

EP No: 17/ 2022-23 STUDY ON HABITAT SURVEY, DISTRIBUTION PATTERN AND GERMPLASM ASSEMBLAGE OF SHOREA TUMBUGGAIA ROXB AN ENDANGERED SEMI-EVERGREEN TREE SPECIES OF PENINSULAR INDIA

INTRODUCTION

The availability of medicinal plants is under serious threat in present days. Over 95% of medicinal plants used by Indian industry are collected from the wild. Threat assessment experiences as per latest IVCP guidelines, for southern and northern India have already listed about 200 species of medicinal plants that are rare, endangered and threatened. Government of India banned export of more than 50 species, believed to be threatened in the wild. There are different factors contributing to the extinction that include habitat loss, introduction of new species, over exploitation indiscrete harvesting, environmental catastrophe, geographic or genetic loss of genetic variations and stimulation of deleterious mutations (genetic erosion), urbanization, shrinking forests, over testing, genetic drift and in breeding.

Conservation aims at preservation, maintenance, sustainable utilization, restoration and ultimately enhancement of quality of life .12 taxa are known from type collection only and 5 taxa are recollected from type locality only, 12 species are included under different IUCN threat categories based on Red Data Book on Indian plants and Conservation Assessment and Management Planning (CAMP) 2001, Andhra Pradesh .*Shorea tumbuggaia* species is an endemic and globally endangered semi-evergreen tree species, (Red list of threatened species IUCN-2006) restricted to the Southern Eastern Ghats up to 100 m, distributed in Seshachalam and Veligonda Hills in Cuddapah, Tirupati Hills in Chittoor District, Andhra Pradesh and North Arcot and Chengalpet districts (Rani and Pullaiah, 2002). *Shorea tumbuggaia* Roxb. Is endemic to Middle Eastern Ghats of Andhra Pradesh and Tamilnadu, endangered globally according to the CAMP and is critically endangered.

Species Description

Shorea tumbuggaia Roxb. or *Vaticatum buggaia*. Wt. & Arn. (Dipterocarpaceae). Commonly known as Green Dammar. It is large sporadic resinous tree attains the maximum height of about 20-30 m with maximum width of 150-190 cm. Bark is thick, rough dark brown longitudinally furrowed, within the furrows gum is exuded. Simple leaves with ultimate reticulate venation.

Inflorescence is Axillary/ terminal panicles. Flowers white. Fruits with a woody pericarp with wings 2-3 times as long as capsule. Single seed with 4 unequal fleshy cotyledons.

Flowering occurs during April to May and fruiting May to June. Each fruit produces only one seed against the actual number of six ovules. The sepals are acresent in that they are thickened, and three of them expand into wings and are larger than the other two sepals. The fruit wall is free from calyx, woody, with a thin inner membranous lining invaginated into the folds of cotyledons and split into two parts at the apex. *Shorea tumbuggaia* is a tree taxon with economic and medicinal values. Stem is used in marine yards as a substitute for pitch.

The major advance in plants produced the marvelous diversity found in seeds and their accompanying fruit structures. The seed itself is the end product of process of growth and development within the parent plant. It is noted that about 10% of all plant species are endangered indicating widespread degradation of ecosystem and therefore the urgent need for strategic conservation action for the selected plant taxon.

Hence the present study focused on suitable climatic conditions, soil characteristics, seed viability, seed germination, seedling vigour index, seedling establishment, growth and development. In order to increase the percentage of seed germination *In vivo* protocol will be very much helpful for mass cultivation practices of the *Shorea tumbuggaia*.

OBJECTIVES

1. To provide the baseline data of selected tree species population structure and distribution pattern to develop the conservation measures to protect the vanishing resources.
2. To develop pre-treatment methods for breaking seed dormancy and seed quality enhancement of selected tree species to enhance seed germination and seedling vigor.
3. To select superior genetic resources of *Shorea tumbuggaia* across its natural distribution and assemblage of germplasm.
4. To determine the genetic estimates of identified genetic resource through progeny evaluation.

MATERIALS AND METHODS

Populations of *Shorea tumbuggaia* were surveyed in its natural habitats in Andhra Pradesh and Tamil Nadu. Twenty Candidate Plus Trees (CPTs) were selected based on superior phenotypic traits, Viz.,: Height, Girth at Breast Height (GBH), Clear bole height and number of branches. Soil samples were collected from the rhizosphere of *Shorea tumbuggaia* trees in Tirumala Hills (Andhra Pradesh). Seeds were collected from the 20 CPTs and were sown in raised mother beds ($1 \times 10 \text{ m}^2$) at Harur Modern Nursery Centre and covered with a layer of sand. CPTs details as tabulated below.

Table 1 - SHOREA TUMBUGGAIA – Geographical details of sources identified:

S. No	Source No.	Latitude	Longitude	Place	District
1	1	13.810045	79.195235	Yerravaripalem	Chitoor
2	2	13.810045	79.195235	Yerravaripalem	Chitoor
3	3	13.810045	79.195235	Yerravaripalem	Chitoor
4	4	13.810045	79.195235	Yerravaripalem	Chitoor
5	5	13.810045	79.195235	Yerravaripalem	Chitoor
6	6	13.810045	79.195235	Yerravaripalem	Chitoor
7	7	13.810045	79.195235	Yerravaripalem	Chitoor
8	8	13.813702	79.218612	Kodur	Annamayya
9	9	13.813716	79.218426	Kodur	Annamayya
10	10	13.813897	79.218429	Kodur	Annamayya
11	11	13.814007	79.218457	Kodur	Annamayya
12	12	13.814030	79.218268	Kodur	Annamayya
13	13	13.814064	79.218130	Kodur	Annamayya
14	14	13.814084	79.218022	Kodur	Annamayya
15	15	13.814459	79.218508	Kodur	Annamayya
16	16	13.816851	79.218013	Kodur	Annamayya
17	17	13.817067	79.217889	Kodur	Annamayya
18	18	13.817119	79.217573	Kodur	Annamayya
19	19	13.817308	79.217629	Kodur	Annamayya
20	20	13.817309	79.217810	Kodur	Annamayya

Table 2 - SHOREA TUMBUGGAIA –MORPHOMETRIC DATA DETAILS OF IDENTIFIED TREE SOURCES IN ANDHRA PRADESH:

Source No.	Tree height (m)	Clear bole height (m)	Girth (cm)	Branches (No.)	
				Main stem braches	Lateral branches
1	13.0	1.8	102.0	2.0	6.0
2	11.0	1.7	85.0	4.0	8.0
3	11.5	3.5	69.0	3.0	7.0
4	12.0	5.3	66.0	2.0	4.0
5	10.5	5.3	58.0	2.0	4.0
6	12.0	6.0	135.0	2.0	6.0
7	11.0	4.6	87.0	3.0	5.0
8	15.0	3.5	150.0	2.0	6.0
9	10.0	4.3	82.0	3.0	5.0
10	15.0	5.0	74.0	3.0	6.0
11	14.0	3.5	70.0	3.0	5.0
12	16.0	4.0	113.0	2.0	6.0
13	10.0	3.5	70.0	2.0	6.0
14	12.0	4.0	78.5	3.0	7.0
15	22.0	6.0	83.0	2.0	6.0
16	23.0	8.0	163.0	2.0	7.0
17	20.0	5.0	120.0	2.0	7.0
18	24.0	4.0	107.0	2.0	4.0
19	25.0	5.6	161.0	2.0	3.0
20	22.0	8.0	171.0	2.0	6.0

Germinated seedlings Once s reached a height of 15 cm, were transplanted into poly bags (16 x 30 cm) filled with a potting mixture of soil, sand, and FYM in a 2:1:1 ratio. Inputs included Vermicompost (30 g), VAM (30 g), Azospirillum (6 g), and Phosphobacteria (6 g) per poly bag. Totally 440 number of seedlings has been established (including 10% casualties). Planting operations will be carried out once the seedlings reached standard height and statistical design & treatments will be followed as per the table given below.

Table 3 – Experimental design:

Design	:	RBD
Replication	:	Four
Number of CPT's	:	20
Spacing	:	5m x 5m,

Table 4 – Treatment Details:

4 Treatments (400 Nos) + 4 Replication Each – 25 Nos.

S.No	Treatment	R1	R2	R3	R4
1	T1(control)	25	25	25	25
2	T2 - Existing strains of <i>Azospirillum</i> + <i>Phosphobacteria</i> + <i>Vermicastings</i>	25	25	25	25
3	T3 - Isolated from <i>Shorea tumbuggaia</i> <i>Azospirillum</i> + <i>Phosphobacteria</i>	25	25	25	25
4	T4 - Isolated from <i>Shorea tumbuggaia</i> <i>Azospirillum</i> + <i>Phosphobacteria</i> + <i>Vermicastings</i> +VAM	25	25	25	25

Observations to be recorded:

1. Soil test will be done before planting and at the end of the experiment.
2. Initial height of the plants will be recorded.
3. Initial Collar girth of the plant will be recorded.
4. Annual height will be recorded upto 10 years
5. Survival percentages will be recorded with respect to various provenances/seed source wise/treatment wise.
6. Phenological character will be recorded provenances/seed and/treatments. source wise
7. Meteorological data will be recorded.
8. The seeds collected from respective trees will be recorded in future.
9. Documentation will be done with Photographs at every stage (Since collection of seeds to Planting in the field).

INTERIM FINDINGS

1. Seeds started germination very quickly (after 15 days).
2. Currently 25 number of seedlings only present in the nursery and current survival percentage of the seedlings is 6% (25/440 plants).
3. Seedlings show burning symptoms of shoot tip and died due die back.
4. *Shorea tumbuggaia* seedlings not withstand in the nursery due to die back.
5. *Shorea tumbuggaia* seedlings in nursery not responding to treatments for controlling die back.
6. This may be the reason for the declining population.

7. Microorganism viz. Azospyllum and phospo bacteria have been isolated from the rhizosphere of *Shorea tumbuggaia*.
8. Planting can be done only if the surviving seedlings attain the desirable health, height and robustness.
6. The experiment is ongoing.



Identification of Source trees



Isolation of Microbial culture



Shorea during initial nursery stage



Few surviving seedlings – Dec'2024