

Final Report on a UGC funded Major Research Project

Project Title : **Developing a Digital Herbarium of Angiospermic
Plants of the Western Ghat Regions of Maharashtra.**

Project Sanctioned by : **University Grants Commission
Bahadur Shah Zafar Marg
New Delhi – 110 002**

UGC File No. : **42-943/2013 (SR)**

Duration of the Project : **01/04/2013 to 31/03/2016**

Place of Work : **Post-Graduate Research Centre,
Department of Botany,
Modern College of Arts, Science and Commerce,
Shivajinagar, Pune-411005,
(MAHARASHTRA, INDIA).**

Work carried out by

**Prin. (Dr.) R. S. Zunjarrao,
Principal Investigator.**

**Dr. R. B. Barmukh,
Co-Investigator.**

**Ms. Anita Kindre,
Research Fellow.**

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CONTENTS

Sr. No.	Title	Page No
	Certificate	
	Acknowledgments	7
1.	Project Report No.	8
2.	UGC Ref. File No.	8
3.	Period of report	8
4.	Title of research Project	8
5.	(a) Name of the Principal Investigator and Co-Investigator(s)	8
	(b) Department	8
	(c) University/College where work has progressed	8
6.	Effective date of starting of the project	8
7.	Grant approved and expenditure incurred during the period of the report: a. Total amount approved: b. Total expenditure	9
8.	Brief objective of the project	9
9.	Introduction	10
10.	Importance of Digital Herbarium	12
11.	Materials and Methods	13
12.	Field work	13
13.	Laboratory work	14

.....contd.....

14.	Website management	15
15.	Results	17
16.	Conclusions summarizing the achievements	18
17.	Indication of scope for future work	19
18.	List of research publications	20
19.	Manpower trained on the project	21
20.	No. of Ph.D. produced	21
21.	Financial Position	22
22.	Procurement/ Usage of Equipment	23
23.	Plans for utilizing the equipment facilities in future	24
24.	References	25

LIST OF PLATES

Plate. No.	Title	After page
1	Regions of Western Ghat of Maharashtra covered in the project	13
2A	Forest Types of Western Ghat Regions of Maharashtra	13
2B	Forest Types of Western Ghat Regions of Maharashtra	13
2C	Sacred groves (<i>Devrai</i>) of Western Ghat regions of Maharashtra	13
3	Field localities of Western Ghat regions of Maharashtra	13
4	Photographic documentation of <i>Capparis divaricata</i> Lam.	14
5	Inauguration and launching of the website: www.indianflora.org	15
6	Home page of the website: www.indianflora.org	17
7A	Web page of the website www.indianflora.org : Plants search by A-Z Botanical name	17
7B	Web page of the website www.indianflora.org : Plants search by A-Z Common name	17
7C	Web page of the website www.indianflora.org : Plants search by A-Z Family name	17
8	Web page of the website www.indianflora.org : Identification of plants by inputting key characters	17
9A	Web page of the website www.indianflora.org : Plant Photos: <i>Desmodium oojeinense</i> (Roxb.) H.Ohashi	17
9B	Web page of the website www.indianflora.org : Plant Photos: <i>Dysoxylum gotadhora</i> (Buch.-Ham.) Mabb.	17
9C	Web page of the website www.indianflora.org : Plant Photos: <i>Moullava spicata</i> (Dalzell) Nicolson	17
9D	Web page of the website www.indianflora.org : Plant Photos: <i>Nothapodytes nimmoniana</i> (J.Graham) Mabb.	17
10A-F	Plants species from Western Ghat regions of Maharashtra.	17

LIST OF TABLES

Table No.	Title	After page
1a	Details of Field visits with locations	13
1b	Geographical coordinates of 80 localities	13
2	List of research publications	19
3	Financial position	21
4	Procurement/usage of equipment:	22

LIST OF ANNEXURES

Annexure No.	Title
1	Shrubs and trees from the Western Ghat regions of Maharashtra
2	Field data sheet for plant identification
3	Research paper published



Progressive Education Society's
MODERN COLLEGE OF ARTS, SCIENCE & COMMERCE
Shivajinagar, Pune 411 005.

- NAAC Re-accredited 'A' Grade
- 'College with Potential for Excellence', UGC
- 'Best College Award', SPPU
- 'Star College Status', DBT
- ISO 9001:2006 Certified
- Community College Scheme, UGC

Rajendra Zunjarrao
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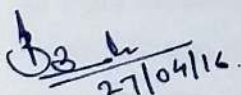
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- Govt. RECG. No. D.E.M.S. Pune Oct.77, Code No. PA/ASC-13
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Ref. No. : MCASC/8779/2015-16

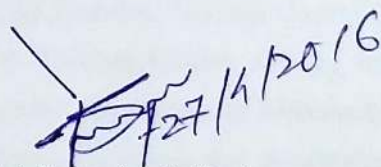
Date : 27/04/2016

Certificate

This is to certify that, the work presented in this report on a project entitled, 'Developing a Digital Herbarium of Angiospermic Plants of the Western Ghat Regions of Maharashtra' [UGC File No.: 42-943/2013 (SR)], a Major Research Project funded by University Grant Commission, is an original work carried out successfully by us in the Post-Graduate Research Centre, Department of Botany, Modern College of Arts, Science and Commerce, Shivajinagar, Pune-5., from the period of 1st April 2013 to 31st March 2016.


27/04/16.

Dr. R. B. Barmukh
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27/4/2016

Prin. (Dr.) Rajendra S. Zunjarrao,
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ACKNOWLEDGEMENTS

On behalf of myself, the Co-Investigator of this project, colleagues, and the staff/research personnel appointed in the project, I, Principal (Dr.) R.S. Zunjarrao, in my capacity as the Principal Investigator, wish to express our sincere gratitude to the authorities of University Grant Commission, Government of India, New Delhi, for financial support for this project. Grateful thanks are also due to the Chairperson and the Honorable Members of the concerned PAC for approving the project and for the encouragement.

We are very much thankful to Hon'ble Prof. Dr. G. R. Ekbote, Chairman, Business Council, Progressive Education Society, Shivajinagar, Pune – 5, for his unstinted guidance and support for all the activities we undertake at the Modern College of Arts, Science and Commerce, Shivajinagar, Pune-5.

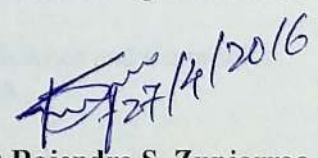
Our grateful thanks are extended to Dr. J. Jayanthi, Scientist D and Dr. C. R. Jadhav, Botanist, Botanical Survey of India, Western Regional Center, Pune, for their valuable help in identification of species.

We wish to thank Dr. Sharad Kambale, Post-Doctoral Fellow, Department of Botany, Goa University, Goa, for valuable help in plant identification and field visits at Sindudurg district. We are also thankful to Dr. Mayur Nandikar, Senior Scientist, Naoroji Godrej Centre for Plant Research, Lawkim Motors Division, Shirwal, Ms. Archana Kindre, Saswad and Mr. Avinash Bhagat, Thane, for their help in field visits in Western Ghat regions of Maharashtra.

We are indeed thankful to Signy IT Solutions Pvt. Ltd., Pune, for developing and maintaining the website www.indianflora.org for Digital Herbarium as per our requirements.

The authorities of Modern College of Arts, Science & Commerce, Shivajinagar, Pune-5, also deserve special thanks for their support and guidance during the field as well as lab work of the project.




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PROJECT COMPLETION (FINAL) REPORT
UGC MAJOR RESEARCH PROJECT 2013-2016

1. Project Report No. : Final
2. UGC Ref. File No. : 42-943/2013 (SR)
3. Period of report : From 1st April 2013 to 31st March 2016
4. Title of Research Project : "Developing a digital herbarium of angiospermic plants of the Western Ghat regions of Maharashtra".
5. Name of the Principal Investigator and Co-Investigator(s)

PI (a) Name & (b) Deptt.:

Dr. R. S. Zunjarrao
Principal Investigator of the Project,
Head, Department of Botany and
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Shivajinagar, Pune-411005.

Co-PI (a) Name & (b) Deptt.:

Dr. R. B. Barmukh,
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Shivajinagar, Pune 411005.

(c) University/College where work has progressed:

Post-Graduate Research Centre,
Department of Botany,
Modern College of Arts, Science and Commerce,
Shivajinagar, Pune-411005,
(Maharashtra, India).

6. Effective date of starting of the project: 1st April 2013

7. Grant approved and expenditure incurred during the period of the report:

a. Total amount approved: Rs. 9,86,750/- (Rs. Nine lac eighty six thousand seven hundred fifty only)

First instalment sanctioned and received: Rs. 6,29,750/- (Rs. Six lac twenty nine thousand seven hundred fifty only)

b. Total expenditure: Rs. 8,86,832/- (Year 2013-2016)

(Rs. 3,40,113/- Year 2013-2014,

Rs. 2,75,105/- Year 2014-2015,

Rs. 2,71,614/- Year 2015-2016).

Brief objective of the project:

The present project was undertaken with the following objectives:

1. Visiting Western Ghat regions of Maharashtra for studying tree species.
2. Taking photographs of these plants by making repeated visits in different seasons.
3. Identification of these plants with the help of available literature such as regional floras and taxonomic experts at the Botanical Survey of India, Western Regional Circle, Pune.
4. Organization of the digital images into a searchable database.
5. Sharing of this database through a dedicated website, www.indianflora.org

INTRODUCTION

Herbarium is a repository of preserved and labeled plants and is used for botanical and ecological research. Each herbarium specimen of angiospermic plant comprises a dried flowering twig of a plant, mounted on archival paper, and affixed with a label providing descriptive data. However, as the time passes by, these herbarium specimens fade and the plant parts may get damaged. This may create difficulties in plant identification.

Herbarium specimen is key to taxonomic and anatomical research work. However, there are few limitations of traditional herbarium. Preparation of traditional herbarium requires utmost care while collecting, pressing, preserving, and mounting the specimen along with accurate, detailed labels. Moreover, if the herbarium specimens are damaged, then it becomes necessary to take expert's advice for correct identification. Though quality herbarium specimens are important recourse, as the number of herbarium sheets increase, need of space and cupboards also increases. For the maintenance of herbarium, more manpower and greater expenses are also needed. Even with proper maintenance and care, sometimes these herbarium sheets are damaged.

For overcoming these limitations of traditional herbarium, a 'Digital Herbarium' of angiospermic tree species found in the Western Ghat regions of Maharashtra is prepared. This digital herbarium can help in accurate and efficient identification even in the absence of expert taxonomist and has negligible expenses on maintenance of herbarium. The infrastructural facility needed is one computer connected to internet. No destruction of natural vegetation and habitat has occurred in making of this digital herbarium.

Digital Herbarium is a well-organized collection of digital images of plants, along with fairly detail botanical description. This digital herbarium can help in accurate and efficient identification even in the absence of expert taxonomist and has negligible expenses on maintenance of herbarium. To share this asset, the infrastructural facility needed is one computer connected to the internet.

Western Ghats is one of the important biodiversity hot spots in India. In Maharashtra, it is spread over the area of 58,400 sq. km. The data on about 650 tree species from Western Ghat regions of Pune, Thane, Satara, Sangali, Kolhapur, Raigad, Ratnagiri and Sindhudurg districts of Maharashtra is collected.

The database of 350 plants is now online and made accessible at free of cost to the world through the dedicated website www.indianflora.org that has been developed through this project.

IMPORTANCE OF DIGITAL HERBARIUM

1. Provides data for floristic studies.
2. Determines native ranges and documents the plants growing in the region through time (invasive species, climate change, habitat destruction, etc.)
3. Helps in documentation on plant associations for phytogeographical and ecological studies.
4. Database provides information on common names and local uses of plants, which is useful for studies in the areas of Anthropology, Ethnobotany and Economic Botany.
5. This database provides the information about common, occasional, endemic, endangered and rare species, which will be useful in conservation biology, environmental, impact statements, endangered species, etc.
6. This database provides material for teaching different aspects of Botany, such as Taxonomy, Field Botany, Plant Communities, Ethnobotany, Forestry etc.)
7. This database will promote appreciation of botanical diversity by making digital specimens available online for viewing by students, researchers, and the public as well.
8. Provides locality data for planning field trips for studies related to Plant Taxonomy and Systematics.

MATERIALS AND METHODS

a) MATERIALS

High quality digital images of angiospermic shrubs and tree species were captured on Canon 600D D-SLR camera equipped with Canon 18-55 mm IS II wide angle and Canon EF-S 55-250 mm 1:4-5.6 IS II telephoto lenses.

These images were stored on a computer (HP Desktop P2-1402 IN Pavilion with HP LED Backlit Monitor W1972a) equipped with scanner (HP Scanner SJ G4010) and printer (HP Laserjet Pro P1108).

The images were edited to add the scale bar and also to suit the website requirements.

b) METHODS

• FIELD WORK

1. As per the flowering and fruiting season, an inventory of shrubs and tree species was prepared using various regional floras. A list of about 1000 plant species, which can be included in this digital herbarium, was made.
2. Fieldwork was done in eight districts of Western Ghat regions of Maharashtra such as Pune, Nashik, Thane, Satara, Kolhapur, Raigad, Ratnagiri, and Sindhudurg districts for photographic documentation and field notes (Plate 1).
3. For the field notes and data collection, various forests were visited such as, evergreen forests, semi-evergreen forests, deciduous forests, scrub forests, mangrove forests, sacred groves (SG) and wildlife sanctuaries (WLS) as well (Plate 2A-2C)
4. Eighty localities were visited during seventy field visits made from April 2013 to March 2016 (Plate 3, Table 1a and 1b)
5. High quality digital images of angiospermic shrubs and tree species were captured during each field visit. These images of plant species included

Table 1a. Details of Field visits with locations

Name of the place visited	Duration of the Visit	
	From	To
Kolhapur District: Dajipur WLS, Kolhapur City	09.10.2013	11.10.2013
Kolhapur District: Radhanagari WLS, Gagan bavda	14.10.2013	17.10.2013
Mumbai, Navi Mumbai & Thane District	03.01.2014	06.01.2014
Pune District Katraj Ghat, Baneshawar	23.02.2013	23.02.2013
Satara District: Mahabaleshwar, Pratapgad	21.03.2013	21.03.2013
Pune City: Hadapsar, Poolgate, Talegav, Lonawala, Lohiya udyan, Kamala Neharu Park, Chitranjan vatika and Empress Botanical Garden	16.05.2014	16.05.2014
	29.05.2014	29.05.2014
	04.06.2014	04.06.2014
	05.06.2014	05.06.2014
	06.06.2014	06.06.2014
	07.06.2014	07.06.2014
Pune City: Pune Municipal Gardens	09.06.2014	09.06.2014
	12.06.2014	12.06.2014
	13.06.2014	13.06.2014
Pune District: Bhimashankar Wild Life Sanctuary	14.06.2014	16.06.2014
Pune City: Botanical Survey of India, Pashan Road, Chaturshrungi, Shivajinagar	18.06.2014	18.06.2014
	27.06.2014	28.06.2014
Pune District: Junnar, Bhimashankar Wild Life Sanctuary	13.07.2014	14.07.2014
Pune City: Modern College Campus, Fergusson College Road, Deccan Gymkhana	16.07.2014	16.07.2014
	18.07.2014	18.07.2014
Satara District: Madhardevi, Vai	19.07.2014	21.07.2014
Pune District: Sinhgad fort	17.09.2014	17.09.2014
Raigad District: Murud, Janjhira, Alibag	20.09.2014	20.09.2014
Pimpri-Chinchwad	28.09.2014	28.09.2014
Satara District: Kaas Plateau	30.09.2014	30.09.2014
Raigad District: Alibag, Revdanda, Phansad WLS	02.10.2014	04.10.2014
Pune City: Hadapsar, Pune Station region, Bund Garden Road	20.10.2014	21.10.2014
	25.11.2014	25.11.2014
	05.12.2014	05.12.2014
New Delhi: UGC Mid-term Evaluation meeting	13.01.2014	13.01.2014
Pune city: Katraj Road, Kondhava, Magarpatta	02.01.2015	02.01.2015
	05.01.2015	05.01.2015
	10.01.2015	10.01.2015
Sindudurg District: Amboli, Malvan, Kudal	16.01.2015	18.01.2015
Pune District: Purandar Taluka	22.01.2015	22.01.2015
Pune District: Velha Taluka	23.01.2015	26.01.2015
Pune District: Dive Ghat, Saswad	01.02.2015	01.02.2015
Pune City: Vetar Tekdi, Sarasbag	03.02.2015	03.02.2015
	04.02.2015	04.02.2015
Pune District: Tamhini Ghat WLS	05.02.2015	05.02.2015

Pune City: Botanical Survey of India, Pune	07.02.2015	07.02.2015
Satara District: Mahabaleshawar, Panchgani, Vai	10.02.2015	10.02.2015
Pune City: Botanical Survey of India, Pune	13.02.2015	13.02.2015
	16.02.2015	16.02.2015
	18.02.2015	18.02.2015
	20.02.2015	20.02.2015
Goa: Taxonomy Workshop at Deptt. Of Botany, Goa University	25.02.2015	28.02.2015
Pune City: NCL, Pashan	02.03.2015	02.03.2015
Pune City: Botanical Survey of India, Pune	20.03.2015	20.03.2015
	26.03.2015	26.03.2015
Pune District: Tamhini Ghat and Kalkai Sacred grove	05.04.2015	05.04.2015
Pune District: Bhimasnagar WLS, Junnar	11.04.2015	11.04.2015
Pune City: Botanical Survey of India, Pune, Empress Botanical Garden	20.04.2015	20.04.2015
	21.04.2015	21.04.2015
Satara District: Kas plateau, Bamnoli, Panchgani, Mahabaleshawar, Vai, Satara city	22.04.2015	25.04.2015
Pune District: Bhore taluk, Shirwal and adjoining area, Veer dam, Purandar taluk and adjoining area	28.04.2015	28.04.2015
	02.05.2015	20.05.2015
	20.06.2015	20.06.2015
Pune District: Katraj Ghat and adjoining area, Bhore taluk, Shirwal, Jejuri, Malhargad, Backside of Purandar, Ghera Purandar, Dive Ghat and adjoining villages of Saswad.	21.06.2015	21.06.2015
	05.07.2015	05.07.2015
	24.09.2015	24.09.2015
	18.10.2015	18.10.2015
	11.11.2015	11.11.2015
Thane District: Murbad, Shahapur, Thane city	12.12.2015	15.12.2015
Kolhapur District: Tilari Ghat Sindhudurg District: Amboli ghat, Malwan, Kudal, Vengurla and Bandha	23.12.2015	28.12.2015
Pune District: Khalad.Kumbharwala, Purandar	11.01.2016	11.01.2016
Satara District: Mandhardevi, Vai and adjoining villages	18.01.2016	18.01.2016
Satara District: Mahabaleshawar, Panchgani, Vai	23.02.2016	23.02.2016
Pune City: Botanical Survey of India, Pune, Savitribai Phule Pune University, Pune and Agharkar Research Institute, Pune	25.02.2016	25.02.2016
	26.02.2016	26.02.2016

Table 1 b. Geographical coordinates of 80 localities

Name of the location	Geographical coordinates	 Altitude from mean sea level (m)
Ghisar SG, Velha	18°17'25.24"N, 73°33'12.68"E	976
Waghjai SG, Bhore	18°6'42.86"N, 73°51'27.76"E	782
Kalkai SG, Tamhini	18°26'48.85"N, 73°25'49.95"E	810
Tamhini Ghat WLS	18°26'30.48"N, 73°24'9.06"E	815
Bhimashankar WLS	19°3'52.49"N, 73°31'59.63"E	929
Purandar fort	18°17'20.45"N, 73°58'29.392"E	1363
Sinhgad fort	18°21'56.17"N, 73°45'20"E	1350
Rajgad fort	18°14'44.83"N, 73°40'74.06"E	1279
Torana Fort	18°16'17.84"N, 73°37'3.267"E	1064
Malhargad	18°24'43.45"N, 74°2'58.02"E	858
Purandar taluk	18°21'7.456"N, 74°1'58.61"E	778
Velha taluk	18°17'46.56"N, 73°38'14.75"E	686
Bhor taluk	18°8'30.97"N, 73°50'43.04"E	620
Junnar taluk	19°12'11.46"N, 73°52'27.3"E	689
Dive ghat	18°24'56.12"N, 73°59'39.95"E	722
Pabe ghat	18°19'15.84"N, 73°39'58.06"E	930
Chivewadi ghat	18°18'17.95"N, 73°58'31.47"E	681
Malshej ghat	19°20'26.25"N, 73°46'28.38"E	566
Varandha ghat	18°6'36.58 "N, 73°39'41.71"E	730
Katraj ghat	18°25'53.56"N, 73°51'29.39"E	709

Baneshwar, Nasarapur	18°34'12.39"N, 73°47'11.49"E	1293
Lonawala	18°43'31.13 "N, 73° 18' 33.4"E	384
Talegaon	18°44'6.32"N, 73°40'20.25"E	590
Pimpri-Chinchwad	18°37'22.15"N, 73°49'14.05"E	580
Savitribai Phule Pune University campus, Pune	18°33'16.19"N, 73°49'14.05"E	590
Botanical Survey of India, Western Regional Centre, Pune	18°32'4.563"N, 73°55'3.433"E	562
Pune City (Urban)	18°24'33.57"N, 73°46'03.71"E	558
Nashik City	20°00'17.15"N, 73°47'20.98"E	591
Kasara Ghat	19°40'17.35"N, 73°28'59.99"E	334
Tansa WLS	19°31'29.00"N, 73°15'53.06"E	325
Tungareshawar WLS	19°4'33.54"N, 72°52'39.56"E	340
Naneghat Hills	19°17'51.27"N, 72°52'39.56"E	832
Yoor hills	19°14'1.55"N, 72°56'40.48"E	325
Mahuli Fort	19°14'1.55"N, 72°56'40.48"E	503
Sidhghad	19°9'29.99"N, 73°31'20.72"E	670
Murbad	19°15'33.45"N, 73°23'22.92"E	80
Shahapur	19°27'21.32"N, 73°19'46.57"E	56
Thane city	19°12'45.41"N, 73°59'3.25"E	40
Pasarni ghat	17°56'36.46"N, 73°51'23.83"E	1135
Khambataki ghat	18°1'53.27"N, 74°1'16.73"E	710
Yavateshawar ghat	17°41'42.19"N, 73°55'48.33"E	815
Pateshawar	17°35'18.77"N, 74°3'3.48"E	850
Kas Platuac	17°43'4.61"N, 73°48'43.15"E	1140

Bamnoli	17°50'48.32"N, 73°52'49.79"E	719
Thoseghar	17°36'11.15"N, 73°50'52.03"E	1126
Chalakewadi	17°28'20.45"N, 73°53'51.96"E	1096
Shirwal	18°8'54.25"N, 73°58'38.93"E	588
Khandala taluka	18°3'15.64"N, 74°0'30.86"E	659
Mahabaleshwar	17°52'41.24"N, 73°40'15.17"E	1438
Wai	17°56'59.97"N, 73°53'45.97"E	718
Panchgani	17°55'7.09"N, 73°47'25.29"E	1293
Pratapgad fort	17°56'14.05"N, 73°34'38.81"E	1086
Palsambe devrai	16°34'39.01"N, 73°55'6.047"E	837
Gagan bavda SG	16°31'27.53"N, 73°50'23.27"E	628
Radhanagari WLS	16°21'1.62"N, 73°57'58.10"E	830
Dajipur WLS	16°24'40.08"N, 73°59'42.02"E	578
Amba Ghat	16°58'20.27"N, 73°47'36.53"E	645
Tilari Ghat	15°47'51.14"N, 74°9'35.18"E	745
Vishalgad	16°34'21.65"N, 73°44'38.78"E	762
Udagiri	17°4'24.76"N, 73°49'27.34"E	890
Wakoli	16°59'12.91"N, 73°51'2.62"E	710
Panhala region	16°48'25.81"N, 74°7'51.36"E	901
Shivaji University Campus, Kolhapur	16°41'3.26"N, 74°15'32.45"E	590
Kolhapur city	16°41'52.88"N, 74°14'16.98"E	567
Phansad WLS	18°41'30.91"N, 72°56'3.28"E	209
Alibag	18°39'9.90"N, 72°55'30.67"E	20
Revdanda	18°35'34.39"N, 72°56'15.16"E	30
Roha	18°26'20.22"N, 73°7'0.305"E	32
Murud	18°19'56.51"N, 72°57'39.21"E	48

Janjira fort	18°20'1.21"N, 72°29'35.83"E	14
Adivare SG	16°43'10.44"N, 73°21'19.08"E	23
Jaitapur	16°37'34.31"N, 73°22'9.82"E	20
Nate	16°38'16.00"N, 73°21'45.95"E	40
Dapoli	17°45'11.20"N, 73°11'17.02"E	223
Hiranyakeshi SG	15°58'12.02"N, 74°0'40.97"E	840
Parle SG	15°50'23.35"N, 74°8'58.11"E	630
Amboli Ghat	15°55'21.49"N, 73°59'41.66"E	715
Sawanwadi	15°57'40.78"N, 73°55'27.31"E	108
Malvan	16°10'1.90"N, 73°36'59.89"E	5
Kudal	15°59'59.84"N, 73°40'58.98"E	38
Bandha road	15°48'40.89"N, 73°51'29.80"E	14
Vengurla	15°53'14.55"N, 73°42'36.07"E	8

Plate 1

Regions of Western Ghat of Maharashtra covered in the project

Year I: Pune and Kolhapur

Year II: Thane, Raigad and Ratnagiri

Year III: Satara, Sindhudurg and Nashik

Plate 1

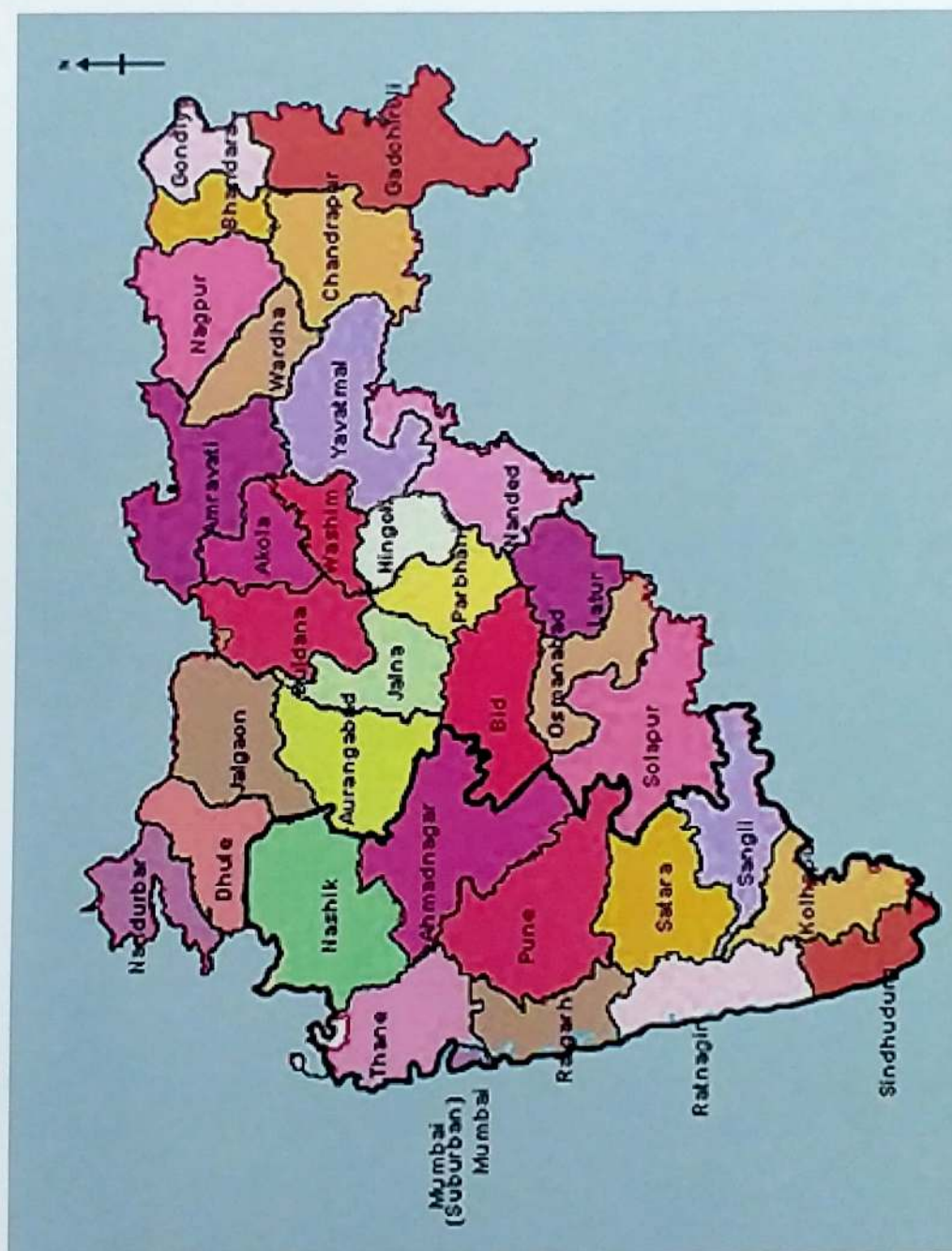


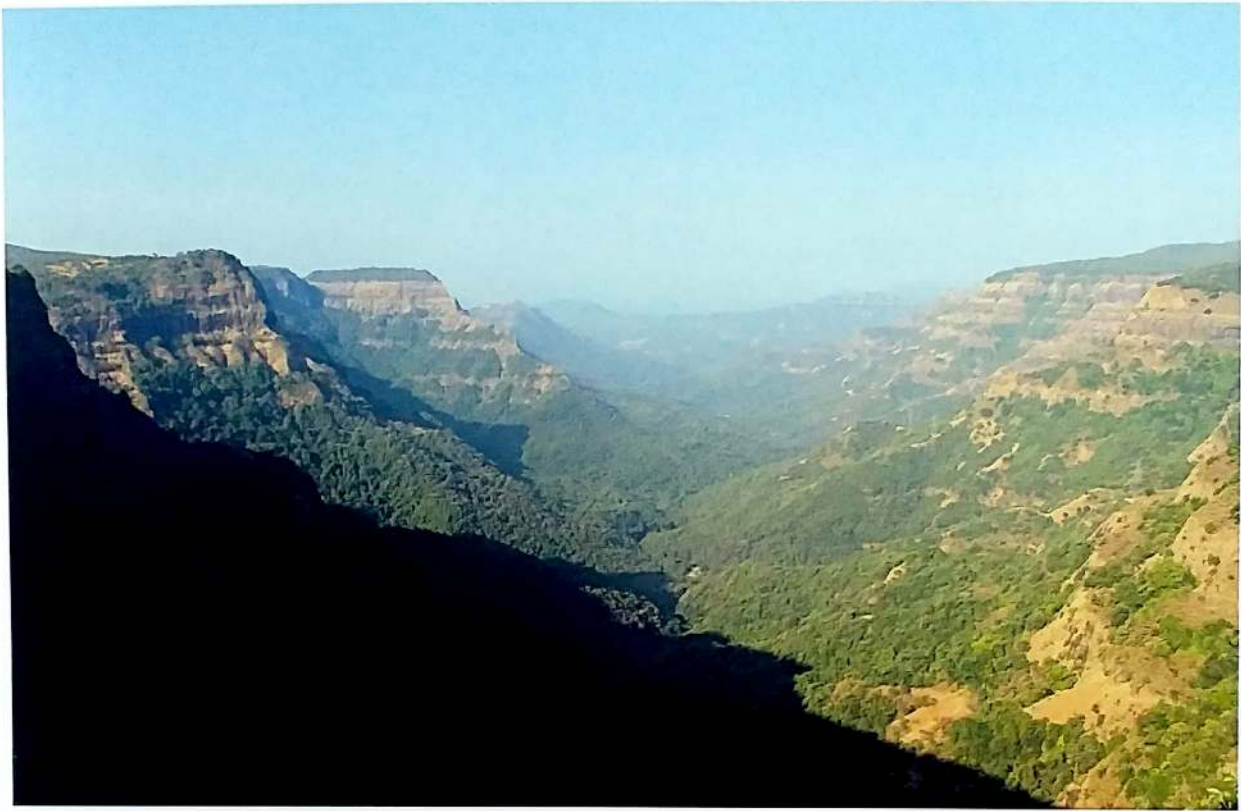
Plate 2A

Forest Types of Western Ghat Regions of Maharashtra

A. Evergreen Forests: Amboli, Dist. Sindhudurg

B. Evergreen Forests: Amboli Ghat regions, Dist. Sindhudurg

Plate 2 A



A



B

Plate 2B

Forest Types of Western Ghat Regions of Maharashtra

- A. Evergreen Forests: Pune district: Varandha Ghat
- B. Semi-evergreen Forests: Pune district: Bhimashankar Wildlife Sanctuary
- C. Semi-evergreen Forests: Kolhapur district: Tilara Ghat
- D. Deciduous Forests: Thane district: Sidhhagad
- E. Littoral Mangroves: Thane district
- F. Scrub Forests: Pune district

Plate 2 B



A



B



C



D



E



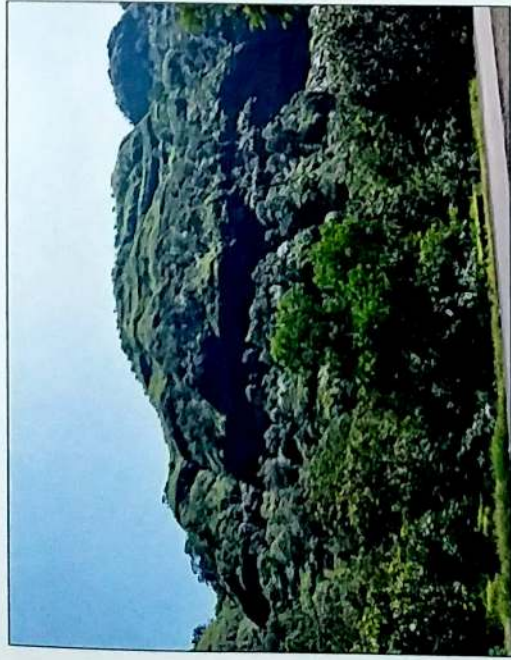
F

Plate 2C

Sacred groves (*Devrai*) of Western Ghat regions of Maharashtra

- A. Pune district: *Kalkai devrai* of Tamhini Ghat
- B. Pune district: Temple of *Jugai devi devrai* of Ghisar village; Velha taluk
Local people are making Irali (rainwear) from the Bamboos obtained in the sacred grove.
- C. Pune district: Water sources; stream near *Mari Aai devrai* of Ghisar village velha taluk.
- D. Kolhapur district: *Palsambe devrai* of Palsambe village, Local people did deforestation and made roads for easy access in the sacred grove which is directly affects plant diversity.
- E. Sindhudurg district:
 - i. Mahadev temple of *Hiranyakeshi devrai*; Amboli
 - ii. *Hiranyakeshi devrai*, Amboli

Plate 2 C



A



B



C



D



E-i)



E-ii)

Plate 3

Field localities of Western Ghat regions of Maharashtra

A. Total 70 visits at 80 localities of Western Ghat regions from Maharashtra: Field work was done in 08 districts:

Pune district: Jugai Devi and Mari Aai Devi Sacred grove - Ghisar, Waghjai Sacred grove - Bhore, Kalkai Sacred grove - Tamhini, Tamhini Ghat wildlife sanctuary, Bhimashankar wildlife sanctuary, Purandar fort, Rajgad fort, Torana fort, Sinhgad fort, Malhargad, Purandar taluk, Velha taluk, Bhore taluk, Junnar taluk, Dive ghat, Pabe ghat, Chivewadi ghat, Malshej ghat, Varandha ghat, Katraj ghat, Lonawala, Talegaon, Pimpri-Chinchwad, Botanical Survey of India, Western Regional Centre-Pune, Savitribai Phule Pune University campus and Pune City (Urban).

Nashik district: Kasara Ghat and Nashik City.

Thane district: Tansa wildlife sanctuary and Tungreshwar wildlife sanctuary, Naneghat Hills, Yeoor hills, Mahuli fort, Sidhgad, Murbad, Shahapur and Thane city.

Satara district: Pasarni ghat, Khambataki ghat, Yavateshwar ghat, Pateshwar, Kas Plateau, Bamnoli, Thosgar, Chalakewadi, Mahabaleshwar, Wai, Panchgani, Shirwal and Khandala taluk.

Kolhapur district: Radhanagari wildlife sanctuary, Dajipur wildlife sanctuary, Palsambe devrai and Gaganbavda Sacred grove, Amba ghat, Tilari ghat, Vishalgad, Udagiri, Wankoli, Panhala region, Shivaji University Campus, and Kolhapur city.

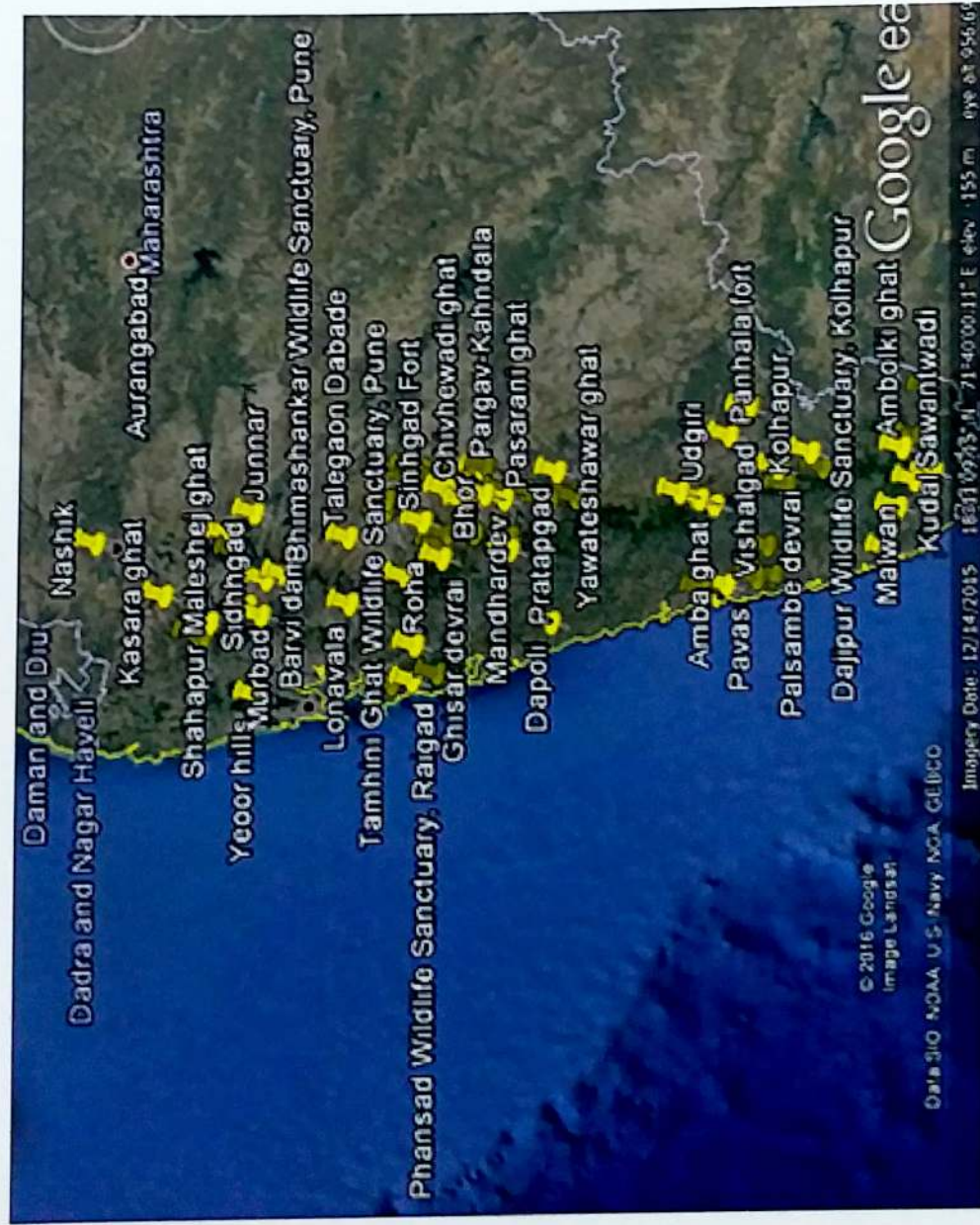
Raigad district: Phansad wildlife sanctuary, Alibag, Revdanda, Roha and Murud-Janjira fort.

Ratnagiri district: Adivare Sacred Grove, Jaitapur, Nate and Dapoli.

Sindhudurg district: Hiranyakeshi Sacred grove, Parle Sacred grove, Amboli ghat, Sawanwadi, Malwan, Kudal, Vengurla and Bandha road.

B. Google earth image of Western Ghat region of Maharashtra.

Plate 3



A



B

habitat, habit, stem, upper and lower surface of leaf, flowering twig, buds, close-up of flower, fruit and special character of a flower, if any (Plate 4).

6. For correct identification and photographic documentation of the plants, repeated season wise visits were made and the data of about 650 (total) tree species was collected.

• LABORATORY WORK:

1. The plants were identified with the help of available literature such as regional floras (Dalzell and Gibson, 1861; Brandis D, 1874; Cooke, 1901-1908; Lakshinarasimhan and Sharma, 1991; Kothari and Moorthy, 1993; Deshpande *et. al.*, 1995; Almeida, 1996, 1998, 2001; Yadav and Sardesai 2002;), books and field guides (Nayar and Sastry, 2000; Mishra and Singh 2001 and Neginhal 2011) and field guides (Sardesai *et.al.*, 2013; Ingalthalikar, 2014).
2. For the correct botanical name, synonyms and common names, literature available online on the websites www.biotic.org, www.flowersofindia.net, www.ipni.org, www.theplantlist.org, and www.tropicos.org was used.
3. The taxonomic experts at Botanical Survey of India, Western Regional Circle, Pune, Maharashtra, were also consulted for the confirmation of plant identifications.
4. Each digital photograph was supplemented with a scale bar (Plate 4) and image editing was done using the free trial version of Adobe Photoshop CS 6.
5. Brief description and key characters of each plant species was also compiled with the help of regional floras, field observations, and notes.
6. The angiospermic plant families on which the data was collected were arranged according to APG III classification system. The status of each plant such as rare, endemic, wild, occasional, common and cultivated was also included in the database. (Annexure I)
7. The data generated was compiled in the form of a dedicated website www.indianflora.org. The website was launched for public access on

Plate 4

Photographic documentation of *Capparis divaricata* Lam.

A. Habit of the plant, B. Branches, C. Leaves: upper surface, D. Leaves: lower surface, E. Fruit and F. Flower

Capparis divaricata Lam.

Botanical Name: *Capparis divaricata* Lam.

Synonym: *Capparis horrida* Banks ex Wight & Arn.

Capparis stylosa DC.

Common Name: Spreading caper, Pachunda, पाचुंदा

Family: Capparaceae

Characters:

Erect shrubs or small tree, thorny, grey stellate pubescent trees. Stipular thorns stout, divaricate, straight or hooked. Leaves coriaceous, linear or ovate-lanceolate, apex mucronate, base cuneate, 5-7 nerved, rounded at the base, the young leaves tomentose, the older glabrous. 6 x 2.5 cm. Flowers axillary, solitary, yellow or greenish, buds beaked, tomentose. Sepals ovate, acute, tomentose on both surfaces. Petals oblong, rounded to acuminate at apex, deciduous. Stamens many, filaments longer than petals, yellowish. Ovary glabrous, ribbed. Fruit a berry, globose, scarlet, warted, 5-6 ribbed, beaked, red at maturity. Seeds numerous, ovoid.

Flowers: January-September

Notes: Occasional along roadsides on hill slopes and scrub forests.

Plate 4



A



B



C



D



E



F

29th February 2016 at the hands of Dr. P. Laxminarsimhan, Scientist In-charge, Botanical Survey of India, Western Regional Centre, Pune, (Plate 5-6).

8. To make user-friendly interface of the website, the plants were listed alphabetically by their botanical names, common names, and families (Plate 7A-C).
9. A list of key characters for plant identification was prepared with the help of field observations and notes. A field data sheet of 15 taxonomic characters was used for preparing this key (Plate 8 and Annexure 2)

• WEBSITE MANAGEMENT

1. The data on each tree species was uploaded on a dedicated website www.indianflora.org developed for the project.
2. The website was developed on the PHP (Hypertext Pre-processor) application platform, which is an HTML-embedded, server-side scripting language, designed for web development. PHP scripts are executed on the server. A PHP interpreter processes PHP code. A major advantage of PHP is that it can be run on all major operating systems. It is compatible with almost all servers. It has multiple layers of security to prevent threats and other malicious attacks.

Code Igniter (CI) was used as an 'Application Development Framework', a toolkit used for developing a web site using PHP.

The database on tree species generated in the project was managed with MySQL, a relational database management system (RDBMS).

3. The data on the website is presented in a user-friendly interface (Plate 9 A-D).
4. The users i.e., students, researchers, NGOs, and people in general may access the information on the website as follows:
 - a. Select tab 'Search by Name'. Enter the name of the plant in the search box provided.

Plate 5

Inauguration and launching of the website: www.indianflora.org

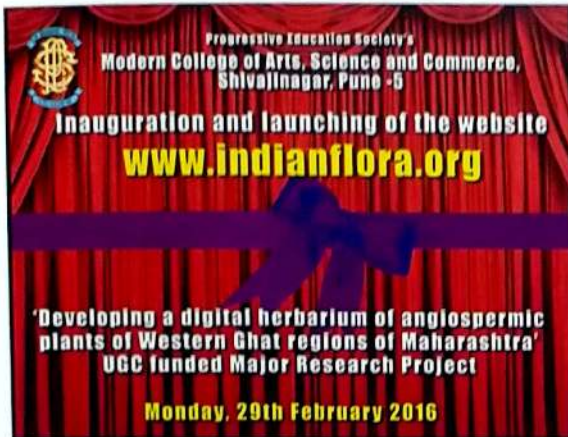
A & B: Inauguration and launching of the website: Digital Herbarium angiospermic plants of Western Ghat regions of Maharashtra: www.indianflora.org on 29th February 2016

C. Website was launched by the hands of Chief guest: Dr. P. Laxminarsimha Scientist In-charge, Botanical Survey of India, Western Regional Centre, Pune

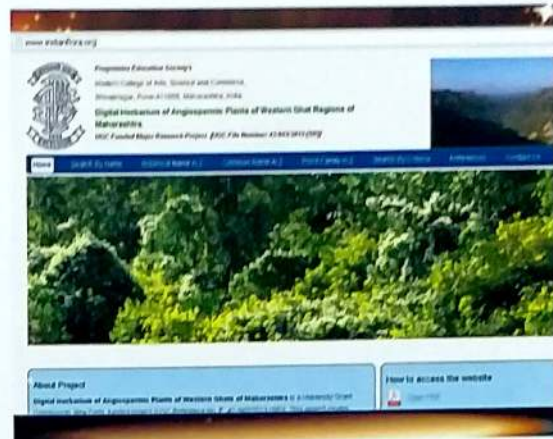
D. Principal Investigator, Dr. R. S. Zunjarrao, giving information about Digital Herbarium and website

E. Project JRF Ms. Anita Kindre, giving information about website and sharing her experiences.

Plate 5



A



B



C



D



E

- b. Select tab 'Botanical Name A-Z' where plants are listed alphabetically as per botanical names. Click on the name of plant to retrieve the details.
 - c. Select tab 'Common Name A-Z' where plants are listed alphabetically as per common names. Click on the name of plant to retrieve the details.
 - d. Select tab 'Search by Criteria'. On the web page, select the characters as observed in the specimen under study. A list of possible plants meeting the inputted criteria is presented. Click on the name of plant to retrieve the details
5. So far, the botanical description and digital photographs of about 350 tree species has been uploaded to the website www.indianflora.org.
6. For any queries, the user has to select the tab 'Contact us' and fill in the details in the boxes provided. Alternatively, the user can contact us on phone or on the email address provided on the same web page.

RESULTS

Before beginning the fieldwork of the project, a list of about 1150 angiospermic tree species found in the Western Ghat regions of Maharashtra was made. By repeated field visits in three years i.e., from 2nd May 2013 to 23rd February 2016, the data on about 650 tree species was collected. Out of these 650 tree species, 610 are correctly identified and the identification of 40 species is yet to be confirmed. The data on 610 tree species belonging to 90 plant families of angiosperms include 51 plants endemic to India, 19 plants endemic to Western Ghats, one plant species endemic to Maharashtra, 11 rare tree species. Further, from the data, 206 plants are found occasionally, 216 plants are found commonly and 65 plants bear edible fruits. Some rare plants were also observed during field visits viz., *Artabotrys zeylanicus* Hook.f. & Thomson *Beilschmiedia dalzellii* (Meisn.) Kosterm., *Dillenia indica* L., *Eriolaena quinquelocularis* (Wight & Arn.) Wight, *Grewia umbellifera* Bedd., *Justicia santapaui* Bennet, *Knema attenuata* (Wall. Ex Hook.f. & Thomas) Warb., *Desmodium oojeinense* (Roxb.) H.Ohashi, *Memecylon talbotianum* Brandis *Sterculia villosa* Roxb. Ex. DC., and *Meiogyne pannosa* (Dalzell) J. Sinclair (Plate 10 A-F). In this database, the families with highest number of representatives were Fabaceae with 80 species, Malvaceae with 44 species and Rubiaceae with 35 species.

The output of the project is development of a dedicated website www.indianflora.org by the project team where the students, researchers, nature lovers, NGOs and people in general can find the information on tree species found growing in the Western Ghat regions of Maharashtra.

Part of the data generated in this project has also been published in a research paper entitled 'Digital Herbarium of Angiospermic Tree Species from Western Ghat Regions of Maharashtra' in the journal 'Dnyanmay'.

Plate 6

Home page of the website: www.indianflora.org

Plate 6

Digital Herbarium of Angi...
indianflora.org
WWF - Western Ghats
Schmuck Kollektionen
Checklist of Rare, End
Tallenge Macro Photo
Flower Names - Com
Digital Herbarium of
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Digital Herbarium of Angiospermic Plants of Western Ghats
Regions of Maharashtra.
UGC Funded Major Research Project, [UGC File Number: 42-3432013 (SR)]

Home
Project Team
Search By Name
Botanical Name A-Z
Common Name A-Z
Plant Family A-Z
Search By Criteria
References
Contact Us

About Project

Digital Herbarium of Angiospermic Plants of Western Ghats of Maharashtra is a University Grant Commission, New Delhi, funded project [UGC Reference No. F. 42-643/2013 (SR)]. This project covers prominent tree species and shrubs from 10 districts, located in Western Ghats regions of Maharashtra, viz., Pune, Ahmednagar, Satara, Sangli, Kolhapur, Ratnagiri, Thane, Sindhudurg, Raigad and Nask. A list of about 1000 species was made, of which 650 plants were documented and the data on 350 plants is currently available on the website. The compilation of data on remaining 300 species is in progress. Plants are photographically documented with respect to habit, stem, upper and lower surface of leaf, inflorescence, close-up of flower and fruit. A brief description of each species is also included. This database covers wild as well as cultivated plants. For identification and description of plant species regional floras published by Botanical Survey of India (BSI) were used. Primary objective of this project is to capture and store high quality digital images of plant species and make this database available to students, researchers and general public to disseminate the awareness of regional plants.

We are thankful to the University Grant Commission, New Delhi, for providing financial assistance worth Rs. 9,80,750/- for this project.

How to access the website

Open PDF

Video

Digital Herbarium of Angiospermic p...

ENG 14:59
INTL 22-09-2016

Plate 7A

Web page of the website www.indianflora.org : Plants search by A-Z Botanical name

Plate 7 A



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Home Project Team Search By Name Botanical Name A-Z Common Name A-Z Plant Family A-Z Search By Criteria References Contact Us

Home > Botanical Name

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z | A-Z

B

- Barleria prattensis* , (Family : Acanthaceae)
- Barleria pruriens* , (Family : Acanthaceae)
- Barringtonia acutangula* , (Family : Lecythidaceae)
- Barringtonia azialica* , (Family : Lecythidaceae)
- Bauhinia acuminata* , (Family : Leguminosae-Caesalpinoideae)
- Bauhinia monandra* , (Family : Leguminosae-Caesalpinoideae)
- Bauhinia purpurea* , (Family : Leguminosae-Caesalpinoideae)
- Bauhinia tomentosa* , (Family : Leguminosae-Caesalpinoideae)
- Bauhinia variegata* , (Family : Leguminosae-Caesalpinoideae)
- Beilschmiedia daltzei* , (Family : Lauraceae)
- Bixa orellana* , (Family : Bixaceae)
- Bombax ceiba* , (Family : Malvaceae)
- Bombax insignis* , (Family : Malvaceae)
- Bonellia macrocarpa* , (Family : Primulaceae)
- Boswellia serrata* , (Family : Burseraceae)
- Bryonia retusa* , (Family : Phyllanthaceae)
- Bridelia montana* , (Family : Phyllanthaceae)
- Bridelia retusa* , (Family : Phyllanthaceae)
- Bridelia stipularis* , (Family : Phyllanthaceae)
- Broussonetia papyrifera* , (Family : Moraceae)
- Brownea coccinea* , (Family : Leguminosae-Caesalpinoideae)
- Brugmansia arborea* , (Family : Solanaceae)
- Brugmansia versicolor* , (Family : Solanaceae)
- Eryophyllum penatum* , (Family : Crassulaceae)
- Euchanania cochinchinensis* , (Family : Anacardiaceae)
- Euteleia monosperma* , (Family : Leguminosae-Papilionoideae)

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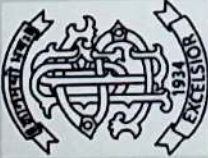
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Plate 7B

Web page of the website www.indianflora.org : Plants search by A-Z Common name

Plate 7 B

Digital Herbarium of Angi
indianflora.org/plant_list_criteria?id=A
The Western Ghats: G
WWF - Western Ghats: G
Schmuck Kollektionen: A
Checklist of Rare, End: T
Tallenge Macro Photo: A
Flower Names - Com: A
Digital Herbarium of Angi



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[Project Team](#)
[Search By Name](#)
[Botanical Name A-Z](#)
[Common Name A-Z](#)
[Plant Family A-Z](#)
[Search By Criteria](#)
[References](#)
[Contact Us](#)

[Home > Common Name](#)

A
B
C
D
E
F
G
H
I
J
K
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M
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Q
R
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X
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Z
A-Z

African tulip tree, *Rugloora*, Pichikari, *Spathodea campanulata*, (Family: Bignoniaceae)
Air Plant, Donkey ears, Anar poi, *Bryophyllum pinnatum*, (Family: Crassulaceae)
Amia, Aila, *Phyllanthus emblica*, (Family: Phyllanthaceae)
Angel's trumpet, Tufari, *Brugmansia arborea*, (Family: Solanaceae)
Apple cactus, *Harrisia bonplandii*, (Family: Cactaceae)
Arara nut, *Joannesia princeps*, (Family: Euphorbiaceae)
Asian bushbush, Asiatic beechberry, Badhara, Kali shivan, *Gmelina asiatica*, (Family: Lamiaceae)
Australian babbol, *Acacia auriculiformis*, (Family: Leguminosae-Mimosoideae)
Australian bottle plant, *Jatropha podagrica*, (Family: Euphorbiaceae)
Australian chestnut, *Castanospermum australe*, (Family: Leguminosae-Caesalpinioideae)
Autograph tree, *Clusia rosea*, (Family: Clusiaceae)
Axle wood tree, Dhavda, *Anogeissus latifolia*, (Family: Combretaceae)

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Plate 7C

Web page of the website www.indianflora.org : Plants search by A-Z Family name

Plate 7 C



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Home > Family Name

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | A-Z

A

- Acanthaceae - 6(*Barleria prattensis* Barleria prattensis Calacanthus grandiflorus Justicia adhatoda Strobilanthes callosus Thelepaepala biocephala)
- Anacardiaceae - 10(*Anacardium occidentale* Buchanania cochinchinensis Holigama amotiana Holigama grahamii Mangifera indica Searsia mysorensis Semecarpus anacardium Spondias pinnata Ziziphus oenoplia Lannea coromandelica)
- Annonaceae - 8(*Annona reticulata* Annona squamosa Artabotrys hexapetalus Miliusa tomentosa Polyalthia longifolia Sageraea laurifolia Uvaria narum Cananga odorata)
- Apocynaceae - 14(*Alstonia scholaris* Carissa inermis Carissa spinarum Carissa carandas Cascabela thevetia Cerbera manghas Holarrhena pubescens Nerium oleander Plumeria obtusa Plumeria rubra Tabernaemontana alternifolia Tabernaemontana divaricata Wrightia arborea Wrightia lindtoria)
- Araliaceae - 2(*Schefflera actinophylla* Schefflera venulosa)
- Asclepiadaceae - 2(*Calotropis gigantea* Calotropis procera)
- Asteraceae - 1(*Chromolaena odorata*)

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Plate 8

Web page of the website www.indianflora.org : Identification of plants by inputting key characters

Plate 8

Digital Herbarium of Ang...
indianflora.org/plant_search_advanced
The Western Ghats
Bookmarks
Apps
Search
Digital Herbarium of Ang...
Flower Names - Com...
Tallenge Macro Photo:
Checklist of Rare, End...
Schmuck Kollektione...
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Home > Advance Search

Advanced Search

Habitat Evergreen forest Semi-evergreen forest Deciduous forest Grassland	Flowering season January February March April	Abundance Common Occasional Endemic Rare
Phyllotaxy	Leaf Type	If compound
Leaf margin	Inflorescence Solitary Axillary Solitary Terminal Raceme Corymbose	Inflorescence size
Flower Colour	Flower size	Corolla/Perianth
Fruit type	Fruit	Family

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Plate 9A

Web page of the website www.indianflora.org

Plant Photos: *Desmodium oojeinense* (Roxb.) H. Ohashi

Plate 9 A



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[The Western Ghats: G](#)
[WWF - Western Ghat](#)
[Schmuck Kollektionen](#)
[Checklist of Rare, End](#)
[Tallenge Macro Photo](#)
[Flower Names - Corn](#)
[Digital Herbarium of](#)

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[Project Team](#)
[Search By Name](#)
[Botanical Name A-Z](#)
[Common Name A-Z](#)
[Plant Family A-Z](#)
[Search By Criteria](#)
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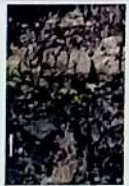
[Home > Botanical Name](#)

Desmodium oojeinense

[Back](#)

Botanical Name: *Desmodium oojeinense* (Roxb.) H. Ohashi
Synonym: *Ougeinia dalbergioides* Benth.
Ougeinia oojeinensis (Roxb.) Hochr.
Common Name: Sandan, Kala-palas, Tewas
Family: Leguminosae-Papilionoideae
Description:
 Large deciduous tree. Short crooked trunk, bark dark brown, deeply cracked. Branches slender, terete. Leaves pinnate, 3-foliate, stipules lanceolate, acute, caduceous. Leaflets rigidly coriaceous, the terminal broadly elliptic or roundish, opposite, obliquely ovate, cordate, all glabrous above, main nerves 4-8 pairs, prominent. Flowers numerous, in short fascicled racemes from the nodes of old branches, fragrant, pedicels colored, filiform, bracts ovate, acuminate, broader than long, villous outside. Calyx pubescent, teeth short, triangular. Corolla white or pinkish white colored. Pods reticulately veined, 5-8 cm long.
Flowers: February-May

Gallery - *Desmodium oojeinense*








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Plate 9B

Web page of the website www.indianflora.org

Plant Photos: *Dysoxylum gotadhora* (Buch.-Ham.) Mabb.

Plate 9 B

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Progressive Education Society's
Modern College of Arts, Science and Commerce,
Shivajinagar, Pune-411005, Maharashtra, India.
Digital Herbarium of Angiospermic Plants of Western Ghat Regions of
Maharashtra.
UGC Funded Major Research Project, [UGC File Number: 42-943/2013 (SR)]

[Home](#) [Project Team](#) [Search By Name](#) [Botanical Name A-Z](#) [Common Name A-Z](#) [Plant Family A-Z](#) [Search By Criteria](#) [References](#) [Contact Us](#)

Home > Botanical Name

Dysoxylum gotadhora

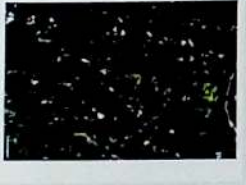
[Back](#)

Botanical Name: *Dysoxylum gotadhora* (Buch.-Ham.) Mabb.
Synonym: *Dysoxylum binectanfolium* C DC.
Dysoxylum reticulatum King
Common Name: Cup-calyx white cedar, Devadanu, Erandi
Family: Meliaceae
Description:
 Large trees. Leaves imparipinnate, leaflets 5-9, alternate or subopposite, coriaceous, elliptic-oblong, apex acuminate, base oblique or inequilateral, to 15 x 6 cm. Flowers in axillary or supra-axillary subglabrous panicles. Pedicels short, articulated. Calyx cup shaped, nearly half as long as the flower, coriaceous, subentire, glabrous. Petals 4, greenish-yellow, valvate except at the apex, tomentose outside. Staminal-tube cylindric, anthers 8. Ovary ribbed, villous, attenuated into the style, 4-celled, ovules 2 in each cell. Stigma hemispheric, truncate. Capsules obovoid or subglobose, grooved, glabrous, orange-colored when ripe, 4-seeded. Seeds purplish brown, shining.
Flowers: July-December
Notes: Common in semievergreen to evergreen forests.

Gallery - *Dysoxylum gotadhora*













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Plate 9C

Web page of the website www.indianflora.org

Plant Photos: *Moullava spicata* (Dalzell) Nicolson

Plate 9 C

indianflora.org/plant_botanical_list?id=M

The Western Ghats WWF - Western Ghats Schmuck Kollektion Checklist of Rare, End Tallen Macro Photo Flower Names - Com Digital Herbarium of



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Digital Herbarium of Angiospermic Plants of Western Ghat Regions
of Maharashtra.
UGC Funded Major Research Project. [UGC File Number: 42-943/2013 (SR)]



Home Project Team Search By Name Botanical Name A-Z Common Name A-Z Plant Family A-Z Search By Criteria References Contact Us

Home > Botanical Name

Moullava spicata

Back

Botanical Name: *Moullava spicata* (Dalzell) Nicolson

Synonym: *Caesalpinia spicata* Dalzell

Wagatea spicata (Dalzell) Wight

Common Name: Candy Corn Plant, Wagati, Wakeri

Family: Leguminosae-Caesalpinioideae

Description:

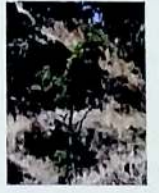
Woody, scandent shrubs. Branches armed with numerous recurved prickles. Bark corky, rough and furrowed, covered with scattered cones. Leaves dark, shining, bipinnate, leaflets 5-7 pairs, coriaceous, oblong, apex obtuse, base rounded or cordate, 4 x 2 cm. Flowers in dense spicate racemose, orange-yellow, nearly sessile. Calyx red, tomentose, lobes oblong, obtuse. Stamens 10, alternately long and short. Pods linear-oblong, fleshy, 5-6 cm. Seeds 3-4, obovate-oblong, brown polished.

Flowers: November-May

Notes: Endemic to Western Ghats. Common in moist deciduous and semievergreen forests.

Gallery - Moullava spicata








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Plate 9D

Web page of the website www.indianflora.org

Plant Photos: *Nothapodytes nimmoniana* (J.Graham) Mabb.

Plate 9 D

dianflora.org/plant_botnical_list?id=N

The Western Ghats WWF - Western Ghats Schmuck Kollektion Checklist of Rare, End T Tallenge Macro Photo Flower Names - Com Digital Herbarium

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UGC Funded Major Research Project. [UGC File Number: 42-943/2013 (SR)]



Home Project Team Search By Name Botanical Name A-Z Common Name A-Z Plant Family A-Z Search By Criteria References Contact Us

Home > Botanical Name

Nothapodytes nimmoniana

[Back](#)

Botanical Name: *Nothapodytes nimmoniana* (J Graham) Mabb
Synonym: *Mappia foetida* (Wight) Miers
Neoloretia dimorpha (Craib) Baehni
Common Name: Fetid Tree, Ghanera, Narkya
Family: Icacinaceae
Description:
Small trees. Branches with wrinkled bark. Leaves crowded towards the ends of the branches, dark green above, paler beneath, ovate to obovate, apex acute to acuminate, base rounded, 25 x 12 cm. Flowers in terminal panicles; white to yellow. Calyx small, pubescent outside. Petals linear-oblong, acute, densely sericeo-villous on both surfaces. Stamens 5, alternate with the petals. Disk shallow, cup shaped, villous within. Drupes ellipsoid or obovoid, to 1.5 cm. long, glabrous, purple when ripe.
Flowers: June-January
Notes: Common in the semievergreen forests. Flowers are having strong foetid smell.
Uses: Plant is exploited for its medicinal value

Gallery - *Nothapodytes nimmoniana*



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Plate 10 A

Plants species from Western Ghat regions of Maharashtra:

Sr. No.	Botanical Name	Common Name	Vern. Name	Family	Status
1.	<i>Beilschmiedia dalzellii</i> (Meisn.) Kosterm.	-	-	Lauraceae	R, E-IND
2.	<i>Meiogyne pannosa</i> (Dalzell) J. Sinclair	Malabar Finger sop	-	Annonaceae	E-IND
3.	<i>Sageraea laurifolia</i> (Graham) Blatt.	Laurel bow-wood	Harkinjal, Sager	Annonaceae	E-WG
4.	<i>Knema attenuata</i> Warb.	Wild nutmeg	Ran Jayphal	Myristicaceae	E-WG
5.	<i>Lophopetalum wightianum</i> Arn.	Wight's lophopetalum	Balpale	Celastraceae	O
6.	<i>Garcinia talbotii</i> Raizada ex Santapau	Talbot garcinia	Limboti, Pansara	Clusiaceae	E-WG

C: Common, En: Endangered, E-IND: Endemic to India, E-WG: Endemic to Western ghats O: Occasional, R: Rare

Plate 10 A



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Plate 10 B

Plants species from Western Ghat regions of Maharashtra:

Sr. No.	Botanical Name	Common Name	Vern. Name	Family	Status
7.	<i>Macaranga peltata</i> (Roxb.) Müll.Arg.	-	Chandvad, Chandada	Euphorbiaceae	C
8.	<i>Mallotus philippensis</i> (Lam.) Müll.Arg.	Scarlet croton, Kaamala tree	Kesari, Shendri	Euphorbiaceae	O
9.	<i>Glochidion ellipticum</i> Wight	-	Bhoma	Phyllanthaceae	C
10.	<i>Carallia brachiata</i> (Lour.) Merr.	Fresh water mangrove	Phanshi	Rhizophoraceae	O
11.	<i>Desmodium oojeinense</i> (Roxb.) H.Ohashi	Sandan	Kala-palas, Tewas	Fabaceae	R
12.	<i>Moullava spicata</i> (Dalzell) Nicolson	Candy Corn Plant	Wagati, Wakeri	Fabaceae	E-IND

C: Common, En: Endangered, E-IND: Endemic to India, E-WG: Endemic to Western ghats O: Occasional, R: Rare

Plate 10 B



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Plate 10 C

Plants species from Western Ghat regions of Maharashtra:

Sr. No.	Botanical Name	Common Name	Vern. Name	Family	Status
13.	<i>Lagerstroemia speciosa</i> (L.) Pers.	Pride of India, Queen crape myrtle	Jarul, Taman	Lythraceae	C
14.	<i>Memecylon umbellatum</i> Burm. f.	Ironwood tree	Anjan	Melastomataceae	C
15.	<i>Holigarna grahamii</i> (Wight) Kurz	Blistering varnish Tree	Ran bibba	Anacardiaceae	O
16.	<i>Lannea coromandelica</i> (Houtt.) Merr.	Indian ash tree, Moya	Moi, Shemat, Shinti	Anacardiaceae	C
17.	<i>Garuga pinnata</i> Roxb.	Garuga	Kakad	Burseraceae	O
18.	<i>Dysoxylum gotadhora</i> (Buch.-Ham.) Mabb.	Cup-calyx white cedar	Devadaru, Erindi	Meliaceae	R

C: Common, En: Endangered, E-IND: Endemic to India, E-WG: Endemic to Western ghats O: Occasional, R: Rare

Plate 10 C



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Plate 10 D

Plants species from Western Ghat regions of Maharashtra:

Sr. No.	Botanical Name	Common Name	Vern.Name	Family	Status
19.	<i>Murraya koenigii</i> (L.) Spreng.	Curry Leaf	Kadhi patta	Rutaceae	C
20.	<i>Dimocarpus longan</i> Lour.	Dragon's eyes, Eyeball tree	Wumb, Omb	Sapindaceae	O
21.	<i>Vateria indica</i> L.	White Damar	Dhup	Dipterocarpaceae	E-WG
22.	<i>Grewia umbellifera</i> Bedd.	Ghat crossberry	-	Malvaceae	E-IND
23.	<i>Helicteres isora</i> L.	East-Indian screw tree	MuradSheng	Malvaceae	O
24.	<i>Sterculia urens</i> Roxb.	Gum karaya	Kandol, Pandruk	Malvaceae	O

C: Common, En: Endangered, E-IND: Endemic to India, E-WG: Endemic to Western ghats O: Occasional, R: Rare

Plate 10 D



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Plate 10 E

Plants species from Western Ghat regions of Maharashtra:

Sr. No.	Botanical Name	Common Name	Vern. Name	Family	Status
25.	<i>Capparis moonii</i> Wight	Large caper	Waghati	Capparaceae	O
26.	<i>Santalum album</i> L.	Sandal wood	Chandan	Santalaceae	E-IND
27.	<i>Symplocos cochinchinensis</i> var. <i>laurina</i> (Retz.) Noot.	Laurel Sapphire Berry	-	Symplocaceae	O
28.	<i>Nothapodytes nimmoniana</i> (J.Graham) Mabb.	Fetid Tree	Ghanera, Narkya	Icacinaceae	O
29.	<i>Tabernaemontana alternifolia</i> L.	-	Nag kuda	Apocynaceae	E-WG
30.	<i>Catunaregam spinosa</i> (Th unb.) Tirveng.	Mountain pomegranate	Gela	Rubiaceae	C

C: Common, En: Endangered, E-IND: Endemic to India, E-WG: Endemic to Western ghats O: Occasional, R: Rare

Plate 10 E



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Plate 10 F

Plants species from Western Ghat regions of Maharashtra:

Sr. No.	Botanical Name	Common Name	Vern. Name	Family	Status
31.	<i>Meyna laxiflora</i> Robyns	Muyna	Hulu, Alu	Rubiaceae	C
32.	<i>Calacanthus grandiflorus</i> (Dalzell) Radlk	Large flowered calacanthus	Mugut	Acanthaceae	E-WG
33.	<i>Justicia santapau</i> Bennet	Santapau's Justicia	-	Acanthaceae	E-IND
34.	<i>Strobilanthes callosus</i> Nees	-	Karvy	Acanthaceae	E-IND
35.	<i>Callicarpa tomentosa</i> (L.) L.	Velvety beauty berry	Kaarivaati	Lamiaceae	O
36.	<i>Olea dioica</i> Roxb.	Rose sandalwood	Parjamb, Hadkya	Oleaceae	O

C: Common, En: Endangered, E-IND: Endemic to India, E-WG: Endemic to Western ghats O: Occasional, R: Rare

Plate 10 F



31



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CONCLUSIONS SUMMARIZING THE ACHIEVEMENTS

The present work is one such example where ICT facilities can be used to build searchable databases useful in botanical studies. Such databases can be shared online for the benefit of users from different sectors like students, researchers, NGOs, and general population. Moreover, preparation of digital herbaria is also an eco-friendly approach since the natural vegetation is not disturbed in its development.

The searchable database of digital herbarium of angiospermic trees of Western Ghat regions of Maharashtra has been made available online from 29th February 2016.

This website can help in accurate and efficient identification of trees from Western Ghat regions of Maharashtra, even in the absence of expert taxonomist and has negligible expenses on maintenance of herbarium. This database can provide a home for global, regional, or local studies. It can also provide digital study material for teaching Taxonomy, Field Botany, Plant Communities, Ethnobotany, Agriculture, Dendrology, Forestry, etc. It is useful in providing information on common names and local uses of plants, which is essential for studies related to Ethnobotany and Economic Botany. This website can also be used for getting a detailed botanical description of tree species found in the Western Ghat regions of Maharashtra.

INDICATION OF SCOPE FOR FUTURE WORK

Western Ghats of Maharashtra is rich in floristic diversity. These plants exhibit different habits such as herbs, shrubs, climbers, and trees. The scope of the present project was on the angiospermic trees and shrubs only. Thus, there is a good opportunity and scope for compiling a similar Digital Herbarium of herbs and climbers as well.

LIST OF RESEARCH PUBLICATIONS

As planned and indicated in the Progress Report for the 2nd year of the project, the following two publications were made. The details are as under:

Table 2. List of publications

Sr. No.	Authors	Title of paper/publication	Name of the Journal/publication	Volume	Pages	Year
1	*R S ZUNJARRAO, R B BARMUKH and ANITA KINDRE	Digital Herbarium of Angiospermic Tree Species from Western Ghat Regions of Maharashtra. (Annexure 3)	<i>Dnyanmay</i>	I(1)	11-13	2015
2	R S ZUNJARRAO, R B BARMUKH and ANITA KINDRE	Website launched: Digital herbarium of angiospermic tree species from Western Ghat regions of Maharashtra.	www.indianflora.org	-	-	29 th February 2016

MANPOWER TRAINED ON THE PROJECT

a) Junior research fellow (JRF)

No.	Name	Designation	Date of Joining	Date of leaving	Total no. of months spent
1	Mr. Shrikant Gund.	JRF	02/05/2013	30/04/2014	12 Months
2	Miss. Anita Kindre.	JRF	06/05/2014	31/03/2016	22 Months 26 days

b) No. of Ph.D. produced: NIL

FINANCIAL POSITION

The financial position of the project is summarized in Table 3.

Table 3: Financial position of the project

No	Financial Position/ Budget Head	Amount Approved (Rs.)	Grant Released 1 st Instalment (Rs.)	Expenditure Incurred 1 st April 2013- 31 st March 2015
I	Books	10,000/-	10,000/-	8,247/-
II	Equipment	2,01,350/-	2,01,350/-	2,01,126/-
III	Contingency	36,000/-	18,000/-	34,155/-
IV	Field Work/Travel	1,00,000/-	50,000/-	62,962/-
V	Hiring Services	50,000/-	25,000/-	7,200/-
VI	Overhead	61,400/-	61,400/-	61,400/-
VII	Project fellow: 14,000/- pm for initial 2 years) 16,000/- pm in 3 rd year	5,28,000/-	2,64,000/-	5,11,742/-
	Total	9,86,750/-	6,29,750/-	8,86,832/-

PROCUREMENT/USAGE OF EQUIPMENT

The details on procurement and usage of the equipment are presented in Table 4.

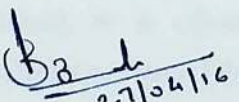
Table 4: Procurement and usage of equipment

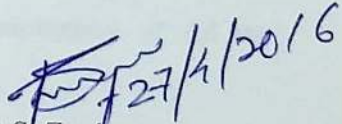
Sr. no.	Name of Equipment	Make / Model	Cost (FE/Rs)	Date of installation	Utilization Rate (%)	Remarks regarding maintenance/ break down
1	Computer Desktop, Printer and Scanner	HP Desktop P2-1402IN – Pavilion, HP LED Backlit Monitor W1972a, HP Laserjet Pro P1108 Printer, HP Scanner SJ G4010	Rs.49,800/-	12-06-2013	100%	Maintenance not required so far.
2	Canon DSLR Camera with two lenses	Canon zoom lens EF-S 55-250 1:4-5.6 IS II Camera body- 600D, 18-55 ISII lens, SD card and camera bag	Rs. 51,400/-	05-07-2012	100%	Servicing of camera body was done in the month July 2015.
3	Website	Custom web application – PHP Database – My SQL	Rs. 99,926/-	29-02-2016 (website was made online)	100%	Maintenance of website was part of website development.

PLANS FOR UTILIZING THE EQUIPMENT FACILITIES IN FUTURE:

Updating the website www.indianflora.org is going to be a continuous process. The digital camera purchased from the financial assistance for this project from UGC will remain in the custody of the Head of the Department of Botany and will be used to capture the digital images of species that are yet to be included in the database. For storing and editing of these digital images and also for maintaining the website, the computer facility generated in the project will be used.

The institution has various science departments that have Post Graduate Research Centers approved by Savitribai Phule Pune University, Pune. Amongst these science departments, Botany, Zoology, Microbiology and Biotechnology, are actively engaged in research. The staff members are awarded research projects by different funding agencies. Thus, the college, which has been awarded prestigious 'Star College Scheme' by DST and 'College with Potential for Excellence' scheme by UGC, will meaningfully utilize the equipment to cater the needs of Post Graduate Academic and Research Activities in many ways.


Dr. R. B. Barmukh
(Co-Investigator)


Dr. R. S. Zunjarrao
(Principal Investigator)
Dr. R. S. Zunjarrao
P. I., UGC MRP,
Digital Herbarium
(2013-2016)

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Shrubs and trees from the Western Ghat Regions of Maharashtra

Sr. No.	Botanical Name	Common Name	Vern Name	Family	Status
1.	<i>Actinodaphne hookeri</i> Meisn.		Pisa	Lauraceae	C
2.	<i>Alseodaphne semecarpifolia</i> Nees		Phudgus	Lauraceae	O
3.	<i>Beilschmiedia dalzellii</i> (Meisn.) Kosterm.			Lauraceae	R, E-IND
4.	<i>Cinnamomum cassia</i> (L.) J.Presl	Grey bollywood	Chirchira	Lauraceae	O
5.	<i>Cinnamomum verum</i> J.Presl	Cinnamon	Dalchini	Lauraceae	O, Cl
6.	<i>Cryptocarya lawsonii</i> Gamble			Lauraceae	E-WG
7.	<i>Litsea deccanensis</i> Gamble	Deccan Tallow Laurel	Chikana	Lauraceae	O
8.	<i>Litsea josephii</i> S.M. Almeida	Joseph's Laurel	Naramba	Lauraceae	O
9.	<i>Litsea stocksii</i> Hook.f.	Joseph's Laurel	Naramba	Lauraceae	E-IND
10.	<i>Persea macrantha</i> (Nees) Kosterm.	Large-flowered bay tree	Gulaamba	Lauraceae	O
11.	<i>Pimenta dioica</i> (L.) Merr.	Allspice		Lauraceae	Cl
12.	<i>Annona muricata</i> L.	Soursop	Hanuman phal	Annonaceae	Cl
13.	<i>Annona reticulata</i> L.	Netted custard apple	Ramphal	Annonaceae	O, Cl
14.	<i>Annona squamosa</i> L.	Custard apple	Sitaphal	Annonaceae	O, Cl
15.	<i>Artabotrys hexapetalus</i> (L.f.) Bhandari	Tail grape	Hirva chafa	Annonaceae	C
16.	<i>Artabotrys zeylanicus</i> Hook.f. & Thomson	Ceylon green champa	Ran Chapha	Annonaceae	R
17.	<i>Cananga odorata</i> (Lam.) Hook.f. & Thomson	Ylang-ylang tree		Annonaceae	O
18.	<i>Meiogyne pannosa</i> (Dalzell) J. Sinclair	Malabar Fingersop		Annonaceae	E-IND
19.	<i>Miliusa tomentosa</i> (Roxb.) J.Sinclair	Hoom	Humb	Annonaceae	O
20.	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Mast tree	Ashok	Annonaceae	C, Cl
21.	<i>Sageraea laurifolia</i> (Graham) Blatt.	Laurel bow-wood	Harkinjal, Sager	Annonaceae	E-WG
22.	<i>Uvaria narum</i> (Dunal) Blume			Annonaceae	O
23.	<i>Magnolia champaca</i> (L.) Baill. ex Pierre	Golden champa	Son champa, Sonchafa	Magnoliaceae	C
24.	<i>Knema attenuata</i> Warb.	Wild nutmeg	Ran Jayphal	Myristicaceae	R, E-WG
25.	<i>Myristica fatua</i> var. <i>magnifica</i> Sinclair	Magnificent Nutmeg		Myristicaceae	E-WG
26.	<i>Adonidia merrillii</i> (Becc.) Becc.	Manila palm		Arecaceae	Cl
27.	<i>Areca catechu</i> L.	Areca palm	Pophali	Arecaceae	C
28.	<i>Calamus pseudotenius</i> Becc.	Slender Rattan Cane	Vet	Arecaceae	C

29.	<i>Caryota urens</i> L.	Fishtail Palm	Maadi	Arecaceae	C
30.	<i>Cocos nucifera</i> L.	Coconut	Nariyal, Shriphal	Arecaceae	C
31.	<i>Latania loddigesii</i> Mart.			Arecaceae	Cl
32.	<i>Phoenix sylvestris</i> (L.) Roxb.	Wild date Palm	Khajur	Arecaceae	C
33.	<i>Roystonea regia</i> (Kunth) O.F.Cook	Royal Palm		Arecaceae	Cl
34.	<i>Washingtonia filifera</i> (Linden ex André) H.Wendl. ex de Bary	California Fan Palm		Arecaceae	Cl
35.	<i>Dendrocalamus strictus</i> (Roxb.) Nees	Calcutta bamboo	Bamboo	Poaceae	C
36.	<i>Dendrocalamus giganteus</i> Munro	Giant bamboo	Bamboo	Poaceae	Cl
37.	<i>Platanus orientalis</i> L.	Oriental plane	Chinar	Platanaceae	Cl
38.	<i>Grevillea robusta</i> A.Cunn. ex R.Br.	Silver oak		Proteaceae	Cl
39.	<i>Macadamia ternifolia</i> F.Muell.	Maroochy Nut, Gympie Nut		Proteaceae	Cl
40.	<i>Dillenia indica</i> L.	Elephant Apple	Karmal	Dilleniaceae	R
41.	<i>Dillenia pentagyna</i> Roxb.	Dog teak	Karmal	Dilleniaceae	O
42.	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Air Plant, Donkey ears	Amar poi	Crassulaceae	Cl
43.	<i>Cayratia trifolia</i> (L.) Domin	Bush Grape	Amboshi	Vitaceae	O
44.	<i>Cissus javana</i> DC.	Climbing Begonia		Vitaceae	O
45.	<i>Leea asiatica</i> (L.) Ridsdale		Banchalita	Vitaceae	O
46.	<i>Leea indica</i> (Burm. f.) Merr.	Bandicoot berry	Karkani	Vitaceae	C
47.	<i>Leea macrophylla</i> Roxb. ex Hornem.	Hathikana	Gajakarni	Vitaceae	O
48.	<i>Arnicratea grahamii</i> (Wight) N.Hallé	Running Straggler	Daushir, dhavashi	Celastraceae	O
49.	<i>Cassine paniculata</i> (Wight & Arn.) Lobr.-Callen	Panicled cassine	Motha Bhutya	Celastraceae	O
50.	<i>Celastrus paniculatus</i> Willd.	Black Oil Plant	Malkangani	Celastraceae	O
51.	<i>Euonymus indicus</i> B.Heyne ex Wall	Indian Spindle Tree		Celastraceae	E-WG
52.	<i>Gymnosporia senegalensis</i> (Lam.) Loes.	Red spike thorn	Henkal	Celastraceae	O
53.	<i>Loeseneriella ovata</i> (Lam.) M.R.Almeida	Oval-leaved hippocratea	Daushir	Celastraceae	O
54.	<i>Lophopetalum wightianum</i> Arn.	Wight's lophopetalum	Balpale	Celastraceae	O
55.	<i>Maytenus rothiana</i> Lobr.- Callen	Roth's spike thorn	Lokhandi, Makar khana	Celastraceae	E-IND
56.	<i>Salacia chinensis</i> L.	Chinese Salacia	Saptrangi	Celastraceae	O
57.	<i>Salacia macrosperma</i> Wight			Celastraceae	E-WG
58.	<i>Connarus monocarpus</i> L.	Indian zebrawood	Sumdari, Sundar	Connaraceae	O
59.	<i>Elaeocarpus serratus</i> L.	Wild Olive tree	Kasava	Elaeocarpaceae	O
60.	<i>Averrhoa bilimbi</i> L.	Cucumber tree	Bilimbi	Oxalidaceae	O
61.	<i>Calophyllum inophyllum</i> L.	Beauty leaf	Undi	Clusiaceae	O
62.	<i>Clusia rosea</i> Jacq.	Autograph tree		Clusiaceae	Cl

63.	<i>Garcinia indica</i> (Thouars) Choisy	Kokam	Bheranda, Ratambi	Clusiaceae	C
64.	<i>Garcinia spicata</i> Hook.f.			Clusiaceae	O
65.	<i>Garcinia talbotii</i> Raizada ex Santapau	Talbot garcinia	Limboti, Pansara	Clusiaceae	E-IND
66.	<i>Mammea suriga</i> (Buch.-Ham. ex Roxb.) Kosterm.		Surangi	Clusiaceae	E-IND
67.	<i>Mesua ferrea</i> L.	Cobra saffron	Nag keshar	Clusiaceae	O
68.	<i>Dichapetalum gelonioides</i> (Roxb.) Engl.	Gelonium Poison-Leaf		Dichapetalaceae	O
69.	<i>Acalypha hispida</i> Burm.f.	Cat's tail		Euphorbiaceae	Cl
70.	<i>Agrostistachys indica</i> Dalzell	Leaf-Litter Plant		Euphorbiaceae	O
71.	<i>Baliospermum solanifolium</i> (Burm.) Suresh	Red physic nut	Danti, Dantika	Euphorbiaceae	C
72.	<i>Blachia andamanica</i> subsp. <i>denudata</i> (Benth.) N.P.Balabr. & Chakrab.	Sahyadri Blachia		Euphorbiaceae	E-WG
73.	<i>Codiaeum variegatum</i> (L.) Rumph. ex A.Juss.	Croton		Euphorbiaceae	Cl
74.	<i>Croton bonplandianus</i> Baill.		Ban tulsi	Euphorbiaceae	C
75.	<i>Euphorbia antiquorum</i> L.	Triangular spurge	Tindhari nivdung	Euphorbiaceae	C
76.	<i>Euphorbia caducifolia</i> Haines	Leafless milk hedge	Thor	Euphorbiaceae	C
77.	<i>Euphorbia cotinifolia</i> L.	Caribbean copper plant		Euphorbiaceae	C
78.	<i>Euphorbia leucocephala</i> Lotz	Snow bush		Euphorbiaceae	C
79.	<i>Euphorbia milii</i> fo. <i>lutea</i> Leandri	Yellow crown of thorns		Euphorbiaceae	Cl
80.	<i>Euphorbia milii</i> var. <i>splendens</i> (Bojer ex Hook.) Ursch & Leandri	Crown of thorns		Euphorbiaceae	Cl
81.	<i>Euphorbia rothiana</i> Spreng.	Common hill spurge	Dudhi	Euphorbiaceae	C
82.	<i>Euphorbia tirucalli</i> L.	Pencil tree	Sher-kandvel	Euphorbiaceae	C
83.	<i>Falconeria insignis</i> Royle	Tiger's milk spruce, Chinese tallow	Khurun, Sherod	Euphorbiaceae	O
84.	<i>Homonoia retusa</i> (Graham ex Wight) Müll.Arg.	Leaved water Croton	Machim	Euphorbiaceae	E-IND
85.	<i>Jatropha curcas</i> L.	Physic Nut, Barbados nut	Mogali Erand	Euphorbiaceae	C
86.	<i>Jatropha gossypifolia</i> L.	Cotton-leaf physic nut	Ratanjot	Euphorbiaceae	C
87.	<i>Jatropha integerrima</i> Jacq.	Pink Peregrina, Spicy jatropha		Euphorbiaceae	C
88.	<i>Jatropha podagrica</i> Hook.	Australian bottle plant		Euphorbiaceae	Cl
89.	<i>Joannesia princeps</i> Vell.	Arara nut		Euphorbiaceae	Cl
90.	<i>Macaranga peltata</i> (Roxb.) Müll.Arg.		Chandvad, Chandada	Euphorbiaceae	O
91.	<i>Mallotus aureopunctatus</i> (Dalzell) Müll.Arg.	Yellow-spotted kamala		Euphorbiaceae	E-IND

92.	<i>Mallotus philippensis</i> (Lam.) Müll.Arg.	Scarlet croton, Kaamala tree	Kesari, Shendri	Euphorbiaceae	O
93.	<i>Mallotus polycarpus</i> (Benth.) Kulju & Welzen		Petari	Euphorbiaceae	E-IND
94.	<i>Mallotus resinousus</i> (Blanco) Merr.	Resinous Kamala		Euphorbiaceae	O
95.	<i>Manihot esculenta</i> Crantz	Tapioca	Kalpakanda	Euphorbiaceae	Cl
96.	<i>Ricinus communis</i> L.	Castor oil plant	Arand	Euphorbiaceae	C
97.	<i>Trevis nudiflora</i> L. var. <i>polycarpa</i> (Benth.) Susila & N.P. Balakr.	Many-fruited Trevis	Petari	Euphorbiaceae	O
98.	<i>Galphimia gracilis</i> Bartl.	Goldshower		Malpighiaceae	Cl
99.	<i>Ochna obtusata</i> DC.	Golden champak	Ramdhan Champa	Ochnaceae	O
100.	<i>Turnera ulmifolia</i> L.	Yellow buttercups		Passifloraceae	O
101.	<i>Antidesma ghaesembilla</i> Gaertn.	Black currant tree		Phyllanthaceae	O
102.	<i>Aporosa cardiosperma</i> (Gaertn.) Merr.	Lindley's Aporosa		Phyllanthaceae	O
103.	<i>Breynia retusa</i> (Dennst.) Alston	Cup-socur	Dalphodi	Phyllanthaceae	C
104.	<i>Bridelia montana</i> (Roxb.) Willd.	Hamilton's bridelia	Chikani	Phyllanthaceae	E-IND
105.	<i>Bridelia retusa</i> (L.) A.Juss.	Spinous kino tree	Asana	Phyllanthaceae	C
106.	<i>Bridelia stipularis</i> (L.) Blume	Climbing bridelia	Phatarpodi	Phyllanthaceae	C
107.	<i>Flueggea leucopyrus</i> Willd.	Bushweed, Indian snow berry	Pandharpali	Phyllanthaceae	C
108.	<i>Glochidion ellipticum</i> Wight		Bhoma	Phyllanthaceae	O
109.	<i>Glochidion hohenackeri</i> (Müll.Arg.) Bedd.			Phyllanthaceae	E-IND
110.	<i>Phyllanthus acidus</i> (L.) Skeels	Star gooseberry	Harpharori, Ray aawla	Phyllanthaceae	Cl
111.	<i>Phyllanthus emblica</i> L.	Amla	Aawla	Phyllanthaceae	C
112.	<i>Drypetes venusta</i> (Wight) Pax & K.Hoffm.			Putranjivaceae	O
113.	<i>Putranjiva roxburghii</i> Wall.	Lucky bean tree	Putranjiva, Patravanti	Putranjivaceae	C
114.	<i>Carallia brachiata</i> (Lour.) Merr.	Freshwater mangrove	Phanshi	Rhizophoraceae	O
115.	<i>Ceriops tagal</i> (Perr.) C.B.Rob.	Tagal Mangrove		Rhizophoraceae	O
116.	<i>Rhizophora mucronata</i> Lam.	Asiatic Mangrove	Kandal	Rhizophoraceae	O
117.	<i>Casearia esculenta</i> Roxb.	Chilla		Salicaceae	O
118.	<i>Casearia graveolens</i> Dalzell	Chilla	Bhokoda	Salicaceae	O
119.	<i>Flacourtia montana</i> J.Graham	Mountain sweet thorn	Raan-tambut	Salicaceae	E-IND
120.	<i>Oncoba spinosa</i> Forssk.	Fried egg tree		Salicaceae	Cl
121.	<i>Salix tetrasperma</i> Roxb.	Indian Willow		Salicaceae	
122.	<i>Acacia auriculiformis</i> Benth.	Australian		Fabaceae	Cl

		babbol			
123.	<i>Acacia chundra</i> (Rottler) Willd.			Fabaceae	C
124.	<i>Acacia concinna</i> (Willd.) DC	Soap-pod	Shikekai	Fabaceae	C
125.	<i>Acacia leucophloea</i> (Roxb.) Willd.	White bark Acacia	Himvar	Fabaceae	C
126.	<i>Acacia pennata</i> (L.) Willd.		Shembarati	Fabaceae	C
127.	<i>Acacia polyacantha</i> Willd.			Fabaceae	C
128.	<i>Acacia catechu</i> (L.f.) Willd.	Cutch tree	Khair	Fabaceae	C
129.	<i>Acacia nilotica</i> (L.) Delile	Babbol	Bhabul	Fabaceae	C
130.	<i>Acrocarpus fraxinifolius</i> Arn.	Pink cedar	Tokphal	Fabaceae	O
131.	<i>Adenanthera pavonina</i> L	Red sandalwood	Thorla goonj	Fabaceae	O
132.	<i>Albizia amara</i> (Roxb.) B.Boivin	Oil cake tree	Krishna shiris	Fabaceae	O
133.	<i>Albizia lebbek</i> (L.) Benth.	Siris tree	Shirish	Fabaceae	C
134.	<i>Albizia lucidior</i> (Steud.) I.C.Nielsen		Potka Siris	Fabaceae	Cl
135.	<i>Albizia procera</i> (Roxb.) Benth.	White shiris	Kinhai	Fabaceae	C
136.	<i>Albizia saman</i> (Jacq.) Merr.	Rain tree	Parjanya- vruksha	Fabaceae	C, Cl
137.	<i>Bauhinia acuminata</i> L.	Dwarf white orchid tree	Safed kanchan	Fabaceae	C
138.	<i>Bauhinia blakeana</i> Dunn	Hong Kong orchid tree		Fabaceae	O
139.	<i>Bauhinia monandra</i> Kurz	Pink orchid tree		Fabaceae	O
140.	<i>Bauhinia purpurea</i> L.	Butterfly tree	Devkanchan	Fabaceae	C
141.	<i>Bauhinia racemosa</i> Lam.	Bidi leaf Tree	Apta	Fabaceae	C
142.	<i>Bauhinia roxburghiana</i> Voigt	Roxburgh's Bauhinia	Semla kanchan	Fabaceae	O
143.	<i>Bauhinia tomentosa</i> Vell.	Yellow orchid tree	Piwala kanchan	Fabaceae	O
144.	<i>Bauhinia variegata</i> L.	White-purple orchid tree	Kanaraj	Fabaceae	O
145.	<i>Brownea coccinea</i> Jacq.	Scarlet flame bean	Lal zumbar	Fabaceae	Cl
146.	<i>Butea monosperma</i> (Lam.) Taub.	Flame of the forest	Palas	Fabaceae	C
147.	<i>Caesalpinia cucullata</i> Roxb.	Ragi		Fabaceae	O
148.	<i>Caesalpinia decapetala</i> (Roth) Alston	Mysore thorn	Chilar	Fabaceae	C
149.	<i>Caesalpinia pulcherrima</i> (L.) Sw	Peacock flower	Shankasur	Fabaceae	Cl
150.	<i>Caesalpinia mimosoides</i> Lam	Mimosa thorn	Narkati	Fabaceae	O
151.	<i>Cajanus cajan</i> (L.) Millsp.	Red gram	Tur	Fabaceae	Cl
152.	<i>Calliandra haematocephala</i> Hassk.	Red powder puff		Fabaceae	Cl
153.	<i>Cassia fistula</i> L.	Golden shower tree	Bahawa	Fabaceae	C
154.	<i>Cassia roxburghii</i> DC.	Red cassia		Fabaceae	O
155.	<i>Cassia grandis</i> L.f.	Horse cassia		Fabaceae	C
156.	<i>Cassia renigera</i> Benth.	Pink cassia		Fabaceae	C
157.	<i>Castanospermum australe</i> A.Cunn. & C.Fraser	Australian chestnut		Fabaceae	Cl

158.	<i>Colvillea racemosa</i> Bojer	Colville's glory	Kilbili	Fabaceae	Cl
159.	<i>Crotalaria retusa</i> L.	Rattlebox	Gagra	Fabaceae	C
160.	<i>Crotalaria spectabilis</i> Roth	Showy rattlepod	Ghungri, Dingala	Fabaceae	C
161.	<i>Dalbergia horrida</i> (Dennst.) Mabb.	Prickly Dalbergia		Fabaceae	E-IND
162.	<i>Dalbergia lanceolaria</i> subsp. <i>paniculata</i> (Roxb.) Thoth.		Phanshi	Fabaceae	O
163.	<i>Dalbergia melanoxylon</i> Guill. & Perr.	Dalbergia		Fabaceae	O
164.	<i>Dalbergia rubiginosa</i> Roxb.	Rusty Dalbergia		Fabaceae	E-IND
165.	<i>Dalbergia sissoo</i> DC.	Indian rosewood	Shisham	Fabaceae	C
166.	<i>Delonix regia</i> (Hook.) Raf.	Flame tree	Gulmohar	Fabaceae	Cl
167.	<i>Dendrolobium triangulare</i> (Retz.) Schindl.	Triangular horse bush		Fabaceae	O
168.	<i>Desmodium laxiflorum</i> DC.	Loose flowered Desmodium	Aasud, Jangli- ganja	Fabaceae	O
169.	<i>Desmodium oojeinense</i> (Roxb.) H.Ohashi	Sandan	Kala-palas, Tewas	Fabaceae	R
170.	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Sickle bush	Kunali, Durangi babool	Fabaceae	C
171.	<i>Erythrina suberosa</i> Roxb.	Corky coral tree	Pangara	Fabaceae	O
172.	<i>Erythrina variegata</i> L.	Indian coral tree	Pangara	Fabaceae	C
173.	<i>Flemingia strobilifera</i> (L.) W.T.Aiton	Wild hops, Luck plant	Kanphuti	Fabaceae	C
174.	<i>Gliricidia sepium</i> (Jacq.) Walp.	Quickstick		Fabaceae	Cl
175.	<i>Indigofera tinctoria</i> L.	West Indian Indigo	Vilayati nil	Fabaceae	C
176.	<i>Lysiloma latisiliquum</i> (L.) Benth.			Fabaceae	C
177.	<i>Millettia peguensis</i> Ali	Moulmein rosewood	Lal karanj	Fabaceae	Cl
178.	<i>Mimosa hamata</i> Willd.	Hooked Mimosa	Gulabi babul	Fabaceae	O
179.	<i>Mimosa pudica</i> L.	Touch-me-not	Lajalu, Lajwanti	Fabaceae	C
180.	<i>Moullava spicata</i> (Dalzell) Nicolson	Candy Corn Plant	Wagati, Wakeri	Fabaceae	E-WG
181.	<i>Parkia biglandulosa</i> Wight & Arn.	Badminton ball tree	Chendu phul	Fabaceae	Cl
182.	<i>Parkinsonia aculeata</i> L.	Jerusalem thorn	Vedi babhul	Fabaceae	Cl
183.	<i>Peltophorum pterocarpum</i> (DC.) K.Heyne	Copperpod	Piwala gulmohar	Fabaceae	Cl
184.	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Sweet tamarind	Vilayati chinch	Fabaceae	Cl
185.	<i>Pongamia pinnata</i> (L.) Pierre	Pongam tree, Indian beech tree	Karanj	Fabaceae	C
186.	<i>Prosopis cineraria</i> (L.) Druce		Shami	Fabaceae	O
187.	<i>Pterocarpus indicus</i> f. <i>echinatus</i> (Pers.) Rojo			Fabaceae	O
188.	<i>Pterocarpus marsupium</i> Roxb.	Indian kino tree	Bija	Fabaceae	En

189.	<i>Pterocarpus santalinus</i> L.f.	Red sandalwood	Raktachandan	Fabaceae	O
190.	<i>Saraca asoca</i> (Roxb.) Willd.	Sorrowless tree	Sita ashok	Fabaceae	O
191.	<i>Senna alata</i> (L.) Roxb.	Candle bush, Ringworm shrub	Dadmurdan	Fabaceae	C
192.	<i>Senna auriculata</i> (L.) Roxb.	Tanner's Cassia	Tarvad	Fabaceae	C
193.	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Siamese Cassia	Kassod	Fabaceae	C
194.	<i>Senna sophora</i> (L.) Roxb.	Sophera Senna	Kashawada	Fabaceae	O
195.	<i>Senna spectabilis</i> (DC.) H.S.Irwin & Barneby	Spectacular Cassia		Fabaceae	C
196.	<i>Senna surattensis</i> (Burm.f.) H.S.Irwin & Barneby	Glaucous Cassia	Motha tarwad	Fabaceae	O
197.	<i>Senna tora</i> (L.) Roxb.	Stinking Cassia	Takla	Fabaceae	C
198.	<i>Sesbania grandiflora</i> (L.) Pers.	Agati	Hatga	Fabaceae	C
199.	<i>Sesbania sesban</i> (L.) Merr.	Common Sesban	Shewri	Fabaceae	Cl
200.	<i>Tamarindus indica</i> L.	Tamarind	Imali, Chinch	Fabaceae	C
201.	<i>Xylia xylocarpa</i> (Roxb.) Taub.	Burma Ironwood	Yerul	Fabaceae	O
202.	<i>Trema orientalis</i> (L.) Blume	Indian Charcoal Tree	Ghol, Kapshi, Khargol	Cannabaceae	C
203.	<i>Elaeagnus conferta</i> Roxb.	Wild olive	Ambgul	Elaeagnaceae	O
204.	<i>Artocarpus altilis</i> (Parkinson ex F.A.Zorn) Fosberg	Breadfruit	Nirphanas	Moraceae	C
205.	<i>Artocarpus gomezianus</i> Wall. ex Trecul		Otamb	Moraceae	O
206.	<i>Artocarpus heterophyllus</i> Lam	Jackfruit	Phanas	Moraceae	O
207.	<i>Artocarpus hirsutus</i> Lam.		Ran phanas	Moraceae	E-IND
208.	<i>Artocarpus lacucha</i> Buch.- Ham.	Lacoocha	Badhar	Moraceae	Cl
209.	<i>Broussonetia papyrifera</i> (L.) L'Hér. ex Vent.	Paper malberry	Jangli toot	Moraceae	Cl
210.	<i>Ficus amplissima</i> Sm.			Moraceae	O
211.	<i>Ficus arnottiana</i> (Miq.) Miq.	Indian rock fig	Paras pipal, Payar	Moraceae	O
212.	<i>Ficus benghalensis</i> L.	Banyan tree	Wad	Moraceae	C
213.	<i>Ficus benghalensis</i> var. <i>krishnae</i> (C.DC.) Corner	Krishna fig, Krishna's butter cup	Krishna- pimpal	Moraceae	Cl
214.	<i>Ficus benjamina</i> L.	Weeping fig	Nandaruk	Moraceae	Cl
215.	<i>Ficus callosa</i> Willd.	Calloused fig		Moraceae	O
216.	<i>Ficus carica</i> L.	Fig	Anjeer	Moraceae	Cl
217.	<i>Ficus elastica</i> Roxb. ex Hornem.	Rubber tree	Rubber Plant	Moraceae	Cl
218.	<i>Ficus exasperata</i> Vahl	Sand paper fig	Karwat	Moraceae	O
219.	<i>Ficus hispida</i> L.f.	Hairy fig	Kala umbar	Moraceae	O
220.	<i>Ficus microcarpa</i> L.f.	Laurel Fig, Indian Laurel	Kamarup	Moraceae	O
221.	<i>Ficus microphylla</i> Salzm. ex Miq.	Moreton bay fig		Moraceae	Cl
222.	<i>Ficus mollis</i> Vahl	Soft Fig		Moraceae	O
223.	<i>Ficus natalensis</i> Hochst.	Natal fig, Triangular leaf		Moraceae	Cl

		fig			
224.	<i>Ficus racemosa</i> L.	Cluster fig	Umbar	Moraceae	C
225.	<i>Ficus religiosa</i> L.	Peepal, Bodhi tree	Pimpal	Moraceae	C
226.	<i>Ficus retusa</i> L.	Laurel fig		Moraceae	O
227.	<i>Ficus tinctoria</i> subsp. <i>gibbosa</i> (Blume) Corner	Dye fig		Moraceae	O
228.	<i>Ficus virens</i> Aiton	White fig	Bassari	Moraceae	O
229.	<i>Hopea ponga</i> (Dennst.) Mabb.	Ponga	Kavshi	Moraceae	O
230.	<i>Morus alba</i> L.	White mulberry, Silkworm mulberry	Shahtoot	Moraceae	Cl
231.	<i>Streblus asper</i> Lour.	Sand paper tree	Kharoli, Kharota	Moraceae	O
232.	<i>Scutia myrtina</i> (Burm.f.) Kurz	Cat Thorn	Cheemat	Rhamnaceae	C
233.	<i>Ziziphus caracutta</i> Buch.-Ham. ex Roxb.		Ghatbor	Rhamnaceae	E-IND
234.	<i>Ziziphus jujuba</i> Mill.	Indian Jujube	Ber	Rhamnaceae	Cl
235.	<i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn.		Jhar Beri, Chanya-bor	Rhamnaceae	C
236.	<i>Ziziphus oenopolia</i> (L.) Mill.	Jackal Jujube	Makai, Burgi	Rhamnaceae	C
237.	<i>Ziziphus rugosa</i> Lam.	Wild Jujube, wrinkled jujube	Toran	Rhamnaceae	C
238.	<i>Ziziphus xylopyrus</i> (Retz.) Willd.			Rhamnaceae	C
239.	<i>Prunus ceylanica</i> (Wight) Miq.	Ceylon Cherry	Daka	Rosaceae	O
240.	<i>Prunus serrulata</i> Lindl.	Cherry blossom		Rosaceae	O
241.	<i>Celtis tetrandra</i> Roxb.	Eastern nettle tree	Brumaj	Ulmaceae	O
242.	<i>Celtis timorensis</i> Span.			Ulmaceae	O
243.	<i>Holoptelea integrifolia</i> Planch.	Indian elm, jungle cork tree	Papri, Vavala	Ulmaceae	O
244.	<i>Boehmeria caudata</i> Sw.	Japanese false nettle	Badami karwat	Urticaceae	O
245.	<i>Debregeasia longifolia</i> (Burm.f.) Wedd.	Orange Wild Rhea	Khargul	Urticaceae	O
246.	<i>Casuarina equisetifolia</i> L.	Whistling pine	Suru	Casuarinaceae	Cl
247.	<i>Anogeissus sericea</i> Brandis			Combretaceae	E-IND-MH
248.	<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall. ex Guillem. & Perr.	Axle wood tree	Dhavda	Combretaceae	C
249.	<i>Combretum albidum</i> G.Don	Piluki	Pewar Wel	Combretaceae	O
250.	<i>Combretum latifolium</i> Blume	Large leaved climbing bushwillow		Combretaceae	O
251.	<i>Combretum rotundifolium</i> Rich.	Monkey brush vine		Combretaceae	Cl
252.	<i>Getonia floribunda</i> Roxb.	Paper flower climber	Ukshi	Combretaceae	C
253.	<i>Terminalia bellirica</i> (Gaertn.)	Beach almond,	Behada	Combretaceae	C

	Roxb.	Bedda nut tree			
254.	<i>Terminalia catappa</i> L.	Indian Almond	Jangli badam	Combretaceae	C
255.	<i>Terminalia chebula</i> Retz.	Chebulic Myrobalan	Hirda	Combretaceae	C
256.	<i>Terminalia elliptica</i> Willd.	Indian Laurel, Silver grey wood	Ain, Satada	Combretaceae	C
257.	<i>Terminalia mantaly</i> H.Perrier			Combretaceae	CI
258.	<i>Terminalia paniculata</i> Roth	Kindal tree	Kinjal	Combretaceae	E-IND
259.	<i>Duabanga grandiflora</i> (DC.) Walp.	Duabanga		Lythraceae	CI
260.	<i>Lagerstroemia microcarpa</i> Hance	Ben Teak	Nana	Lythraceae	E-IND
261.	<i>Lagerstroemia parviflora</i> Roxb.	Small flowered crape	Bondara	Lythraceae	O
262.	<i>Lagerstroemia speciosa</i> (L.) Pers.	Pride of India, Queen crape myrtle	Jarul, Taman	Lythraceae	C
263.	<i>Lagerstroemia thorelii</i> Gagnep.			Lythraceae	CI
264.	<i>Lawsonia inermis</i> L.	Henna	Mehendi	Lythraceae	CI
265.	<i>Punica granatum</i> L.	Pomegranate	Anar, Dalimb	Lythraceae	C, CI
266.	<i>Sonneratia alba</i> Sm.	Sweet-scented apple mangrove	Karpu	Lythraceae	C
267.	<i>Sonneratia apetala</i> Buch.-Ham.	Sonneratia Mangrove	Kandal	Lythraceae	C
268.	<i>Woodfordia fruticosa</i> (L.) Kurz	Fire Flame Bush	Dhayati	Lythraceae	C
269.	<i>Melastoma malabathricum</i> L.	Malabar Melastoma	Shapti , Rindha	Melastomataceae	O
270.	<i>Memecylon talbotianum</i> Brandis	Talbot Memecylon		Melastomataceae	R, E-IND
271.	<i>Memecylon umbellatum</i> Burm. f.	Ironwood tree	Anjan	Melastomataceae	C
272.	<i>Callistemon citrinus</i> (Curtis) Skeels	Bottle brush tree		Myrtaceae	C
273.	<i>Eucalyptus globulus</i> Labill.		Neelgiri	Myrtaceae	C
274.	<i>Eugenia phillyraeoides</i> Trimen	Ceylon Plum	Ran Jambhul	Myrtaceae	O
275.	<i>Melaleuca bracteata</i> F.Muell.	Golden bottle brush		Myrtaceae	O
276.	<i>Psidium guajava</i> L.	Guava	Amrood, Peru	Myrtaceae	C
277.	<i>Syzygium caryophyllatum</i> (L.) Alston	South Indian Plum	Ran lawang	Myrtaceae	O
278.	<i>Syzygium cumini</i> (L.) Skeels	Java plum, Jamun	Jambhul	Myrtaceae	C
279.	<i>Syzygium gardneri</i> Thwaites			Myrtaceae	C
280.	<i>Syzygium hemisphericum</i> (Wight) Alston	Hemispheric Rose	Goljamb, Redi jambul	Myrtaceae	O
281.	<i>Syzygium jambos</i> (L.) Alston	Rose apple	Gulab jamun	Myrtaceae	O, CL
282.	<i>Syzygium salicifolium</i> (Wight) J.Graham		Bhedas	Myrtaceae	E-IND
283.	<i>Syzygium zeylanicum</i> (L.) DC.	Spicate Eugenia	Bhedas, Pitkuli	Myrtaceae	O

284.	<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	False primrose	Panlavang	Onagraceae	O
285.	<i>Turpinia cochinchinensis</i> (Lour.) Merr.	Turpinia		Staphyleaceae	O
286.	<i>Anacardium occidentale</i> L.	Cashew	Kaju	Anacardiaceae	C
287.	<i>Buchanania cochinchinensis</i> (Lour.) Almeida	Chironji tree	Charoli	Anacardiaceae	O
288.	<i>Holigarna arnottiana</i> Hook.f.	Black varnish Tree	Ranbiba	Anacardiaceae	E-IND
289.	<i>Holigarna grahamii</i> (Wight) Kurz	Blistering varnish Tree	Ran bibba	Anacardiaceae	O
290.	<i>Lannea coromandelica</i> (Houtt.) Merr.	Indian ash tree, Moya	Moi, Shemat, Shinti	Anacardiaceae	C
291.	<i>Mangifera indica</i> L.	Mango	Aam, Amba	Anacardiaceae	C
292.	<i>Nothopegia castaneifolia</i> (Roth) Ding Hou		Amberi	Anacardiaceae	E-IND
293.	<i>Searsia mysorensis</i> (G.Don) Moffett	Mysore sumac	Dasani, Amboni	Anacardiaceae	C
294.	<i>Semecarpus anacardium</i> L. f.	Marking nut, dhobi nut tree	Bhillava, Bibba	Anacardiaceae	C
295.	<i>Spondias pinnata</i> (L. f.) Kurz	Wild Mango	Ambada, Dholamba, Ranamba	Anacardiaceae	C
296.	<i>Boswellia serrata</i> Roxb. ex Colebr.	Indian olibanum	Dhupali	Burseraceae	O
297.	<i>Commiphora wightii</i> (Arn.) Bhandari		Guggul	Burseraceae	O
298.	<i>Garuga pinnata</i> Roxb.	Garuga	Kakad	Burseraceae	O
299.	<i>Aglaia lawii</i> (Wight) C.J.Saldanha	Law's aglaia		Meliaceae	O
300.	<i>Azadirachta indica</i> A.Juss.	Neem	Kadunimb	Meliaceae	C
301.	<i>Chukrasia tabularis</i> A.Juss.	Indian redwood	Chikrasi	Meliaceae	O
302.	<i>Cipadessa baccifera</i> (Roth) Miq.	Ranabili	Nalbila	Meliaceae	O
303.	<i>Dysoxylum gotadhora</i> (Buch.- Ham.) Mabb.	Cup-calyx white cedar	Devadaru, Erindi	Meliaceae	R
304.	<i>Khaya grandifoliola</i> C.DC.			Meliaceae	C
305.	<i>Khaya senegalensis</i> (Desv.) A.Juss.	Senegal Mahogany		Meliaceae	Cl
306.	<i>Melia azedarach</i> L.	Chinaberry tree	Bakan-nimb	Meliaceae	C
307.	<i>Melia dubia</i> Cav.	Malabar neem	Limbhara, Mahanim	Meliaceae	C
308.	<i>Swietenia mahogani</i> L.	Mahogany, West Indian mahogany		Meliaceae	C
309.	<i>Toona hexandra</i> M.Roem.		Toon	Meliaceae	O
310.	<i>Turraea pubescens</i> Hell.	Wild honey suckle	Kapur bhendi	Meliaceae	O
311.	<i>Acronychia pedunculata</i> (L.) Miq.	Indian Aspen		Rutaceae	C
312.	<i>Aegle marmelos</i> (L.) Corrêa	Stone apple, Wood apple	Bel	Rutaceae	C
313.	<i>Atalantia wightii</i> Yu.Tanaka	Wild Orange		Rutaceae	E-IND

314.	<i>Atalantia racemosa</i> Wight ex Hook.	Bombay atalantia	Makadlimbu	Rutaceae	O
315.	<i>Chloroxylon swietenia</i> DC.	Ceylon satinwood	Behru	Rutaceae	O
316.	<i>Citrus aurantiifolia</i> (Christm.) Swingle	Lime	Kaghzi-nimbu	Rutaceae	C
317.	<i>Citrus maxima</i> (Burm.) Merr.	Pomelo	Papanas	Rutaceae	Cl
318.	<i>Clausena anisata</i> (Willd.) Hook.f. ex Benth.			Rutaceae	O
319.	<i>Glycosmis pentaphylla</i> (Retz.) DC.	Ban nimbu	Kirmira	Rutaceae	O
320.	<i>Limonia acidissima</i> Groff	Wood apple	Kauth	Rutaceae	C
321.	<i>Murraya koenigii</i> (L.) Spreng.	Curry Leaf	Kari patta, Kadhi patta	Rutaceae	C
322.	<i>Murraya paniculata</i> (L.) Jack	Orange Jasmine	Kunti, Pandhari	Rutaceae	C
323.	<i>Ravenia spectabilis</i> Engl.	Lemonia		Rutaceae	Cl
324.	<i>Toddalia asiatica</i> (L.) Lam.	Forest pepper	Ran marvel	Rutaceae	O
325.	<i>Zanthoxylum rhetsa</i> DC.	Indian prickly ash	Tirphal	Rutaceae	O
326.	<i>Allophylus cobbe</i> (L.) Raeusch.	Indian allophylus	Tinpani	Sapindaceae	O
327.	<i>Dimocarpus longan</i> Lour.	Dragon's eyes, Eyeball tree	Wumb, Omb	Sapindaceae	O
328.	<i>Dodonaea viscosa</i> (L.) Jacq.	Hop bush	Vilayti-mehandi	Sapindaceae	O
329.	<i>Harpullia zanguebarica</i> (J.Kirk) Radlk.	Black pearl tree		Sapindaceae	O
330.	<i>Koelreuteria paniculata</i> Laxm.	Flamegold		Sapindaceae	O
331.	<i>Lepisanthes tetraphylla</i> Radlk.		Kurpa	Sapindaceae	C
332.	<i>Litchi chinensis</i> Sonn.	Lichi		Sapindaceae	Cl
333.	<i>Majidea zanguebarica</i> J. Kirk ex Oliv.	Black pearl tree		Sapindaceae	C
334.	<i>Sapindus laurifolius</i> Balb. ex DC	South India Soapnut	Phenil, Ritha	Sapindaceae	C
335.	<i>Sapindus trifolius</i> L.	South India soapnut, three-leaf soapberry	Phenil, Ritha	Sapindaceae	C
336.	<i>Schleichera oleosa</i> (Lour.) Merr.	Ceylon oak, Lac tree	Kusum, Kusumb	Sapindaceae	C
337.	<i>Ailanthus excelsa</i> Roxb.	Indian tree of heaven	Mahrakh	Simaroubaceae	C
338.	<i>Simarouba amara</i> Aubl.	Bitterwood, Paradise-tree		Simaroubaceae	Cl
339.	<i>Bixa orelliana</i> L.	Lipstick tree	Shendri	Bixaceae	C
340.	<i>Cochlospermum religiosum</i> (L.) Alston	Buttercup tree	Ganeri	Bixaceae	C
341.	<i>Vateria indica</i> L.	White Damar	Dhup	Dipterocarpaceae	E-WG
342.	<i>Shorea robusta</i> Gaertn.		Sal	Dipterocarpaceae	Cl
343.	<i>Abutilon indicum</i> (L.) Sweet	Indian mallow	Petari	Malvaceae	C
344.	<i>Abutilon persicum</i> (Burm.f.) Merr.	Persian mallow	Madam	Malvaceae	C
345.	<i>Adansonia digitata</i> L.	Baobab	Gorakhchinch	Malvaceae	Cl

346.	<i>Bombax ceiba</i> L.	Silk cotton tree	Kate savar	Malvaceae	C
347.	<i>Bombax insigne</i> Wall.	Showy silk cotton tree	Dev savar	Malvaceae	R
348.	<i>Ceiba pentandra</i> (L.) Gaertn.	Kapok tree	Samali	Malvaceae	Cl
349.	<i>Decaschistia trilobata</i> Wight	Lobed Leaved Mysore Mallow		Malvaceae	C
350.	<i>Dombeya burgesiae</i> Gerrard ex Harv.	Pink wild pear		Malvaceae	Cl
351.	<i>Erinocarpus nimmonii</i> J.Graham		Jangli Bhendi	Malvaceae	E-WG
352.	<i>Eriolaena quinquelocularis</i> (Wight & Arn.) Wight	Bothi	Badjari dhaman	Malvaceae	R, E-IND
353.	<i>Firmiana colorata</i> (Roxb.) R.Br.	Scarlet steruli	Kaushi	Malvaceae	C
354.	<i>Grewia abutilifolia</i> Vent. ex Juss.	Mallow-leaved crossberry	Kirmith	Malvaceae	O
355.	<i>Grewia asiatica</i> L.		Phalasa	Malvaceae	C
356.	<i>Grewia damine</i> Gaertn.	Salvia leaved crossberry	Bihul, Bather	Malvaceae	O
357.	<i>Grewia hirsuta</i> Vahl	Kukurbicha	Govli	Malvaceae	O
358.	<i>Grewia serrulata</i> DC.		Kaori	Malvaceae	O
359.	<i>Grewia tiliifolia</i> Vahl		Dhaman	Malvaceae	C
360.	<i>Grewia umbellifera</i> Bedd.	Ghat crossberry		Malvaceae	R,E-IND
361.	<i>Guazuma ulmifolia</i> Lam.	West Indian Elm, Bastard cedar	Rudrakshi	Malvaceae	O
362.	<i>Helicteres isora</i> L.	East-Indian screw tree	MuradSheng	Malvaceae	O
363.	<i>Hibiscus hirtus</i> L.	Lesser Mallow	Dupari	Malvaceae	O
364.	<i>Hibiscus hispidissimus</i> Griff.	Wild Hibiscus	Kateri bhendi	Malvaceae	Cl
365.	<i>Hibiscus lobatus</i> (Murray) Kuntze	Lobed leaf mallow	Lahan Jaswand	Malvaceae	Cl
366.	<i>Hibiscus mutabilis</i> L.	Changeable rose	Bhendi gulab	Malvaceae	Cl
367.	<i>Hibiscus rosa-sinensis</i> L.	China rose	Jaswand	Malvaceae	Cl
368.	<i>Hibiscus schizopetalus</i> (Dyer) Hook.f.	Japanese hibiscus		Malvaceae	Cl
369.	<i>Hibiscus vitifolius</i> L.	Grape leaved mallow	Van kapus	Malvaceae	O
370.	<i>Holmskioldia sanguinea</i> Retz.	Chinese hat	Kapni	Malvaceae	Cl
371.	<i>Kleinhovia hospita</i> L.	Guest tree		Malvaceae	Cl
372.	<i>Kydia calycina</i> Roxb.	Kydia	Warang	Malvaceae	O
373.	<i>Malachra capitata</i> (L.) L.	Brazil Jute	Ran bhendi	Malvaceae	C
374.	<i>Malvaviscus penduliflorus</i> Moc. & Sessé ex DC.	Pendulous sleeping Hibiscus		Malvaceae	Cl
375.	<i>Microcos paniculata</i> L.	Microcos	Hasoli	Malvaceae	C
376.	<i>Pterospermum acerifolium</i> (L.) Willd.	Maple-leaved bayur tree	Kanak champā, Muchkund	Malvaceae	O
377.	<i>Pterygota alata</i> (Roxb.) R.Br.	Buddha coconut	Karvati	Malvaceae	O
378.	<i>Sida acuta</i> Burm.f.	Common wireweed	Chikana	Malvaceae	C

379.	<i>Sterculia foetida</i> L.	Wild Indian Almond	Jangali badam	Malvaceae	C
380.	<i>Sterculia guttata</i> Roxb. ex G. Don	Spotted Sterculia	Hirik, Kukar	Malvaceae	O
381.	<i>Sterculia urens</i> Roxb.	Gum karaya	Kandol, Pandruk	Malvaceae	O
382.	<i>Sterculia villosa</i> Roxb.	Hairy Sterculia	Sardol	Malvaceae	R
383.	<i>Thespesia lampas</i> (Cav.) Dalzell	Common Mallow	Jangli bhendi, Raan bhendi	Malvaceae	C
384.	<i>Thespesia populnea</i> (L.) Sol. ex Corrèa	Indian tulip tree	Paras pipal, Raan bhendi	Malvaceae	C
385.	<i>Triumfetta rhomboidea</i> Jacq.	Burr bush	Thinjhira	Malvaceae	C
386.	<i>Urena lobata</i> L.	Caesarweed	Vanbhendi	Malvaceae	C
387.	<i>Muntingia calabura</i> L.	Singapore Cherry	Paanchara	Muntingiaceae	C
388.	<i>Guidia glauca</i> (Fresen.) Gilg	Fish poison bush	Datpadi, Rametha	Thymelaeaceae	C
389.	<i>Capparis decidua</i> (Forssk.) Edgew.	Bare Caper	Nepati, Karil	Capparaceae	O
390.	<i>Capparis divaricata</i> Lam.	Spreading caper	Pachunda	Capparaceae	C
391.	<i>Capparis grandis</i> L.f.			Capparaceae	O
392.	<i>Capparis rotundifolia</i> Rottler	Round leaf caper	Kolisma	Capparaceae	O
393.	<i>Capparis sepiaria</i> L.	Wild caper bush	Kantharyel, Kanthari	Capparaceae	O
394.	<i>Capparis zeylanica</i> L.	Ceylon caper	Govindi, Vyaghranakhi	Capparaceae	O
395.	<i>Capparis moonii</i> Wight	Large caper	Waghati	Capparaceae	O
396.	<i>Cleoserrata speciosa</i> (Raf.) Iltis	Showy spider flower		Capparaceae	C
397.	<i>Crateva adansonii</i> subsp. <i>odora</i> (Buch.-Ham.) Jacobs	Garlic pear tree, Caper tree	Varun	Capparaceae	O
398.	<i>Carica papaya</i> L.	Papaya	Papai	Caricaceae	C
399.	<i>Moringa oleifera</i> Lam.	Drumstick Tree	Shevga	Moringaceae	Cl
400.	<i>Salvadora persica</i> L.	Toothbrush tree	Meswak, Pilu	Salvadoraceae	O
401.	<i>Dendrophthoe falcata</i> var. <i>coccinea</i> Santapau	Red honey suckle mistletoe	Bandgul, Vanda	Loranthaceae	E-WG
402.	<i>Dendrophthoe falcata</i> var. <i>falcata</i> Mistletoe	Honey suckle mistletoe	Bandgul, Vanda	Loranthaceae	C
403.	<i>Macrosolen capitellatus</i> (Wight & Arn.) Danser	South Indian mistletoe	Lahan bandgul	Loranthaceae	O
404.	<i>Tolypanthus lageniferus</i> Tiegh.	Indian Tolypanthus	Pela bandgul	Loranthaceae	E-IND
405.	<i>Olax scandens</i> Roxb.	Parrot Olax	Harduli	Olacaceae	O
406.	<i>Cansjera rheedei</i> J.F. Gmel.	Rheed's False Olive		Opiliaceae	O
407.	<i>Osyris lanceolata</i> Hochst. & Steud.	Wild tea	Chimat	Santalaceae	O
408.	<i>Santalum album</i> L.	Sandalwood	Chandan	Santalaceae	E-IND
409.	<i>Scleropyrum pentandrum</i> (Dennst.) Mabb.	Hard pear tree		Santalaceae	O
410.	<i>Viscum articulatum</i> Burm. f.	Leafless mistletoe	Banda	Santalaceae	O

444.	<i>Allamanda cathartica</i> L.	Golden trumpet vine		Apocynaceae	C
445.	<i>Alstonia scholaris</i> (L.) R. Br.	Devil tree	Saptparni	Apocynaceae	C
446.	<i>Asclepias curassavica</i> L.	Scarlet milkweed	Haladi-kunku	Apocynaceae	C
447.	<i>Calotropis gigantea</i> (L.) Dryand.	Crown flower	Mandar	Apocynaceae	C
448.	<i>Calotropis procera</i> (Aiton) Dryand.	Rubber bush	Rui	Apocynaceae	C
449.	<i>Carissa inermis</i> Vahl			Apocynaceae	C
450.	<i>Carissa spinarum</i> L.	Wild karanda	Jangali Karvand	Apocynaceae	C
451.	<i>Carissa carandas</i> L.	Karanda	Karvand	Apocynaceae	C
452.	<i>Cascabela thevetia</i> (L.) Lippold	Yellow oleander	Piwali kanher	Apocynaceae	Cl
453.	<i>Cerbera manghas</i> L.	Sea mango	Sukanu	Apocynaceae	Cl
454.	<i>Chonemorpha fragrans</i> (Moon) Alston	Frangipani Vine, Wood vine	Moorva	Apocynaceae	O
455.	<i>Holarrhena pubescens</i> Wall. ex G.Don	Indrajao	Kutaja, Pandhra kuda	Apocynaceae	C
456.	<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	Black Creeper	Shyamalata, Krishna-sarwa	Apocynaceae	O
457.	<i>Nerium oleander</i> L.	Oleander	Kaner, Kanher	Apocynaceae	C
458.	<i>Parsonsia alboflavescens</i> (Dennst.) Mabb.			Apocynaceae	C
459.	<i>Plumeria obtusa</i> L.	White Frangipani	Champa, Chafa	Apocynaceae	C
460.	<i>Plumeria pudica</i> Jacq.		Pandhara chapha	Apocynaceae	C
461.	<i>Plumeria rubra</i> L.	Frangipani	Red champa	Apocynaceae	C
462.	<i>Tabernaemontana alternifolia</i> L.		Nag kuda	Apocynaceae	E-WG
463.	<i>Tabernaemontana divaricata</i> (L.) R.Br. ex Roem. & Schult.	Crape jasmine	Chandni	Apocynaceae	C
464.	<i>Wrightia arborea</i> (Dennst.) Mabb.	Woolly Dyeing Rosebay	Pandu kuda, Tambda kuda	Apocynaceae	O
465.	<i>Wrightia tinctoria</i> R.Br.	Sweet Indrajao	Kala kuda	Apocynaceae	O
466.	<i>Strychnos nux-vomica</i> L.	Nux Vomica, Poison Nut	Kajra	Loganiaceae	O
467.	<i>Strychnos potatorum</i> L.f.	Clearing nut tree	Nirmali	Loganiaceae	O
468.	<i>Canthium angustifolium</i> Roxb.	Narrow leaved canthium	Shengali	Rubiaceae	O
469.	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Mountain pomegranate	Gela	Rubiaceae	O
470.	<i>Coffea arabica</i> L.	Coffee	Kafi	Rubiaceae	C
471.	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Haladu	Kadami	Rubiaceae	O
472.	<i>Hamelia patens</i> Jacq.	Firebush	Haman	Rubiaceae	C
473.	<i>Hymenodictyon obovatum</i> Wall.		Kadwa Sirid	Rubiaceae	E-IND
474.	<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	Bridal couch tree	Bhorsal, Kala bachnag	Rubiaceae	O

475.	<i>Ixora brachiata</i> Roxb.	Gorbale	Gurani	Rubiaceae	E-IND
476.	<i>Ixora chinensis</i> Lam.	Chinese Ixora		Rubiaceae	CI
477.	<i>Ixora coccinea</i> L.	Pink Ixora	Rugmini	Rubiaceae	CI
478.	<i>Ixora coccinea</i> L.	Red Ixora	Rugmini	Rubiaceae	CI
479.	<i>Ixora elongata</i> B. Heyne ex G. Don	Rosy Ixora	Gulab kuda	Rubiaceae	E-WG
480.	<i>Ixora javanica</i> (Blume) DC.	Javanese ixora, Jungle Geranium		Rubiaceae	CI
481.	<i>Ixora nigricans</i> R.Br. ex Wight & Arn.	Black Ixora	Katkuda	Rubiaceae	E-WG
482.	<i>Ixora pavetta</i> Andr.	Indian Pavetta	Kankara, Papat	Rubiaceae	
483.	<i>Ixora polyantha</i> Wight	Many-flowered Ixora	Rankuda	Rubiaceae	E-WG
484.	<i>Meyna laxiflora</i> Robyns	Muyna	Hulu, Alu	Rubiaceae	C
485.	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Kaim	Kadamb	Rubiaceae	O
486.	<i>Morinda citrifolia</i> L.	Indian Mulberry, Great morinda	Bartundi	Rubiaceae	O
487.	<i>Morinda pubescens</i> Sm.	Indian Mulberry, Morinda tree	Aseti	Rubiaceae	O
488.	<i>Mussaenda erythrophylla</i> Schumach. & Thonn.	Red Flag Bush		Rubiaceae	C
489.	<i>Mussaenda glabrata</i> (Hook.f.) Hutch. ex Gamble	Flag bush, Dhobi Tree	Bhutakesha, Sarvad	Rubiaceae	O
490.	<i>Mussaenda philippica</i> A. Rich.	White Mussaenda		Rubiaceae	CI
491.	<i>Mussaenda philippica</i> A. Rich.	Queen sirikit Mussaenda		Rubiaceae	CI
492.	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Kadam	Kadamb	Rubiaceae	O
493.	<i>Ophiorrhiza rugosa</i> Wall.			Rubiaceae	O
494.	<i>Oxyceros rugulosus</i> (Thwaites) Tirveng.	Climbing Randia	Vela Gela	Rubiaceae	O
495.	<i>Pavetta crassicaulis</i> Bremek.			Rubiaceae	E-IND
496.	<i>Pavetta indica</i> L.	Indian Pavetta	Papat	Rubiaceae	C
497.	<i>Pavetta tomentosa</i> Roxb. ex Sm.			Rubiaceae	O
498.	<i>Pentas lanceolata</i> (Forssk.) Deflers	Star flower		Rubiaceae	O
499.	<i>Psychotria truncata</i> Wall.	Truncate-Calyx Psychotria		Rubiaceae	E-IND
500.	<i>Psydrax umbellata</i> (Wight) Bridson	Umbelled Canthium	Arsul	Rubiaceae	O
501.	<i>Spermadietyon suaveolens</i> Roxb.	Forest Champa	Gidesa	Rubiaceae	O
502.	<i>Tamilnadia uliginosa</i> (Retz.) Tirveng. & Sastre	Divine Jasmine	Pandhara	Rubiaceae	O
503.	<i>Argyrea cuneata</i> Ker Gawl.	Purple morning glory	Mhalungi	Convolvulaceae	E-IND

504.	<i>Ipomoea carnea</i> Jacq.	Bush morning glory	Besharam	Convolvulaceae	C
505.	<i>Acnistus arborescens</i> (L.) Schltdl.	Hollow heart		Solanaceae	CI
506.	<i>Brugmansia arborea</i> (L.) Steud.	Angel's trumpet	Tutari	Solanaceae	CI
507.	<i>Brugmansia versicolor</i> Lagerh.	Peach angel's trumpet		Solanaceae	CI
508.	<i>Cestrum nocturnum</i> L.	Night blooming jasmine	Raatrani	Solanaceae	CI
509.	<i>Datura innoxia</i> Mill.	Datura	Dhotra	Solanaceae	C
510.	<i>Datura metel</i> L.	Datura	Safed dhotra	Solanaceae	C
511.	<i>Solanum anguivi</i> Lam.			Solanaceae	C
512.	<i>Solanum erianthum</i> D. Don	Big Eggplant	Ban tamakhu, Kutri	Solanaceae	C
513.	<i>Solanum torvum</i> Sw.	Turkey Berry	Bhurat, Marang	Solanaceae	C
514.	<i>Withania somnifera</i> (L.) Dunal	Winter cherry	Ashwagandha	Solanaceae	C
515.	<i>Asystasia dalzelliana</i> Santapau	Violet Asystasia	Neelkanth	Acanthaceae	C
516.	<i>Avicennia marina</i> (Forssk.) Vierh.	Grey Mangrove	Tavir	Acanthaceae	O
517.	<i>Avicennia officinalis</i> L.	Indian Mangrove	Tiwar	Acanthaceae	O
518.	<i>Barleria involucrata</i> var. <i>elata</i> (Dalzell) C.B. Clarke			Acanthaceae	E-IND
519.	<i>Barleria prattensis</i> Santapau	Pink barleria	Gulabi koranti	Acanthaceae	O
520.	<i>Barleria prionitis</i> L.	Porcupine flower	Vajradanti	Acanthaceae	E-IND
521.	<i>Barleria terminalis</i> Nees	Blue barleria	Nili koranti	Acanthaceae	E-WG
522.	<i>Calacanthus grandiflorus</i> (Dalzell) Radlk	Large flowered calacanthus	Mugut	Acanthaceae	E-WG
523.	<i>Crossandra infundibuliformis</i> (L.) Nees	Crossandra	Aboli	Acanthaceae	C
524.	<i>Ecbolium ligustrinum</i> (Vahl) Vollesen	Green ice crossandra	Ekboli	Acanthaceae	O
525.	<i>Eranthemum roseum</i> (Vahl) R.Br.	Rosy Eranthemum	Dasamui	Acanthaceae	E-IND
526.	<i>Excoecaria agallocha</i> L.	Blinding Tree	Gewa	Acanthaceae	CI
527.	<i>Justicia adhatoda</i> L.	Malabar nut	Adulsa	Acanthaceae	CI
528.	<i>Justicia santapaui</i> Bennet	Santapau's Justicia		Acanthaceae	R, E-IND
529.	<i>Lepidagathis cuspidata</i> Nees	Spiny Lepidagathis	Kate adulsa	Acanthaceae	E-IND
530.	<i>Neuracanthus sphaerostachys</i> Dalzell	Pin cushion plant	Golgonda	Acanthaceae	E-IND
531.	<i>Pleocaulus sessilis</i> (Nees) Bremek.		Topali karvi	Acanthaceae	O
532.	<i>Pseuderanthemum carruthersii</i> (Seem.) Guillaumin	Yellow-vein Eranthemum		Acanthaceae	O
533.	<i>Rhinacanthus nasutus</i> (L.) Kurz	Snake Jasmine	Gajkarni	Acanthaceae	O
534.	<i>Strobilanthes callosus</i> Nees		Karvy	Acanthaceae	E-IND
535.	<i>Strobilanthes heyneanus</i> Nees	Karun kurinji	Akra	Acanthaceae	

536.	<i>Strobilanthes integrifolia</i> Kuntze	Wayti		Acanthaceae	E-WG
537.	<i>Thelepaspale ixiocephala</i> (Benth.) Bremek.	Sky Blue Karvy	Patri	Acanthaceae	E-WG
538.	<i>Thunbergia erecta</i> (Benth.) T.Anderson	Bush clock vine		Acanthaceae	O
539.	<i>Dolichandrone atrovirens</i> (Roth) K.Schum.	Wavy trumpet flower		Bignoniaceae	E-IND
540.	<i>Dolichandrone falcata</i> (Wall. ex DC.) Seem.	Medhshingi	Hawar, Medhshingi	Bignoniaceae	E-IND
541.	<i>Dolichandrone spathacea</i> (L.f.) Seem.	Mangrove trumpet tree	Samudrashingi	Bignoniaceae	O
542.	<i>Fernandoa adenophylla</i> (Wall. ex G.Don) Steenis	Katsagon	Marodphali	Bignoniaceae	O
543.	<i>Handroanthus impetiginosus</i> (Mart. ex DC.) Mattos			Bignoniaceae	O
544.	<i>Heterophragma</i> <i>quadrioculare</i> (Roxb.) K.Schum.	Murus	Waras	Bignoniaceae	E-IND
545.	<i>Jacaranda mimosifolia</i> D.Don	Blue Jacaranda	Neelmohur	Bignoniaceae	Cl
546.	<i>Kigelia africana</i> (Lam.) Benth.	Sausage tree	Balam khira	Bignoniaceae	Cl
547.	<i>Millingtonia hortensis</i> L.f.	Indian Cork Tree, Tree Jasmine	Akash chameli, Buchache zad	Bignoniaceae	Cl
548.	<i>Oroxylum indicum</i> (L.) Kurz	Broken Bones Tree	Tetu	Bignoniaceae	O
549.	<i>Radermachera xylocarpa</i> (Roxb.) Roxb. ex K.Schum.	Padri tree	Khadshingi	Bignoniaceae	E-IND
550.	<i>Spathodea campanulata</i> P.Beauv.	African tulip tree	Rugtoora, Pichkaari	Bignoniaceae	Cl
551.	<i>Stereospermum tetragonum</i> DC.	Yellow Snake Tree	Paroli, Padal	Bignoniaceae	O
552.	<i>Tabebuia aurea</i> (Silva Manso) Benth. & Hook.f. ex S.Moore	Silver trumpet tree, Yellow Tabebuia		Bignoniaceae	Cl
553.	<i>Tabebuia pallida</i> (Lindl.) Miers	Cuban pink trumpet Tree, Pink Tabebuia		Bignoniaceae	Cl
554.	<i>Tabebuia rosea</i> (Bertol.) Bertero ex A.DC.	Pink trumpet tree		Bignoniaceae	Cl
555.	<i>Tecoma capensis</i> (Thunb.) Lindl.	Cape honeysuckle		Bignoniaceae	Cl
556.	<i>Tecoma fulva</i> (Cav.) G.Don			Bignoniaceae	Cl
557.	<i>Tecoma stans</i> (L.) Juss. ex Kunth	Yellow bells, Yellow trumpet	Ghanti ful	Bignoniaceae	Cl
558.	<i>Anisomeles heyneana</i> Benth.	Western hill catmint	Gopali	Lamiaceae	E-IND
559.	<i>Callicarpa tomentosa</i> (L.) L.	Velvety beauty berry	Kaarivaati	Lamiaceae	O
560.	<i>Clerodendrum chinense</i> (Osbeck) Mabb.	Chinese glory bower		Lamiaceae	C
561.	<i>Clerodendrum infortunatum</i> L.	Hill glory bower	Bhandira	Lamiaceae	C
562.	<i>Clerodendrum paniculatum</i> L.	Pagoda flower		Lamiaceae	C
563.	<i>Clerodendrum phlomidis</i> L.f.	Arni	Takalimula	Lamiaceae	C

564.	<i>Clerodendrum splendens</i> G.Don	Flaming glorybower		Lamiaceae	C
565.	<i>Clerodendrum thomsoniae</i> Balf.f.	Bleeding heart vine		Lamiaceae	C
566.	<i>Colebrookea oppositifolia</i> Sm.	Indian squirrel tail	Bhamber, Bhaman	Lamiaceae	C
567.	<i>Gmelina arborea</i> Roxb.	Gamhar	Sivan	Lamiaceae	C
568.	<i>Gmelina asiatica</i> L.	Asian bushbeech, Asiatic beechberry	Badhara, Kali shivan	Lamiaceae	O
569.	<i>Hyptis suaveolens</i> (L.) Poit.	Bush mint	Darp tulas	Lamiaceae	C
570.	<i>Ocimum basilicum</i> L.	Sweet basil	Ram tulsi	Lamiaceae	C
571.	<i>Ocimum tenuiflorum</i> L.	Holy basil	Tulasi	Lamiaceae	C
572.	<i>Plectranthus barbatus</i> Andrews	Indian coleus	Manimul	Lamiaceae	C
573.	<i>Pogostemon benghalensis</i> (Burm.f.) Kuntze	Bengal Pogostemon		Lamiaceae	C
574.	<i>Pogostemon purpurascens</i> Dalzell	Sangbrei		Lamiaceae	C
575.	<i>Premna coriacea</i> C.B.Clarke		Rawan, Chambarti	Lamiaceae	O
576.	<i>Salvia splendens</i> Sellow ex Schult.	Scarlet Sage		Lamiaceae	Cl
577.	<i>Tectona grandis</i> L.f.	Teak	Sag, Sagwan	Lamiaceae	C
578.	<i>Vitex altissima</i> L.f.	Peacock chaste tree	Balage	Lamiaceae	C
579.	<i>Vitex leucoxylon</i> L.f.	White-wood chaste tree	Songarbi	Lamiaceae	O
580.	<i>Vitex negundo</i> L.	Chaste tree	Nirgudi	Lamiaceae	C
581.	<i>Vitex trifolia</i> L.	Three-leaved chaste tree	Nirgudi	Lamiaceae	O
582.	<i>Chionanthus mala-elengi</i> (Dennst.) P.S.Green	Malabar Fringe Tree	Heddi	Oleaceae	E-IND
583.	<i>Ligustrum perrottetii</i> A.DC.	Nilgiri Privet	Kungin, Medsing	Oleaceae	E-IND
584.	<i>Nyctanthes arbor-tristis</i> L.	Coral Jasmine	Parijatak	Oleaceae	C
585.	<i>Olea dioica</i> Roxb.	Rose sandalwood	Parjamb, Hadkya	Oleaceae	O
586.	<i>Russelia equisetiformis</i> Schltdl. & Cham.	Coral plant		Plantaginaceae	Cl
587.	<i>Citharexylum spinosum</i> L.	Fiddlewood		Verbenaceae	O
588.	<i>Duranta erecta</i> L.	Golden dew drop		Verbenaceae	Cl
589.	<i>Lantana camara</i> L.	Lantana	Tantani, Ghaneri	Verbenaceae	C
590.	<i>Lantana montevidensis</i> (Spreng.) Briq.	Trailing Lantana	Tantani	Verbenaceae	C
591.	<i>Rotheca serrata</i> (L.) Steane & Mabb.	Blue fountain bush	Bharangi	Verbenaceae	C
592.	<i>Stachytarpheta indica</i> (L.) Vahl	Indian Snakeweed		Verbenaceae	C
593.	<i>Cordia dichotoma</i> G.Forst.	Indian cherry,	Lasora, Shelu	Boraginaceae	O

594.	<i>Cordia monoica</i> Roxb.	Clammy cherry			
595.	<i>Cordia sebestena</i> L.	Snot berry		Boraginaceae	O
596.	<i>Cordia sinensis</i> Lam.	Scarlet cordia	Lal Lasora	Boraginaceae	C
597.	<i>Ehretia laevis</i> Roxb.	Gondni		Boraginaceae	O
598.	<i>Ilex malabarica</i> Bedd.	Chamror	Datrang	Boraginaceae	O
599.	<i>Artemisia nilagirica</i> (C.B.Clarke) Pamp.	Indian wormwood	Dhor dawna	Aquifoliaceae	E-IND
600.	<i>Blumea lanceolaria</i> (Roxb.) Druce	Lanceleaf Blumea		Asteraceae	C
601.	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Bitter bush, Devilweed	Tivra gandha	Asteraceae	C
602.	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Giant Mexican Sunflower	Kanak gol	Asteraceae	C
603.	<i>Tithonia rotundifolia</i> (Mill.) S.F.Blake	Mexican sunflower, Tithonia		Asteraceae	C
604.	<i>Hippobroma longiflora</i> (L.) G.Don	Star of Bethlehem		Campanulaceae	O
605.	<i>Lobelia nicotianifolia</i> Roth ex Schult.	Wild tobacco	Ran tambakhu	Campanulaceae	O
606.	<i>Schefflera actinophylla</i> (Endl.) Harms	Queensland umbrella tree		Araliaceae	O
607.	<i>Schefflera elliptica</i> (Blume) Harms	Elliptic-Leaved Schefflera		Araliaceae	Cl
608.	<i>Schefflera venulosa</i> (Wight & Arn.) Harms	Schefflera vine		Araliaceae	O
609.	<i>Pittosporum dasycaulon</i> Miq.	Sahyadri Pittosporum	Gapsundi	Pittosporaceae	E-IND
610.	<i>Sambucus canadensis</i> L.	American elder		Adoxaceae	Cl

C: Common, Cl: Cultivations, En: Endangered, E-IND: Endemic to India, E-WG: Endemic to Western ghats, O: Occasional, R: Rare.

Field data sheet for plant identification:

Plant Name:

Common name:

Location:

Date:

- | | | | | |
|--|---|---|---|--|
| 1. Habitat/
1. Evergreen forest /
2. Semi-evergreen forest/
3. Deciduous forest/
4. Scrub forest/
5. Aquatic/
6. Sea
7. Cultivations/
8. All | 4. Phyllotaxy/
1. Alternate/
2. Opposite/
3. Opposite-Decussate/
4. Whorled/
5. Distichous
6. Digitate
7. Crowded at the ends
8. Fascicled | 14. Denticulate/
15. Wavy/
16. Serrulate | 26. Terminal peduncled
corymbose
27. Terminal racemes
28. Axillary fascicles
29. Fascicles on leafless
branches
30. Pendulous raceme
31. Pendulous racemes
32. Axillary umbels
33. Axillary corymbose
raceme
34. Terminal racemes
35. Spicate racemose
36. Spherical heads
37. Globose head
38. Axillary tubercles
39. Densely clustered in raceme
40. Terminal panicles
41. Subglobose clusters
42. Peduncled cymes | 10. Flower Colour/
1. White/
2. Pink/
3. Purple/
4. Red/
5. Green/
6. Blue/
7. Yellow/
8. Orange/
9. Greenish Yellow/
10. Orange Yellow |
| 2. Flowering season/
1. Jan/
2. Feb/
3. March/
4. Apr/
5. May/
6. Jun/
7. Jul/
8. Aug/
9. Sep/
10. Oct/
11. Nov/
12. Dec/
13. All month | 5. Leaf Type/
1. Simple/
2. Compound

6. If compound/
1. Palmate/
2. Pinnate

7. Leaf margin/
1. Entire/
2. Dentate/
3. Serrate/
4. Undulate/
5. Convolute/
6. Crenate/
7. Ciliate/
8. Crispate/
9. Spinous/
10. Lobed/
11. Crenulate/
12. Uneven/
13. Revolute/ | 8. Inflorescence/
1. Solitary Axillary/
2. Solitary Terminal/
3. Raceme/
4. Cymose/
5. Corymbose /
6. Spike/
7. Catkin/
8. Spadix/
9. Umbel/
10. Umbellate Cyme
11. Hypanthodium/
12. Capitulum/
13. Unipar cyme
14. bipar cyme/
15. Helic cyme/
16. Scorp cyme/
17. Cyathium/
18. Panicle/
19. Axillary Panicle/
20. Terminal Panicle/
21. Verticillaster/
22. Spikelet/
23. Head
24. Terminal corymbose
cymes
25. Terminal polychasial
cymes | 11. Flower size/
1. Smaller than 1 cm/
2. 1-2 cm/
3. 2-5 cm/
4. 6-10 cm/
5. 10-20 cm/
6. >20 | 12. Corolla/Perianth
1. Polypetalous/
2. Gamopetalous
3. Monochlamydeae

13. Fruit type/
1. Legume/
2. Follicle/
3. Siliqua/
4. Silicula/
5. Capsule/
6. Caryopsis/ |
| 3. Abundance
1. Common/
2. Occasional/
3. Endemic/
4. Rare | | 9. Inflorescence size/
1. 0-1 cm
2. 1-5 cm
3. 6-10 cm
4. 11-20 cm
5. 21-30 cm
6. 31-50 cm
7. >50 cm | | |

7. Achene/
8. Cypsel/
9. Nut/
10. Samara/
11. Lomentum/
12. Drupe/
13. Syconous/
14. Sorosis/
15. Aggr. Berries/
16. Aggr. Drupes
17. Aggr. Achenes
18. Aggr. Of follicles/
19. Hesperidium/
20. Pome/
21. Pepo/
22. Berry/
23. Regma/
24. Pod/

14. Fruit/

1. Edible/
2. Non-Edible

15. Family/

Sr. No.	Name of the Family
1.	Lauraceae
2.	Annonaceae
3.	Magnoliaceae
4.	Myristicaceae
5.	Arecaceae
6.	Poaceae
7.	Platanaceae
8.	Proteaceae
9.	Dilleniaceae
10.	Crassulaceae
11.	Vitaceae

12.	Celastraceae
13.	Connaraceae
14.	Elaeocarpaceae
15.	Oxalidaceae
16.	Clusiaceae
17.	Dichapetalaceae
18.	Euphorbiaceae
19.	Malpighiaceae
20.	Ochnaceae
21.	Passifloraceae
22.	Phyllanthaceae
23.	Putranjivaceae
24.	Rhizophoraceae
25.	Salicaceae
26.	Fabaceae
27.	Cannabaceae
28.	Elaeagnaceae
29.	Moraceae
30.	Rhamnaceae
31.	Rosaceae
32.	Ulmaceae
33.	Urticaceae
34.	Casuarinaceae
35.	Combretaceae
36.	Lythraceae
37.	Melastomataceae
38.	Myrtaceae
39.	Onagraceae
40.	Staphyleaceae
41.	Anacardiaceae
42.	Burseraceae
43.	Meliaceae
44.	Rutaceae
45.	Sapindaceae
46.	Simaroubaceae
47.	Bixaceae
48.	Dipterocarpaceae

49.	Malvaceae
50.	Muntingiaceae
51.	Thymelaeaceae
52.	Capparaceae
53.	Caricaceae
54.	Moringaceae
55.	Salvadoraceae
56.	Loranthaceae
57.	Olacaceae
58.	Opliacae
59.	Santalaceae
60.	Cactaceae
61.	Ancistrocladaceae
62.	Plumbaginaceae
63.	Polygonaceae
64.	Cornaceae
65.	Hydrangeaceae
66.	Ebenaceae
67.	Lecythidaceae
68.	Myrsinaceae
69.	Primulaceae
70.	Sapotaceae
71.	Symplocaceae
72.	Icacinaceae
73.	Apocynaceae
74.	Loganiaceae
75.	Rubiaceae
76.	Convolvulaceae
77.	Solanaceae
78.	Acanthaceae
79.	Bignoniaceae
80.	Lamiaceae
81.	Oleaceae
82.	Plantaginaceae
83.	Verbenaceae
84.	Boraginaceae
85.	Aquifoliaceae

86.	Asteraceae
87.	Campanulaceae
88.	Araliaceae
89.	Pittosporaceae
90.	Adoxaceae



Digital Herbarium of Angiospermic Tree Species from Western Ghat Regions of Maharashtra

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Abstract -

The present investigation reports a digital solution to overcome limitations of traditional herbarium. The data of tree species in the Western Ghat regions of Maharashtra is presented in this paper. The botanical information and digital photographs of about 130 tree species from the Western Ghat regions of Pune, Kolhapur, Thane, Satara, Sangali, Raigad and Sindhudurg districts of Maharashtra were used to build a searchable database to be made available online at the dedicated website www.indianflora.org. So far, the data of about 535 tree species which include 43 endemic to Western Ghats and 7 rare species has been recorded.

Keywords : Digital herbarium, Digital images, Endemic plants, Maharashtra, Plant systematics, Western Ghats

I. Introduction

The term herbarium, used in the strictest sense today, is a collection of preserved plant specimens. The importance of herbarium as a teaching, learning resource has been established from time to time in colleges, universities and research institutions as well. Every institution concerned with Plant Sciences has a collection of such herbarium specimens. The plant species represented in such collections are usually collected during the field visits organized by the institutes and also from the personal collection. These herbarium specimens are usually from the local areas and are easily accessible only to the researchers of the adjoining areas. Furthermore, these are physical specimens and therefore demands sufficiently large, dedicated and well equipped infrastructure. It also demands recurrent expenses on manpower required to maintain such herbaria and for preserving these specimens in acceptable conditions.

Thus, there are four major constraints in relying on conventional herbaria:

- i. The recurring cost for preparation and maintenance of herbarium specimens
- ii. The infrastructural facilities required for herbarium
- iii. Accessibility of such herbarium collection is usually limited to the nearby areas

iv. Disturbance to the vegetation to a certain extent

To overcome this, we are preparing a 'Digital Herbarium' or E-flora of angiospermic tree species. The Digital Herbarium is made of high quality digital images of plants and the related botanical information. This can help in accurate and efficient identification even in the absence of expert taxonomist and has negligible expenses on maintenance of herbarium. The infrastructural facility needed is one computer connected to internet. No destruction of natural vegetation and habitat occurs in making of this digital herbarium. It can be made accessible free of cost and round the clock from any part of the world through a dedicated web site. Online accessibility makes it available not only to researchers but to students and the general population as well.

The present work reports tree species diversity in the Western Ghat regions of Maharashtra, one of the important biodiversity hot spots in India. In Maharashtra, it is spread over the area of 58,400 sq. km. In the present study, so far, the digital herbarium is represented by about 130 tree species from the Western Ghat regions of Pune, Kolhapur, Thane, Satara, Sangali, Raigad and Sindhudurg districts of Maharashtra. The tree species include 43 trees endemic to Western Ghats, 7 rare species, 55 medicinal species and 60 plants species which yield edible fruits from the total 535 tree species.

II. Methodology

According to flowering and fruiting seasons, an inventory of about 950 tree species was prepared with the help of various regional floras^{[1], [2], [3], [4], [5], [6], [7], [8]}. The field work was done in Western Ghats region of Maharashtra such as Pune, Kolhapur, Thane, Satara, Sangali, Raigad and Sindhudurg districts for photographic documentation and field notes. During the field work, visits to various sacred groves and wild life sanctuaries (WLS) from Western regions of Maharashtra, namely, Phansad WLS, Tungreshawar WLS, Bhimashankar WLS, Tamhini WLS and Sanjay Gandhi National Park, Borivali were made for photographic documentation of plants. Each plant was photographed by repeated visits in different seasons for its habit, stem, upper and lower surface of leaf, flowering twig, close-up

of flower and special character of a flower, if any, to make correct identification of these plants.

The plants were identified with the help of literature available which included regional floras^{[1], [2], [3], [4], [5], [6], [7], [8]}, book^[9], field guide^[10] and web sites^{[11], [12]}. The experts from Botanical Survey of India, Pune (Western Regional Circle) were also consulted for correct identification. The digital images were edited with Photoshop software for making them suitable for uploading and viewing on web pages.

The database generated is being organized for displaying on a dedicated web site www.indianflora.org which will be developed on a PHP platform (Fig.1).

Fig. 1. Design of main page of a dedicated website www.indianflora.org of the digital herbarium

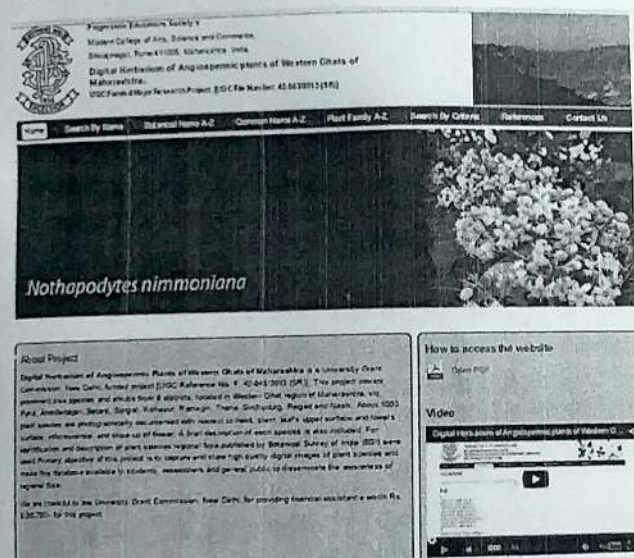


Fig. 1. Design of main page of a dedicated website : www.indianflora.org of the digital herbarium

The website displays the plant lists categorized by common names, botanical names and plant families. In this e-flora, digital images of each plant were arranged in the logical sequence of habit, stem, upper and lower surface of leaf, flowering twig, close-up of flower and special character of a flower, if any (Fig.2). A brief description of each plant also accompanies the set of digital images. A criteria based search programme is also made available on the website for correct identification of tree plant specimens.

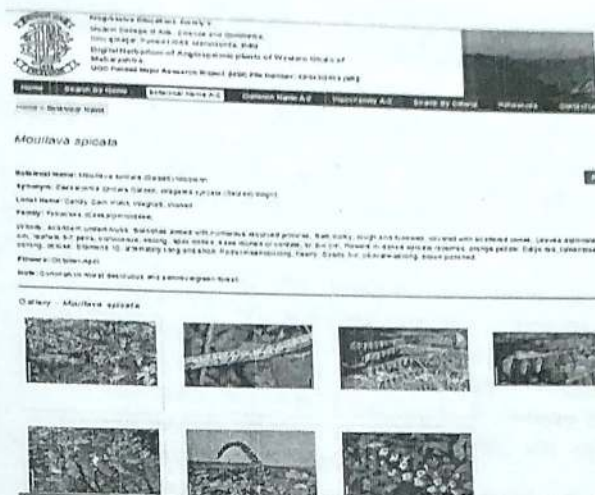


Fig.2. Design of webpage of one tree species

III. Results

Out of more than 950 tree species to be studied, at present the digital herbarium is represented by about 535 tree species. These tree species include 45 trees endemic to Western Ghats, 7 rare species (Table 1), 55 medicinal species and 60 plant species which yield edible fruits.

TABLE 1

List of Endemic and Rare Plants from Western Ghat Regions of Maharashtra

Botanical Name	Family	Status
<i>Actinodaphne hookeri</i> Meisn.	Lauraceae	Endemic
<i>Aglaia elaeagnoides</i> (A. Juss.) Benth.	Meliaceae	Endemic
<i>Aglaia lawii</i> (Wight) C.J.Saldanha	Meliaceae	Endemic
<i>Allophylus cobbe</i> (L.) Raeusch.	Sapindaceae	Endemic
<i>Bombax ceiba</i> L.	Malvaceae	Endemic
<i>Buchanania cochinchinensis</i> (Lour.) Almeida	Anacardiaceae	Endemic
<i>Carallia brachiata</i> (Lour.) Merr.	Rhizophoraceae	Endemic
<i>Careya arboea</i> Roxb.	Lecythidaceae	Endemic
<i>Celtis timorensis</i> Span.	Ulmaceae	Endemic
<i>Dillenia pentagyna</i> Roxb.	Dilleniaceae	Endemic
<i>Dysoxylum binectariferum</i> (Roxb.) Hook. f ex Bedd.	Meliaceae	Endemic
<i>Dysoxylum malabaricum</i> Bedd. ex Hiern	Meliaceae	Endemic
<i>Garcinia indica</i> (Thouars) Choisy	Clusiaceae	Endemic
<i>Garcinia talbotii</i> Raiz. ex Santapau	Clusiaceae	Endemic
<i>Garuga pinnata</i> Roxb.	Bursaceae	Endemic
<i>Glochidion ellipticum</i> Wight	Euphorbiaceae	Endemic
<i>Grewia abutilifolia</i> Vent. ex L.	Tiliaceae	Endemic
<i>Grewia nervosa</i> (Lour.) Panigr.	Tiliaceae	Endemic
<i>Harpullia arborea</i> (Blanco) Radlk.	Sapindaceae	Endemic
<i>Helicteres isora</i> L.	Sterculiaceae	Endemic



<i>Holigarna arnottiana</i> Hook. f	Anacardiaceae	Endemic
<i>Holigarna grahamii</i> (Wight) Kurz.	Anacardiaceae	Endemic
<i>Lagerstroemia parviflora</i> Roxb	Lythraceae	Endemic
<i>Lagerstroemia reginae</i> Roxb.	Lythraceae	Endemic
<i>Lagerstroemia microcarpa</i> Wight	Lythraceae	Endemic
<i>Lannea coromandelica</i> (Houtt.) Merr. Odinawodier Roxb.	Anacardiaceae	Endemic
<i>Macaranga peltata</i> (Roxb.) Muell.Arg.	Euphorbiaceae	Endemic
<i>Maesa indica</i> (Roxb.) DC.	Myrcinaceae	Endemic
<i>Maytenus rothiana</i> (Walp.) Lobereau- Callen	Celastraceae	Endemic
<i>Memecylon umbellatum</i> N. Burman	Melastomaceae	Endemic
<i>Morinda citrifolia</i> L.	Rubiaceae	Endemic
<i>Moullava spicata</i> (Dalzell) Nocols	Leguminosae	Endemic
<i>Nothapodytes nimmoniana</i> (Grah.) Mabb.	Icacinaceae	Endemic
<i>Psydrax dicoccos</i> Gaertn.	Rubiaceae	Endemic
<i>Sageraea lauriflora</i> (Grah.) Blatter	Annonaceae	Endemic
<i>Sterculia guttata</i> Roxb. ex DC.	Sterculiaceae	Endemic
<i>Sterculia urens</i> Roxb.	Sterculiaceae	Endemic
<i>Strobilanthes callosus</i> Nees	Acanthaceae	Endemic
<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	Endemic
<i>Wrightia arborea</i> (Dennst.) Mabb.	Apocynaceae	Endemic
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	Rutaceae	Endemic
<i>Ziziphus rugosa</i> Lam.	Rhamnaceae	Endemic
<i>Ziziphus xylopyrus</i> (Retz.) Willd.	Rhamnaceae	Endemic
<i>Beilschmiedia dalzellii</i> (Mcisn.) Kosterm.	Lauraceae	Rare
<i>Elaeocarpus serratus</i> L.	Elaeocarpaceae	Rare
<i>Eriolaena quinquelocularis</i> (Wight & Arn.) Wight Bothi	Sterculiaceae	Rare
<i>Grewia umbellifera</i> Bedd.	Tiliaceae	Rare
<i>Knema attenuata</i> (Wall. Ex Hook.f. & Thomas) Warb.	Myristicaceae	Rare
<i>Desmodium oojeinense</i> (Roxb.) H. Ohashi	Leguminosae	Rare
<i>Sterculia villosa</i> Roxb. Ex. DC.	Sterculiaceae	Rare

IV. Conclusion

This database to be published on a dedicated website www.indianflora.org can help to know the tree wealth of Western Ghats of Maharashtra. It can help in accurate and efficient identification of tree species even in the absence of expert taxonomists. It has

negligible expenses on maintenance of herbarium. Moreover, it can be accessed and used free of cost by the NGOs, students, researchers and anybody interested in tree identification.

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