

Handbook of Flowering Plants of Nepal

(Volume 1. Gymnosperms and Angiosperms: Cycadaceae - Betulaceae)

**Krishna K. Shrestha
Shandesh Bhattarai
Prabin Bhandari**



Handbook of Flowering Plants of Nepal

About the authors

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Cover page: *Mahonia napaulensis* DC. (Berberidaceae)

Photo credit: Neera Joshi Pradhan

Photos inside back cover page: *Alnus nepalensis* (Betulaceae), *Butea monosperma* (Fabaceae), *Caltha palustris* (Ranunculaceae), *Coelogyne nitida* (Orchidaceae), *Dactylicapnos macrocapnos* (Papaveraceae), *Ficus hispida* (Moraceae), *Fritillaria cirrhosa* (Liliaceae), *Magnolia kisopa* (Magnoliaceae), *Miscanthus nepalensis* (Poaceae), *Nelumbo nucifera* (Nelumbonaceae), *Pinus wallichiana* (Pinaceae), and *Saxifraga parnassifolia* (Saxifragaceae)

Photo credit: Krishna K. Shrestha

Inside cover page: Map of Nepal

Map credit: Dibas Shrestha

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FOREWORD

Nepal has a tremendous diversity of plants and the Nepalese people have a long history of using them to support their everyday livelihoods. Plants provide for our basic needs of food, shelter and heat, but also spices, oils, fibres, medicines, and much more. Plants enrich our lives with their beauty, and a great many have an indispensable role in religious ceremonies in Nepal. These plants, and the habitats in which they grow, also provide ecosystem services to a wide area of Asia, impacting on millions of lives in surrounding countries and beyond. Nepal is a major component of the Himalayan biodiversity hotspot, and so the ca. 7000 species of higher plants thought to grow within its borders are important locally, nationally and globally.

With growing pressures from habitat destruction, climate change, invasive plants, and over exploitation, it is more important than ever to conserve the Nepalese flora, use plants sustainably, and ensure that they will be available for future generations. However, if you don't know about the plants you have, what their names are, what are their characteristics, and where are they found, then it is difficult to conserve them effectively. Such knowledge is encapsulated within a Flora - a comprehensive documentation of plants in an area, together with tools to aid identification (usually keys, but also illustrations and photographs). Nepal is one of the last countries in the northern hemisphere yet to produce a completed Flora, although work on this is well underway with the *Flora of Nepal* (www.floraofnepal.org).

Producing a Flora is a long term, nation-building project. It is not an easy task and requires significant resources. It takes many years to generate the comprehensive knowledge base, which taxonomic botanists need to conduct their research. Building the in-country capacity to undertake these studies is also vitally important, as is developing the international networks of partners to share knowledge and experience. No one country has expertise in all plant groups, and so collaborations need to be made with experts working in other countries to produce the most up to date, authoritative accounts of these plants.

Botanists began collecting scientific samples (herbarium specimens) in Nepal in 1802, but the most extensive fieldwork has been since the early 1950s, when Nepal opened its doors to foreign visitors. These collections enabled the first floristic works to be published - checklists of plants known to occur in Nepal,

with basic information on distribution. Botanical exploration continues and such publications go out of date almost as soon as they are printed. Species new to science are regularly discovered, new records are found for plants previously known from other countries, major extensions are made to distribution and altitude ranges, and new taxonomic revisions adjust the species limits and generic placements of previously known species. These advances in knowledge sometimes result in changes of scientific names, well-known names being placed into synonymy and new species names being proposed.

This new *Handbook of Flowering Plants of Nepal* updates previous checklists with these kinds of new information, and incorporates the latest classifications put forward by the international taxonomic community. It also extends our knowledge on Nepalese plants by including data on vernacular names, uses and life forms. This will be very helpful for those needing to use an updated classification and nomenclature of Nepalese plants, and for applied researchers looking for information on how plants are used. Students of biodiversity will find a great deal of useful information on Nepal, its plants and the history of botanical exploration in the detailed Introduction. Taxonomy students are particularly well served by the incorporation of the APG definitions of plant families and their relationships based on molecular studies of DNA. This book represents a major stepping-stone on the pathway to completing the *Flora of Nepal*, and is an indispensable resource for anyone working on Nepalese plants.



September 13, 2017

Dr Mark F. Watson

Editor-in-Chief, Flora of Nepal
Royal Botanic Garden Edinburgh, UK

PREFACE

Globally, the number of species belonging to Plant Kingdom, Animal Kingdom (except invertebrates), and Kingdom Mycota (Fungi) is fairly catalogued, whereas information on the Kingdom Monera (Bacteria) and Protocista (Algae, Diatoms, and Protozoa) are largely unknown, except Green Algae. In general, documentation of biodiversity resources is either incomplete or data deficient, with many doubtful or uncertain species. Nepal is considered as one of the biodiversity rich countries in the world on the basis of number of species versus area of the country. It has been realized that integrated and updated information on plants, animals and microorganisms of Nepal should be available to the wide range of stakeholders including students, researchers, policy makers, and planners, especially for the sustainable use of the biological resources and conservation of rare, threatened and endemic species.

The 'Flora of Nepal' is a dream project for Nepal, which has been initiated by the Department of Plant Resources (then Department of Medicinal Plants), Government of Nepal since the early 1960s. '*Prodromus Florae Nepalensis*' (Don 1825) was the first publication on Flora of Nepal, based on the plant collections by Buchanan Hamilton (1802-1803), and Nathalien Wallich (1820-1821). With the collaboration of the Natural History Museum, London and University of Tokyo, Japan published 'An Enumeration of the Flowering Plants of Nepal: Vols. 1-3 (Hara *et al* 1978, Hara and Williams 1979, and Hara *et al* 1982), followed by the publication of 'Name List of Flowering Plants of Nepal' (Koba *et al* 1994), and 'Annotated Checklist of the Flowering Plants of Nepal' (Press *et al* 2000). The updated version of the Annotated checklist was published on-line (www.efloras.org) in 2004 with the support of Missouri Botanical Garden, USA.

The Department of Plant Resources published 'Catalogue of Nepalese Vascular plants (1976), which has later been updated (Rajbhandari and Baral 2010, Rajbhandari *et al* 2011, 2012, 2015). Since 2000, many new species and new records to Nepal Flora, as well as significant nomenclatural changes have been noticed. Moreover, the classification system adopted by the Enumeration (Bentham and Hooker system, 1867-1892), and Flora of Nepal Vol. 3 (Engler and Diels 1911) has been revised and replaced in recent Flora and taxonomic treatments by the Angiosperm Phylogeny Group (APG III and IV).

The sequences of the orders and families in the present book has been arranged according to APG IV system (2016). In addition, the new species and new records reported from Nepal, as well as recent nomenclatural changes have been adopted. Moreover, we have incorporated valid synonyms, Local Nepali names (in Devanagari), English/Common names, life form (plant habit), elevation ranges, and use value of majority of plants in the Volume I. Gymnosperms and Angiosperms: Cycadaceae – Betulaceae, and upcoming volume II. Angiosperms: Coriariaceae – Apiaceae which is in progress, will be published soon.

We are grateful to Neera Joshi Pradhan (Studio Petals, Khumaltar, Lalitpur) and Priyanka Malla (London, UK) for their contribution in colour drawing of cover page and cover page design accordingly. Similarly, Dibas Shrestha (Central Department of Hydrology & Meteorology, TU) is acknowledged for preparing the map of Nepal, and Buda Dangol (Manchester, UK) for editing the language. The authors sincerely acknowledge the support of our colleagues Narendra Nath Tiwari (Ayurveda Campus, Institute of Medicine, TU), Mohan Siwakoti, Sangeeta Rajbhandary and Suresh Kumar Ghimire (Central Department of Botany, TU), Ila Shrestha (Patan Multiple Campus, Lalitpur), Jyoti Prasad Gajurel and Bishnu Rijal (former students, Central Department of Botany, TU), and Keshab Raj Rajbhandari, Sanjeev Kumar Rai, Ramesh Basnet and Subhash Khatri (Department of Plant Resources, MoFSC/GoN) for their cooperation in preparing the book.

The first author greatly acknowledges the contribution of Steve Blackmore, JR Press and DA Sutton (The Natural History Museum, London, UK), Peter Raven (Missouri Botanical Garden, St.Louis, USA) and Mike Gilbert (Royal Botanic Gardens, Kew, UK) for their extensive support during the publication of previous version of the checklist ‘Annotated Checklist of the Flowering Plants of Nepal’, and online version of the checklist (www.efloras.org) respectively. These resources are considered as the fundamental source of information while publishing this book.

Our special thanks goes to Mark F. Watson, Colin A. Pendry, Bhaskar Adhikari (Royal Botanic Garden Edinburgh, UK), and Ram Prasad Chaudhary (Research Centre for Applied Science & Technology, TU) for their critical comments, valuable suggestions and feedback to update the book. The authors also extend their sincere gratitude to the authorities of Tribhuvan University (TU), Nepal Academy of Science and Technology (NAST), Department of Plant Resources (DPR), Royal Botanic Garden Edinburgh, UK and University of Tokyo, Japan for their support and cooperation. Finally, we are thankful to the Scientific Publishers, Jodhpur, India for publishing the book.

The Authors

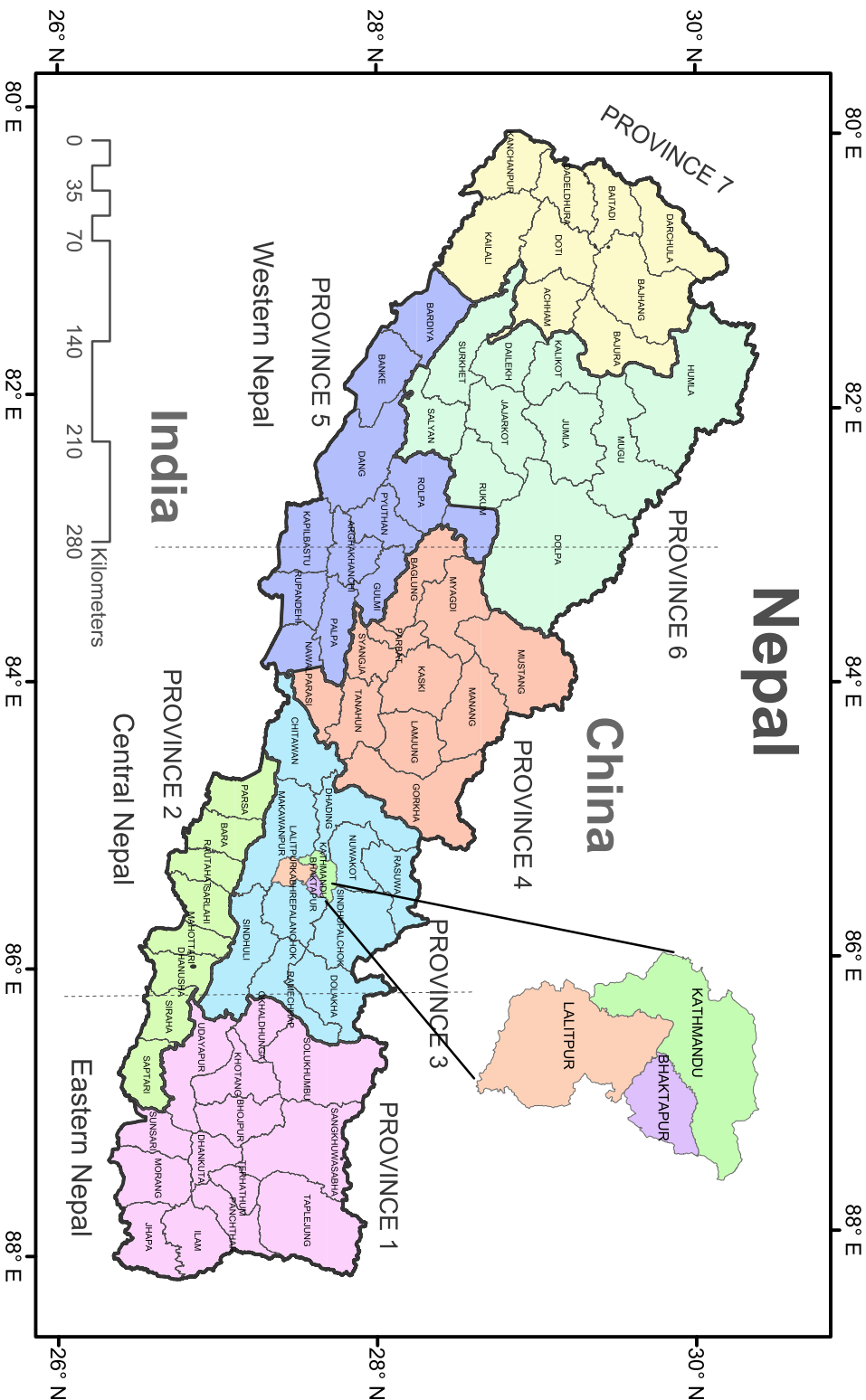
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Flowering plants of Nepal: Representative species



1. *Pinus wallichiana*



2. *Magnolia kisopa*



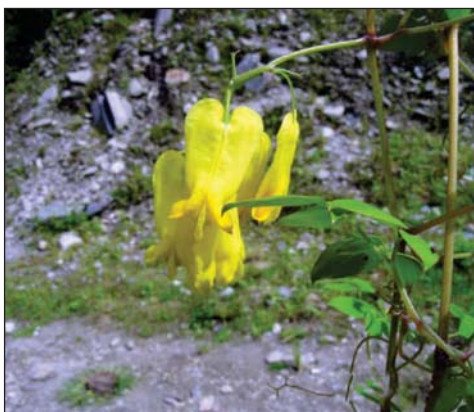
3. *Fritillaria cirrhosa*



4. *Coelogyne nitida*



5. *Miscanthus nepalensis*



6. *Dactylicapnos macrocapnos*

Flowering plants of Nepal: Representative species



7. *Caltha palustris*



8. *Nelumbo nucifera*



9. *Saxifraga parnassifolia*



10. *Butea monosperma*



11. *Ficus hispida*



12. *Alnus nepalensis*

FORMAT

The previous version of Enumeration (Hara *et al* 1978, Hara and Williams 1979, and Hara *et al* 1982) and Checklist (Press *et al* 2000) have been updated and modified based on new addition of species to Nepal Flora, nomenclatural changes, and additional information on Local names, English/Common names, Use Values, IUCN Red List Categories, and CITES Appendices. The Latin (Scientific) names in bold letters are accepted names, following Flora of Nepal (2011), Flora of China (1994-2013) and Flora of Bhutan (1983-2002). Online databases such as TROPICOS (www.tropicos.org), Global Biodiversity Information Facility (www.gbif.org), The Plant List (www.theplantlist.org), as well as Catalogue of Life (www.catalogueoflife.org), and International Plant Name Index (www.ipni.org) are also consulted, wherever necessary.

Distribution for species within Nepal is based on herbarium specimens and Flora books, while Flora of Nepal Vol. 3 (Watson *et al* 2011) is followed for distribution format of taxa. Elevation ranges are based on the herbarium specimens and Flora books. The Use and parts used are based on published literature; and IUCN Red List Categories, and CITES Appendices are based on the respective websites.

Sample 1. Description of flowering plants

CUPRESSALES [Order]

TAXACEAE [Family]

Taxus L. [**Genus**: Generic name with authority]

Taxus wallichiana Zucc. [**Species**: Latin name with authority] [4, 5, 15, 19]

Taxus baccata subsp. *wallichiana* (Zucc.) Pilg. (1, 71); *Taxus yunnanensis* W.C.Cheng & L.K.Fu [**Synonyms**]

Literature citation [1 = Enumeration Vol. 1; 4 = Checklist, 2000; 5= Catalogue, 2009, etc.....]

लौठ सल्ला, बर्म सल्ला, ढेंग्रे सल्ला (Lauth sallaa, Barne sallaa, Dhengre sallaa); East Himalayan Yew [**Nepali/ English name**]

Medium-sized evergreen trees. C, E Nepal: 1900-3300(-3500) m. Nepal, E Himalaya, Tibetan Plateau, Assam-Burma and E Asia. [**Life form/Distribution in Nepal/Elevation ranges/General distribution**]

Use(s)/Parts used: Timber, Medicine (bark, leaves), Food (fruit), Fodder.

IUCN Category: **Endangered** A2acd (ver 3.1)

CITES Appendix: II.

Sample 2. Description of Endemic plants

FABACEAE (LEGUMINOSAE)

Oxytropis DC.

Oxytropis nepalensis Vass., *Nov. Syst. Pl. Vasc.* **14**: 175. 1977. [2, 4, 8, 11, 12, 27, 29]

[**Species name/ Protologue** (original publication citation)]

Perennial stemless herbs. Nepal: 3500-4500 m. (**Endemic to Nepal**). [**Life form/ Elevation/ Distribution**]

Central: *Mustang*, Tukucha, Kali Gandaki 13500 ft. (4110 m); JDA Stainton, WR Sykes and LHJ Williams 1135 (Holotype: BM). [**Type specimen**]



Distribution Format

Distribution for species and infraspecific taxa occurring outside Nepal is indicated by a list of geographical regions, which are defined according to political borders, with countries or provinces grouped to form regions underlying biogeographic basis. The names used for the regions are intended to be descriptive and non-political (Watson *et al* 2011). The present book has also adopted the distribution pattern as follows:

W Himalaya	NW India (Jammu & Kashmir [including Siachen Glacier, regions disputed with Pakistan], Himachal Pradesh, Uttarakhand), N Pakistan (Khyber Pakhtunkhwa [previously known as North West Frontier Province], Gilgit-Baltistan [also known as Northern Areas, region disputed with India], Azad Kashmir [region disputed with India]).
E Himalaya	N India (Sikkim & Darjeeling), Bhutan, NE India (Arunachal Pradesh [disputed border with S Tibet, China]).
Tibetan Plateau	China (Xizang [including Aksai Chin and Shaksgam Valley regions disputed with India], Qinghai).
Assam-Burma	NE India (Assam, Nagaland & Manipur), Myanmar.
S Asia	E Pakistan (Punjab, Sind, Islamabad), Peninsular India, Sri Lanka, Bangladesh, Maldives.
E Asia	China (excluding Xizang, Xinjiang, Qinghai), N & S Korea, Japan, Taiwan.
SE Asia	Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia, Philippines, New Guinea.
N Asia	China (Xinjiang), Russia, Mongolia.
C Asia	Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan.
SW Asia	Afghanistan, W Pakistan (Baluchistan, Federally Administered Tribal Areas), Iran, Middle East, Arabian Peninsula, Turkey, Azerbaijan, Armenia, Georgia.

Asia	Collective term for all above areas of Asia.
Europe	includes Ukraine, Belarus, Baltic republics.
Africa	includes Madagascar.
N America	includes C America south to Panama.
S America	south of Panama.
Australasia	Australia, New Zealand, Pacific Islands.
Cosmopolitan	collective term for a generally worldwide distribution.

Source: Watson *et al* 2011 Flora of Nepal Vol. 3, Royal Botanic Garden Edinburgh, UK



Abbreviations and Acronyms

AD	Anno Domini
APG	Angiosperm Phylogeny Group
BM	Herbarium, Natural History Museum (British Museum), London
BPP	Biodiversity Profiles Project
C	Central
ca.	circa (about, approximately)
CAL	Central National Herbarium, Calcutta
Cat. no.	Catalogue number
CBD	Convention on Biological Diversity
CDBTU	Central Department of Botany, Tribhuvan University
CE	Critically Endangered
CITES	Convention on International Trade in Endangered Species of wild fauna and flora
DD	Herbarium, Forest Research Institute, Dehradun
DD	Data Deficient
DPR	Department of Plant Resources
E	Herbarium, Royal Botanic Garden Edinburgh
E	East, Eastern
ed.	Edited
EN	Endangered
et al.	et alia – and others
EW	Extinct in the Wild
Fig.	Figure
ft.	Feet

G	Herbarium, Conservatoire et Jardin Botaniques de la Ville de Geneve
G-DC	Geneva – De Candolle's Herbarium
GEF	Global Environment Facility
GH	Gray Herbarium, Harvard University Herbarium, Cambridge, USA
GRM	Muséum d'Histoire Naturelle de Grenoble
ICIMOD	International Centre for Integrated Mountain Development
IUCN	International Union for Conservation of Nature
K	Herbarium, Royal Botanical Gardens Kew
KATH	National Herbarium and Plant Laboratories (NHPL)
KUN	Herbarium, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, China
K-W	Herbarium, Royal Botanical Gardens Kew-Wallich's collections
KYO	Herbarium, Kyoto University
LC	Least Concern
LE	Herbarium, Komarov Botanical Institute, Saint Petersburg, Russia
LINN	Herbarium of Linnaean Society of London, UK
m	Meter
MENRIS	Mountain Environment and Natural Resources Information System
MoFSC	Ministry of Forest and Soil Conservation
N	North, Northern
NA	Not Available (Data Deficient)
NAST	Nepal Academy of Science and Technology
NT	Near Threatened
P	Herbarium, Museum National d'Histoire Naturelle Paris
PE	Herbarium, Institute of Botany, Chinese Academy of Sciences, Beijing, China
RBG Kew	Royal Botanic Gardens Kew
Rep. ed.	Reprinted edition
SE	South East, South-Eastern
s.n.	sine nomine (without collection number)

SW	South West, South-Western
TI	Herbarium, University Museum, University of Tokyo, Tokyo, Japan
TNS	National Museum of Nature and Science, Tsukuba, Japan
TUCH	Tribhuvan University Central Herbarium
UK	United Kingdom
US	Herbarium, Smithsonian Institution Washington DC, United States
USA	United States of America
Vol.	Volume
VU	Vulnerable
W	West, Western
WCMC	World Conservation Monitoring Centre
?	Question
%	Percentage
*	Asterisk
~	Approximately
<	less than
>	greater than
°	Degree

Flowering plants of Nepal: Representative species



1. *Pinus wallichiana*



2. *Magnolia kisopa*



3. *Fritillaria cirrhosa*



4. *Coelogyne nitida*



5. *Miscanthus nepalensis*

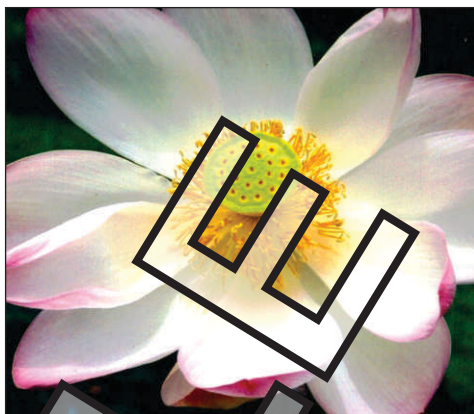


6. *Dactylicapnos macrocapnos*

Flowering plants of Nepal: Representative species



7. *Caltha palustris*



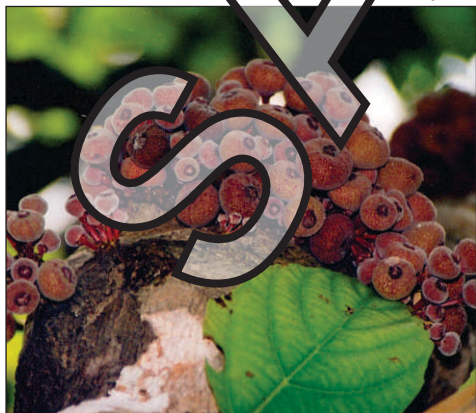
8. *Nelumbo nucifera*



9. *Saxifraga parnassifolia*



10. *Butea monosperma*



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12. *Alnus nepalensis*