



# 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](http://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<sup>[1], [2], [3], [4], [5], [6], [7], [8]</sup>. 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, Tungareshawar 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<sup>[1], [2], [3], [4], [5], [6], [7], [8]</sup>, book<sup>[9]</sup>, field guide<sup>[10]</sup> and web sites<sup>[11], [12]</sup>. 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](http://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](http://www.indianflora.org) of the digital herbarium

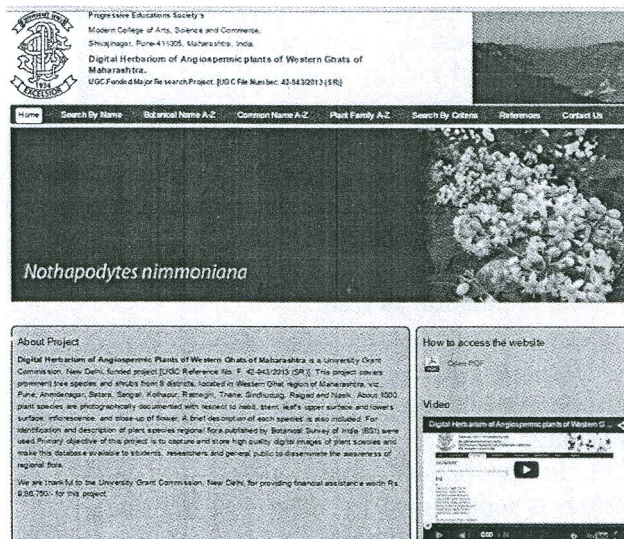


Fig. 1. Design of main page of a dedicated website : [www.indianflora.org](http://www.indianflora.org) of the digital herbarium

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.

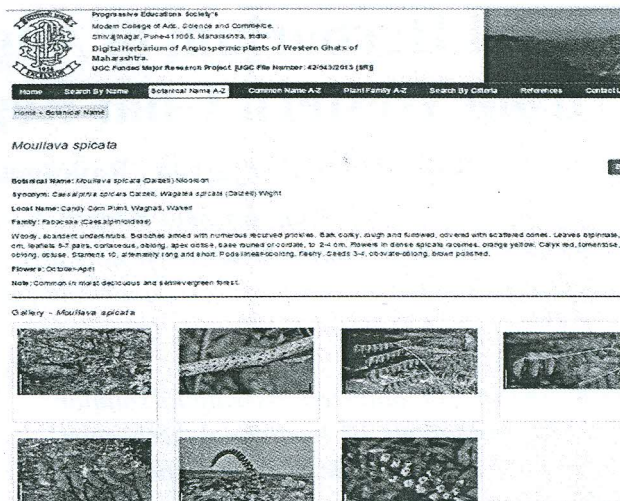


Fig.2. Design of webpage of one tree species

### 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 elaeagnoidea</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.	Burseraceae	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. Odianawodier 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> (Meisn.) 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](http://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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