



Pictorial Flora

WAGHAI

Botanical Garden



Padamnabhi S. Nagar

Dinesh Rabari



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MESSAGE

Mr. Louise Dickinson Rich has said "I feel a great regard for trees; they represent age and beauty and the miracles of life and growth." Thus, we can say that trees are the connecting links between the earth and the heaven. We do know whether or not an "actual" heaven exists in the sky. But, it certainly exists on our own due to the trees as one of the dictionary meanings of "heaven" is 'a condition or place of happiness, delight, or pleasure' or 'a place or state of supreme happiness.'

Undoubtedly, trees make our lives enriched and blessed not only by supplying wood our homes, institutions and offices, but also in several subtle ways that we do not even think about in our daily rush of acquiring wealth, socio-economic hierarchy and fulfilling our mundane responsibilities.

First and foremost, they share with us (and other multitude of animals) they make by capturing the solar energy in their tiny cells capable of that "divine" process called photosynthesis. They contribute in releasing oxygen that is so vital for our survival. When they regulate our micro-climate and when they die, they contribute in nutrient cycling through decomposition. Above from birds, their canopies are home to innumerable insects and mammals ranging from a cute squirrel to ferocious leopard!

Despite all these, how many we know details about various aspects of trees around us? How many of us know about distribution, population (numbers), habitats, local/English/Scientific names and origin etc. of tree species nearby us? Surely, very few of us as it need painstaking research, analyses and compilation.

That is what the authors of this book "Pictorial Guide – trees of Waghai Botanical Garden" have done. Waghai Botanical garden is largest Botanical garden of Gujarat. It is located in Waghai in south Dang Forest Division. It is known for its large number of plant species.

This comprehensive document has satisfied a long-awaited need of having single book that would describe important aspects of a majority of trees in Waghai Botanical Garden. It is as unique as its details depicting how many individual tree species exist at a Waghai Botanical Garden.

I am sure, every tree lover and tree enthusiast would find this unique publication useful. Sincerely appreciate the efforts made by the DCF, Shri. Dinesh Rabari, Dr. P.S. Nagar, The Maharaja Sayajirao University of Baroda and its research team-members in producing such a useful document that would be a model for state too.

Shri. M.J. Parmar,

Chief Conservator of Forest, Valsad Circle

FOREWORD

Since its initiation in the year 1966 the Waghai Botanical Gardens (WBG) was innumerable, people have contributed substantially to bring the WBG to its present stage and I earnestly feel that still it has to go miles ahead in future. The progress had been multi-directional and fulfils different aspects like conservation of Biodiversity, sustainable use and education and research in the field of botany and forestry.

The book "Pictorial Guide - Trees of Waghai Botanical Garden" is a step further in enhancing its utility not only to foresters, scientists and researchers, but to all the people interested in plants, who wants to achieve some insight and awareness. It is amazing to witness the stupendous efforts put forth by the authors to include all relevant information on the trees growing in the Garden and also to the herbarium specimens which are deposited at the Garden's Herbarium.

My heartfelt congratulations are due to all those who have passed through this painful process. Their hard work and efforts have gifted me with the most valuable souvenir depicting my own life time work of developing this garden at some point of recent past. This book is the most ever handbook for all, who cares for the plants and are curious enough to know the plants with their names.

My heartiest congratulation is due to Dr. P. S. Nagar, Mr. Roshan Parmar, Mr. Krishna Singh Rajput, Miss Pallavi Patel and Miss Ankita Throat and the whole team of The Maharaja Sayajirao University of Baroda for making this a reality. There is huge contribution of Lasubhai and Kasubhai for providing such endemic, ethnic information of plants of the Dangs and to the Mr. Kiran Patel Forester of Waghai Botanical Garden for his support.

Dr. Bharat G. Vashi

Former Prof. of Forestry

ASPEE College of Horticulture and Forestry

Navsari Agriculture University

ACKNOWLEDGMENT

First of all we would like to give tribute to all those unknown foresters and researchers who have contributed to the real treasure of Waghai Botanical Garden since its inception. We are highly thankful to the Vice-Chancellor and Registrar of The Maharaja Sayajirao University Vadodara, for taking interest in plant diversity awareness and providing necessary assistance for the research work. Authors are also thankful to Prof. Haribhai R. Kataria, Dean, Faculty of Science and Prof. N. S. R. Krishnayya, Head, Department of Botany, Faculty of Science, The Maharaja Sayajirao University Vadodara, for providing the research lab facilities and necessary cooperation.

Authors are also highly thankful to Shri M. J. Parmar, (IFS) Chief Conservator of Forests, Valsad Circle, for their kind support, valuable suggestions, and necessary assistance to work out on the trees of Waghai Botanical Garden. Authors are also highly thankful Retd. Prof. B. G. Vashi Botanist, Botanical Garden, Waghai (Dangs) (1973-1980) for giving his value able inputs, Authors are also thankful to Late Mr. J. V. Aras (IFS) who posted ACF Botanical Garden Waghai during (1973-1978) without his hard work and pain taking knees garden would not be able to stand upon, we would like to thank Late Mr. Gangaram who was taken care about all the plant species which was lay in this treasure hold garden. Our thanks are extended to Late Mr V. P. Gosai, who was the Forester of the Garden during (1971-1979) who was real artist, all sculptures of the garden. Thanks are due to Retd. Prof. Minoo Parabia for sharing his knowledge and observations on trees of WBG. Thanks are due to Mr. Pratik Pandya, Mr. Dinesh Rabari, Mr. Kiran Patel, Miss Pallavi Patel and Miss Ankita Throat, forest guides Mr. Lasu and Kasu bhai and other staff of Waghai Botanical Garden (WBG) who went updating us with the latest information on the plants flowering in the WBG. Authors are thankful to Mr. Roshan Parmar, Mr. Ankur Rajwadi, Mr. Akash Vanjara and Mr. Krishna sing Rajput, who has contributed immensely for the identification of various plant species. Authors would like to thank Ms. Mannu Diwedi, Ms. Kalpana Pal and M.Sc. Final Taxonomy students Sangita Gami, Kamartaha Saiyed, Pankaj Prajapati, Snehal Chavda, Sagar Jadeja, Riya Engineer who have helped us and support for compilation the book. Thanks are due to Dr. Kishore Rajput and Dr. Dharmendra Shah, for unconditional support. Thanks to Prof. Vinay Raole, Prof. Sandhya Kiran Garge, Dr. Rinku Desai and all colleagues of Botany department for necessary support. We are also thankful to all Forest Officials of Gujarat and to the local guide for sharing their valuable field knowledge.

Dr. Padamnabhi S. Nagar

Mr. Dinesh Rabari

PREFACE

I love trees, especially in wilderness. I feel as if they are my true company. I touch them, feel them, observe them, enjoy the aroma of flowers and taste them. Probably I dream and wish that I spend my life in forest along with these plants, talking to them and listening to them. I am deeply attached with plants and I wish that each student dealing with botany should feel the life of a plant. It has to do with observations, trying to understand how they live and why they die, their adaptation to various conditions and it has influenced the life and innovations in life of a man. Forest is full of Adventure and stories one aspire to be while in Jungle. It teaches you how to leave with other creatures without harming them and simultaneously save yourself. When plants can develop defense mechanisms for their own self, why we should not learn from them to save our self. The aroma or constituent that saves a plant could be answer to present day problems and issues. The seed dispersal mechanism in each plant is a phenomenon and to understand these mechanisms one's life is too short to understand. If you are looking for new innovations don't move anywhere just move to nature. Observe the complexity you will get answer to all your questions and clues for new innovation and latest technologies. Plants have learned to give and give only with all harsh conditions. Not only this you cut them, they won't die, they will regenerate themselves with new beginning; still retaining their memory. They spend whole live at one place and still don't complain. They don't move but their offspring fly (seeds and pollens) across the world with no boundaries. Learning how to identify a tree in the wild is just a starting point. As you will move on you will find treasure of trees opening one by one. Just have patience the journey into trees is just going to start. I hope this treasure which has been compiled with the assistance of research scholars and students will definitely change your thinking regarding trees and their importance in life.

Botanical gardens are important centers for education. There are 1600 botanical gardens in the world which, between them, maintain the largest collection of plant species outside nature. As many as 60,000 of these plant species may be threatened with genetic impoverishment or will be extinct within the next 30-40 years. Threats include factors such as habitat loss and fragmentation, invasive species, over-exploitation of plant and animal species, pollution of soil, water and atmosphere, global climate change, industry, agriculture and forestry.

Botanical gardens have an obvious and vital role to play in conserving plants but conservation cannot succeed without education. Gardens are uniquely placed to teach people about the importance of the plants in our lives and in the global ecosystem. In the above context the booklet deals with some of the most unique flowering trees, scandent

shrub of Waghai Botanical Garden, Gujarat. Waghai Botanical Garden is the largest garden of Gujarat spread in an area of 24 Hectares. There are 262 different types of Trees occurring at Waghai Botanical garden belonging to 60 families. The Garden has been divided into different plots, which represent the various forest types occurring in India as classified by Champion and Seth. Various trees have been introduced in the Garden, from various biogeographically zones of India and from other tropical countries. The booklet is first of its kind which gives insight into the unexplored plants of Waghai Botanical Garden, of which some of them has been not even incorporated in the Flora of Gujarat too. The information in the book will definitely ignite the interest of among researchers, foresters and environmentalist.

An effort has been made to give a brief account on Waghai Botanical garden and a colorful journey into the exclusive trees of the garden. The information on plants given in the book gives insight into their common/local names, origin and some interesting facts. It aims to serve those who wish to learn about trees of Waghai Botanical garden.

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INTRODUCTION

Trees are the most complex and successful plants on earth. They have been around for 370 million years and quite likely will be around for many millions of years to come. Today, they cover almost one third of the earth's dry land and comprise more than 80,000 different species ranging from small Arctic willows that are just a few inches high to the lofty giant redwoods, which stand at an amazing 113m/368ft. Trees are the oldest living organisms on earth. In California, USA, there are Bristlecone pines which are known to be over 4,500 years old and in the United Kingdom there are few trees of a similar age. Ever since the first primates appeared in the Paleocene epoch, 65 million years ago, trees have played an integral part in human development, providing food, shelter, safety, medicines, timber and fuel among other things. Trees are indeed essential to all life. They reduce pollution by absorbing vast amounts of carbon dioxide from the atmosphere while at the same time replacing it with 'clean' oxygen. Each day 0.4 ha/1 acre of trees produce enough oxygen to keep 18 people alive. Forests of trees help to regulate water flow and can reduce the effects of flooding and soil erosion. They also influence weather patterns by increasing humidity and generating rainfall. With their myriad shades of green, trees make our cities and towns more colourful. They increase wildlife diversity and create a more pleasant living and working environment. They provide shade in summer and shelter in winter. It is a fact that post-operative hospital stays are shortened when patients are in rooms with views of trees. For centuries poets, writers and artists have been inspired by the beauty of trees. Works such as Wordsworth's *Borrowdale Yews* and John Constable's majestic elms in *The Hay-Wain* will live on long after the original trees depicted have died. Trees help to bring beauty to our gardens and parks. Chosen well, they will provide stunning flowers, foliage, fruits and bark every day of the year. Nothing brings structure and maturity to a garden more successfully than a tree. With so many obvious values it should be safe to assume that trees are venerated the world over. Unfortunately that is not the case. Over ten per cent of the world's tree species are now endangered. More than 8,750 species are threatened with extinction - some are literally down to their last one or two specimens. Across the world we are losing at least 40 ha/100 acres of trees every minute. This book is a celebration of trees in all their forms from hardy evergreens and deciduous broadleaves, to desert survivors and tropical palms growing at Waghai Botanical Garden. It reveals what incredible organisms trees are and describes the diversity that exists throughout the world and how they each contribute to the planet. Trees in habitat and many natural landscapes from the highest mountain ridges all the way down to sea level, and have adapted to different circumstances. The heat of the tropics, the biting cold of northern lands, the salt and wind

of the sea and the pollution of the city have all contributed to the evolution of the tree. The book features a comprehensive encyclopedia of tree species found in different biogeographically zones of the world at Waghai Botanical Garden. This book aims to bring a greater understanding and appreciation of trees in general to a wider audience. It should encourage you to look more closely at the diversity of trees in your own locality and if you have the opportunity to visit far-flung countries to appreciate the diversity that exists on the planet.

Waghai Botanical Garden (WBG)

Waghai Botanical Garden was established by the Forest department in 1966. WBG is situated near about 2 Km from Waghai on Waghai-Saputara Road in Dangs District, Gujarat. It is largest garden in Gujarat spreads over an area of 24 Hectares. Waghai Botanical Garden has a systematic network of roads with a stretch of 7 Km in length. The climate detail of WBG includes, average rainfall between 1600 mm to 2000 mm; average minimum temperature is of 10 °C (December, January) and maximum temperatures goes up to 45 °C (June, July) has been recorded.

The Waghai Botanical Garden is divided into 12 different plots, which represent all forest types occurring in India as classified by Champion and Seth as shown in map. Various trees have been introduced in the Garden, from various biogeographically zones of India and from other tropical countries. Waghai Botanical Garden is rich in floristic diversity having wide varieties of plant species. Garden has beautiful, natural and silent ambiance. You can see the plants which we only heard about and also the plants which cannot found in urban area.



With plants you can also see variety of insects and birds whose home is this garden. WBG is place where you can see more than 100 years old trees, more than 100 ft. height trees. You can see more than 25 exclusive plant species that are only present in WBG across whole Gujarat. Roads in garden are well planed with particular plant species belongs to particular road. So you can walk on interesting road like Shetur road, bhilamo road, champo road instead of particular city roads. Garden is well decorating with beautiful ornamental flowering plants which enhance its beauty that you can feel at the step when you enter in garden.

Details of different plots & Facilities present in WBG.

Evergreen Plot:

Evergreen plot is a mimic of forest type observed in Southern and North Eastern part of India. This plot has more than 328 plant species which includes plants like *Hopea Ponga*, *Artocarpus heterophyllus*, *Duabanga grandiflora* etc.

Moist Deciduous Plot:

The plot is prepared by considering forest species available in the Southern Western Ghats, North India and Andaman & Nicobar Island. It has more than 323 plant species such as *Lagerstromia indica*, *Shorea robusta*, *Dillenia indica*, *Albizia procera* etc.

Dry Deciduous Plot:

Dry Deciduous plot has vegetation similar to that of forest type of Madhya Pradesh, Gujarat, Andhra Pradesh, Karnataka, Tamilnadu, and Punjab which comprises of more than 42 species. The representative species in such forest type are *Terninalia arjuna*, *Anogeissu latifolia*, *Diosphyros montana*, *Semicarpus anacardium*, etc.

Scrub and Thorn Plot:

This plot includes plants found in forest of Madhya Pradesh, Maharashtra, Andhra Pradesh and Rajasthan. This plot represents 101 plant species few examples are *Acacia pinnata*, *Zizyphus mauritiana* etc.

Arid Zone Plot:

The plot comprised of environment than that of arid zone of India as found in North Gujarat and Rajasthan. More than 114 plant species of the respective forest types were planted in this plot. The vegetation of the plot includes species like *Cappris zeylanica*, *Tamrix indica*, *Opuntia ficus-indica* and some perennial grasses.

Taxonomy Plot:

The plot was developed for the identification, nomenclature and classification of plant kingdom. The significance of the plot is to provide insight details of the complexity in plant diversity with the help of many plant species herbaria present in the WBG.

Medicinal Plot:

This plot was added to the garden in subsequent years of its formation. It has collection of 257 species which have medicinal usages in Ayurveda, Unani, Siddha, Homeopathy and modern medicines.

Arogyvan:

This plot is also added to WBG and Inaugurated by Honorable chief minister shri. Narendra Modi. This plot harbors medicinal herb, shrub and tree plant species. It is divided in three parts like herb, shrub and tree plot. It is a largest plot of WBG and give information's of uses of plants as it has sign board assign to each and every plant.

Bamboo Plot:

The plot comprised of 6 bamboo species found in different regions of India, such as Bamboosa tulododies, Bamboosa vulgaris etc.

Dangs Plot:

This plot represents the species occurring in Dang forest. It has more than 468 species.

Cacti and Succulent Plot:

Cacti and succulents have always attracted people across world. The plot includes 142 different varieties of Cacti and Succulents.

Tuber Plot:

In Tuber plot you can see different type of tuberous plant and also get the knowledge of its uses.

RET & E Plot:

This plot represents the rare, endangered, threatened & endemic plant species of Gujarat.

Palm Plot:

Palm plot will show you variety of palm species from all over India.

Fruit Plot:

A fruit which we consume in day to day life but don't know from which tree it belongs then fruit plot is must to visit in WBG.

Aquatic Pond:

Aquatic pond is also rich with different types of aquatic plant species.

Orchid House:

Orchid house is also another attraction in WBG where you can see different types of ornamental and wild Orchid. Your inside photographer will must wake up to capture images, when you see the glorious beautiful flowers.

Rose Garden:

Rose Garden is another attraction as it has variety colors of rose flowers plant.

Pragvad (Unique tree of WBG):

Sacred Plants are also the reason to visit WBG as it has Pragvad; it's a pleasure to see its unique canopy and feel the nature vibes when to seat under it.

Library and Herbarium Room:

WBG has Library of 552 books which includes books on different Flora, Horticulture, Floriculture, Agriculture and the published forest reports. The Herbarium is a unique, having collection of Dr. R. I. Patel - An eminent Taxonomist of Gujarat. There are 3644 plant specimens belonging to 3245 Dicot, 399 Monocot and 2 Pteridophyte. The collection is mainly of Dr. B. G. Vashi, Dr. J. R. Parmar and Mr. K. L. Dubey.

Bhagat Hut:

You can see Variety types of seeds of plants that are present in WBG in Bhagat hut present at arogyvan.

Nursery & Green House: In situ conservation of variety of plant species present in WBG is done at this place.

Dangs Kutir: Here you can get glimpse of Tradition and culture of Dang District.

Souvenir Shop:

It is a place where you can buy unique & traditional gift items, wallpapers, boutique items, bamboo items and much more which represent Dangs and Botany. It is must to visit in WBG.

Canteen: It provides you indigenous food items.

Kitchen Area:

This place provides you space for making own food and dining.

Children Play Area: It has slider, swing chair, rope climbing, joy train and Archery. Children can enjoy them self in this.

Selfie Zone: To step up with current scenario WBG recently developed Selfie zone for tourist and visitors.

Parking: Large space in front of garden is dedicated for the parking of vehicles.

Biodiversity Interpretation Center:

This the place where meetings, seminars and exhibitions take place related to Botany, Biodiversity and forestry.

Heritage Rest House:

Heritage rest house is also well developed maintain with attractive garden and landscape.

***Acacia auriculiformis* A.Cunn. Ex.Benth**
Mimosaceae



Acacia auriculiformis, commonly known as auri, earleaf acacia, northern black wattle, Papuan wattle, and tan wattle, and tan wattle, akashmoni in Bengali, is a fast growing, crooked, gnarly tree. It is native to Australia, Indonesia and Papua New Guinea. In Thailand the tender leaves are eaten with nam prik chili sauce or papaya salad.

Bengali Baval/Earpod wattle



***Albizia procera* (Roxb.) Benth.**
Mimosaceae



The genus *Albizia* was named after Filippo degli Albizzi, a nobleman who introduced *A. julibrissin* into cultivation in 1749. Fragrant flowers form whitish globose head looks like *Siris*, hence White *Siris* name is given. Fruit ripe after 6-9 months of flowering, remains on the tree until the whole twig bearing the pods is shed.



Safed *Siris*/ Doon *Siris*



***Ardisia solanacea* (Poir.) Roxb.**
Primulaceae



Bisi



This plant has its origin in Indian subcontinent. The fruit is look like shoe button hence the English name is shoe button tree. Its' flowering season ranges from the month of March to August and fruiting starts from July to September.

Bauhinia roxburghiana Voigt

Caesalpinaceae



Roxburgh's Bauhinia/
Semla/ Kandla/ Karial/ Chakera

A clear, light-coloured gum is obtained from the plant. It resembles gum arabic (obtained from *Acacia senegal* and other *Acacia* spp.) and is used locally for sizing cloth and paper, but is not considered of very high value because it is only partially soluble in water. A fibre is obtained from the inner bark. The wood is one of the best of its genus in the lower Himalayas, but is not much used.

Couroupita guianensis Aubl.
Lecythidaceae



Shivalingi/ Tope Gola/ Nagalingam/
Cannonball Tree

Cannon ball flowers are considered of special significance in Buddhist culture in Sri Lanka. In Tamil Nadu, it is called Nagalingam flower. The sivalingam shape is visible at the center of the flower and snake shaped pollen is the specialty of this flower and it has very good fragrance. This rare flower can be used for Shiva Pooja



***Ficus microcarpa* L.f.**
Moraceae

According to Hindu mythology, Lord bramha and other all great saints used to meditate under this tree and get bramhagyan. This tree is very much sacred to hindu religion.



Pragvad/ Chinese banyan/
Malayan banyan

Kigelia africana (Lam.) Benth.
Bignoniaceae



Balam Kheera/ Sausage tree

The genus name comes from the Mozambican Bantu name, kigeli-keia, while the Common names sausage tree and cucumber tree refer to the long, sausage-like fruit. Unusual tree featuring 3-24" long sausage shaped fruits growing at the ends of long stems. The flowers are also quite showy and the fruit, while not palatable for humans, is popular with hippos, baboons, and giraffes. There are some steroid chemicals found in the sausage tree that are currently added to commercially available shampoos and facial creams.



Mimusops elengi L.
Sapotaceae



Maulsari/ Spanish cherry



The name was given by Linnaeus to commemorate Joseph G. Koelreuter (1733 – 1806), Professor of Natural History at Karlsruhe (Germany) and a pioneer in the field of hybridisation.

Schleichera oleosa (Lour.) Oken

Sapindaceae



Kusum is the best species for rearing the lac insects and the lac produced on it is of the best quality of natural shellac (Kosami lakh). The whitish fleshy aril has a pleasant acid taste and is eaten. The young fruits are pickled. Seeds are also eaten raw or roasted. Kusum oil has long been used for hair dressing (said to be the Macassar oil of hair dressers) Kusum oil contains some cyanogeni compounds which at high temperatures emit poisonous fumes and therefore the oil is processed with great care.



Kusum/ Kosimdi/ Ceylon Oak/
Lac Tree/ Macassar Oil Tree



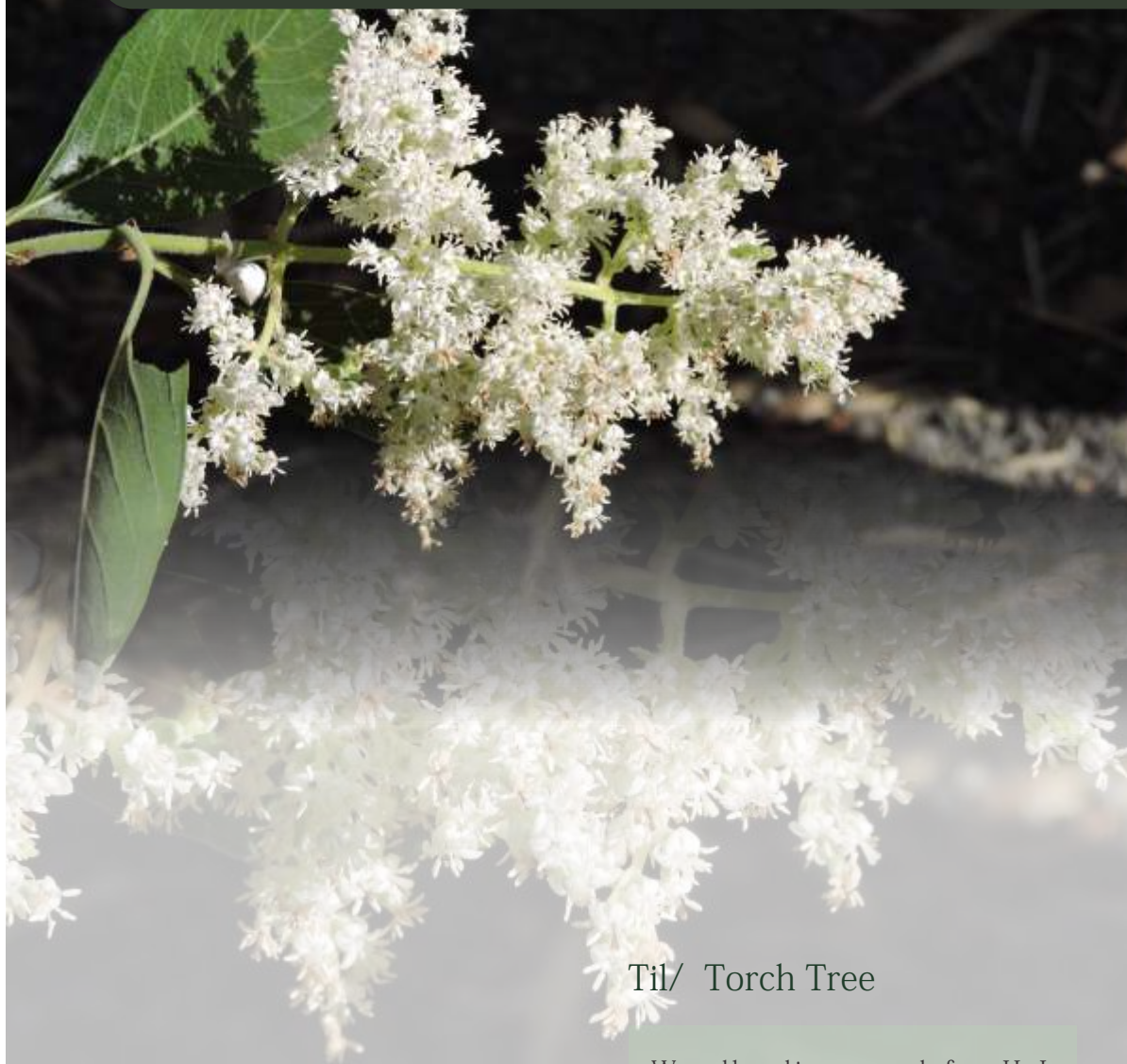
***Vateria indica* L.**
Dipterocarpaceae

Safed Daama/ White Damar/
Indian Copal/ Malabar tallow/
Piney varnish



Vateria indica, the white dammar is a species of plant in the family Dipterocarpaceae. It is endemic to India. It is threatened by habitat loss. This tree grows like a palm but has blunt thorns along its trunk. Some stilbenoids in resins from *V. indica* have been shown to have some in vitro anti-tumor effects in high doses when isolated from the plant.

***Wendlandia heynei* (Schult.) Santapau & Merchant**
Rubiaceae



Til/ Torch Tree

Wendlandia named for H L Wendland, curator of botanical garden at Hannove. heynei named for Dr B Heyne, German botanist and traveller.



Buy This Book
Kindly Contact: Miss Pallavi Patel, Botanist,
Waghai Botanical Garden.

Mo. 8141281703

The book gives pictorial view of the trees of Waghai Botanical Garden (WBG) and their significance in scientific terms. Primarily the book deals with the two hundred and sixty two flowering trees belonging to sixty families of Waghai Botanical Garden with colorful plates, their scientific names, local names, and interesting facts. These are endemic or indigenous trees, introduced in the garden from various regions of India viz., Western Ghats, North East Himalayas, Eastern Ghats, and from other tropical countries. It will take you into the journey of wonders of trees.

Dr. Padamnabhi S. Nagar is actively engaged from last twenty four years in plant biodiversity. Mr. Dinesh Rabari, DCF, South Dang Forest Division, Dangs and Garden Superintendent is involved in conservation of plant biodiversity of South Gujarat and renovation of Waghai Botanical Garden for innovative interaction.