20	Date palm	<i>Phoenix dactylifera</i>	Arecaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
21	Babul	<i>Acacia nilotica</i>	Fabaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
22	Aapta	<i>Bauhinia racemosa</i>	Fabaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
23	Ain	<i>Terminalia tomentosa</i>	Combretaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
24	Sweet thorn	<i>Acacia karroo</i>	Fabaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11
25	Bhokar	<i>Cordia dichotoma</i>	Boraginaceae	0.1	0.1	1.0	1.23	1.75	3.12	6.11

dominant ones, as revealed by their Importance Value Index (IVI), were *Tectona grandis* (33.53), *Madhuca longifolia* (25.72), *Dyospyros melanoxylon* (17.68), *Butea monosperma* (16.43), *Terminalia bellirica*, *Buchanania lanzan* and *Pongamia pinnata* (14.69 for each) (Table 2). For *T. chebula* the associate species seems to vary depending upon the geoclimatic locations of its distribution which usually influence the composition of the vegetation of a particular region. For example, Singh *et. al.* (2019) recorded *Pinus roxburghii*, *Acacia catechu*, *Embelica officinalis*, *Mangifera indica*, *Mallotus philipensis* and *Cassia fistula* as the major associate tree species of *T. chebula* in Hamirpur district of Himachal Pradesh.

CONCLUSION

Terminalia chebula Retz. was found as dominant tree species with the IVI of 45.38 in its natural populations. But on other side *T. chebula* was recorded in tree stage only having GBH between 80-220 cm. However, the natural regeneration was found completely absent, showing lack of natural regeneration at all of *T. chebula* in the study area. Since the species has got economical value and has high demand for its fruits in national and international markets, there is urgent need to take up steps for its artificial regeneration in locations where the major associate species like *Tectona grandis*, *Madhuca longifolia*, *Dyospyros melanoxylon*, *Butea monosperma*, *Terminalia bellirica*, *Buchanania lanzan* and *Pongamia pinnata* exist.

ACKNOWLEDGMENT

Authors acknowledge their sincere thanks to the Maharashtra Forest Department, Specially, CCF & Field Director Malghat Tiger Reserve and CCF Amravati Territorial Circle, Amravati for permission to carry out the research work in Malghat area. We wish to express our deepest thanks to local field guide Mr. Pravin Jamkar for his help and support during the field work.

REFERENCES

- Byakagaba, P., Eilu, G., Bosco, L. J., & Okullo. (2011). Population structure and regeneration status of *Vitellaria paradoxa* (C.F. Gaertn.) under different land management regimes in Uganda, *Agricultural Journal*, 6 (1), 14-22.
- Chauhan, D. S., Singh, B., Chauhan, S., Shanai, C. S., & Todria, N. P. (2010). Regeneration and plant diversity of natural and planted Sal (*Shorea robusta* Gaertn F) Forests in the Terai-Bhabhar of Sohagibarwa Wildlife Sanctuary. *Indian Journal of American Science*, 6 (3), 32-45.
- Curtis, J. T. (1959). The vegetation of Wisconsin. An Ordination of Plant Communities, University Wisconsin Press, Madison, Wisconsin, 657.
- Dymock, W., Warden, C. J. H., & Hopper, D. (1976). Pharmacographia indica: A history of the principal drugs of vegetable origin met within British India. Bishen Singh Mahendra Pal Singh, Deharadun, Uttarakhand, India, 1-5.
- Kusuma, N. H., Selvi, D., Thirusendura, Umarani, R., Eevera, T., Janaki, P., & Vigneshwari. (2024). Unraveling the mystery: Decoding seed characteristics and germination challenges in *Terminalia chebula* Retz. *Tree, Forests and people*, 18, 100692.
- Mishra, K. C. (1989). Manual of plant ecology (3rd edn.). Oxford and IBH Publishing Co Pvt Ltd, New Delhi, India : 193.
- Sahu, S. C., Dhal N. K., Mohanty R. C. (2012). Tree species diversity, distribution and population structure in a tropical dry deciduous forest of Malyagiri hill ranges, Eastern Ghats, India: *Tropical Ecology*, 53 (2), 163-168
- Sharma, D., & Thakur, S. (2016). Natural regeneration status of *Terminalia chebula* Retz. in Himachal Pradesh. *International Journal of Rarm Sciences*, 6 (3): 132-136.
- Sharma, D., Gupta, A., Sagar, N., & Kumar, K. (2018). Natural regeneration status of tree species in Pong Dam Wildlife sanctuary, Himachal Pradesh. *Agric International*, 5 (2), 57-59.
- Singh, D. R. R., Dhir, K. K., Vij, S. P., Nayyar, H., & Singh, K. (2003). Study of genetic improvement technique of *Terminalia chebula* Retz.- an important multipurpose tree species of India. *Indian Forester*, 129, 154-168.
- Singh, S., Sharma, K., & Sharma, D. (2019). Phytosociological Studies on Natural Populations of *Terminalia chebula* Retz.. in District Hamirpur, Himachal Pradesh: *International Journal of Economic Plants*, 6 (4), 191-195.
- Singh, S., Sharma, K., & Sharma, D. (2020). Natural regeneration of *Terminalia chebula* Retz. in Hamirpur district of Himachal Pradesh. *Journal of Pharmacogenosy and Phytochemistry*, 9 (1), 284-287.
- Talwar, S., & Bhatnagar, A. K. (2014). Pollination biology of *Terminalia chebula* Retz.-in Delhi and Western Ghats. *The International Journal of Plant Reproductive Biology*, 6(2), 181-194.