

TREES OF LAOS AND VIETNAM: A FIELD GUIDE TO 100 ECONOMICALLY OR ECOLOGICALLY IMPORTANT SPECIES

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SUMMARY

This field guide to 100 economically or ecologically important tree species from Laos and Vietnam enables the user to identify the included taxa with user-friendly keys. It includes scientific names, botanical descriptions of families, genera, and species. Specific information on distribution, habitat, ecology, and uses has been compiled. All specimens examined have been listed.

Key words: Flora of Laos and Vietnam, field guide, tree-identification, tree flora, Indochina.

INTRODUCTION

Laos and Vietnam's forests are one of the countries' richest natural resources, supporting a huge diversity of plant and animal life, and providing forest products to support local livelihoods. In recent years forest cover in the tropics has decreased drastically and Laos and Vietnam are among the few South East Asian countries where still a substantial part of the land is covered by often unexplored, practically unknown original vegetation. Except 'Flore du Laos, du Cambodge et du Vietnam' and its predecessors there is no publication which enables us to identify plants with an easy to use key. Almost all other publications are descriptive but without any means to identify plants except comparing either descriptions or photographs. Our manual aims at assisting foresters and botanists and their students with user-friendly keys in the identification of some major components of the forests. We hope that our contribution will stimulate further studies of the flora.

SCOPE OF THE FIELD GUIDE

The intended scope of the manual is a Flora containing 100 tree species belonging to 83 genera and 40 families from Vietnam and Laos, important either economically or ecologically, and the means to identify them by field as well as herbarium characters. This manual contains all the information which is needed for identification, including

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full scientific names, synonyms, literature, vernacular names, botanical descriptions, distribution, habitat & ecology, uses, and specimens examined. Keys to the families, genera, and species are given.

FORMAT OF DESCRIPTIONS

- Families, genera, and species are treated in alphabetical order within the two major groups ‘Gymnospermae’ and ‘Angiospermae’.
- If a family contains more than 1 genus, a key to the genera is given. If a genus has more than one species, a key to the species is given.
- Scientific genera and species names. Nomenclature generally follows recent literature, however, in some cases we have used names that are common use in the Floras of Laos and Vietnam.
- Synonyms are limited to those used in recent literature.
- Vernacular names have been cited using two main languages: Lao (L) and Vietnamese (V).
- Descriptions are based on literature and herbarium specimens kept at Leiden (L) and Paris (P).
- Distribution for the plant families is mentioned including the number of genera and species in the world, Laos, and Vietnam. Distribution within both countries is by province using the names as published in ‘Flore du Cambodge, du Laos et du Vietnam’ 31 (2003) 96.
- Habitat and ecology information include data on forest type, the habitats and altitude where the species are occurring, and the flowering and fruiting time.
- Data on uses.

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FLORISTIC TREATMENT

SPOT CHARACTERS FOR THE GENERA

List of spot characters

- | | |
|---|---|
| 1 – Gymnosperms | 28 – Leaves peltate |
| 2 – Bark with hissing sound when cut | 29 – Leaves trifoliate |
| 3 – Armed plants | 30 – Leaflets alternate |
| 4 – Stem flanged | 31 – Leaflets opposite |
| 5 – Twigs with ridges | 32 – Leaf or leaflet margin entire |
| 6 – Sap white | 33 – Leaf or leaflet margin toothed |
| 7 – Sap yellow | 34 – Leaves hairy |
| 8 – Sap black or brown | 35 – Leaves or leaflets with dots |
| 9 – Sap red or orange | 36 – Leaves or leaflets with domatia |
| 10 – Living parts of plants with smell | 37 – Leaves 3-veined |
| 11 – Stellate hairs or scales present | 38 – Intramarginal vein present |
| 12 – Glands on petiole | 39 – Leaves with very close parallel veins |
| 13 – Glands on leaf lamina | 40 – Inflorescences a spike |
| 14 – Stipules present | 41 – Inflorescences in a head |
| 15 – Stipules absent | 42 – Flowers large and showy (at least
1.5 cm diam.) |
| 16 – Petioles swollen | 43 – Ovary inferior |
| 17 – Petioles wrinkled | 44 – Ovary superior |
| 18 – Winged rhachis or petiole | 45 – Fruits compound |
| 19 – Rhachis with swollen nodes | 46 – Fruits dehiscent |
| 20 – Leaves opposite | 47 – Fruits indehiscent |
| 21 – Leaves whorled | 48 – Fruits with wing(s) |
| 22 – Leaves spirally arranged | 49 – Fruit a berry |
| 23 – Leaves alternate (in two rows) | 50 – Fruit a cone |
| 24 – Leaves simple | 51 – Fruit a drupe |
| 25 – Leaves palmately compound or
digitate | 52 – Fruit a nut |
| 26 – Leaves pinnately compound | 53 – Fruit a capsule |
| 27 – Leaves bipinnately compound | 54 – Fruit a pod |
| | 55 – Seeds winged |

Spot characters

1. Gymnosperms
Cupressus, Dacrycarpus, Dacrydium, Fokienia, Keteleeria, Nageia, Pinus, Podocarpus
2. Bark with hissing sound when cut
Dillenia
3. Armed plants
Caesalpinia p.p., *Erythrina* p.p., *Gmelina* p.p., *Pithecellobium* p.p.

4. Stem flanged
Archidendron p.p.
5. Twigs with ridges
Duabanga
6. Sap white
Aglaia p.p., *Alstonia*, *Broussonetia*, *Canarium*, *Eberhardtia*, *Madhuca*, *Wrightia*
7. Sap yellow
Mesua
8. Sap black or brown
Canarium p.p., *Choerospondias*, *Dracontomelon*
9. Sap red or orange
Bischofia, *Dalbergia*, *Endospermum* p.p., *Horsfieldia*, *Knema*, *Pterocarpus*
10. Living parts of plants with smell
Cananga, *Canarium*, *Cinnamomum*, *Cupressus*, *Dracontomelon*, *Fokienia*, *Michelia*
11. Stellate hairs or scales present
Aglaia, *Aleurites*, *Bombax* p.p., *Endospermum*, *Lagerstroemia*, *Pterospermum*
12. Glands on petiole
Archidendron, *Terminalia* p.p.
13. Glands on leaf lamina
Diospyros, *Endospermum*, *Fagraea*, *Gmelina*, *Terminalia* p.p., *Vatica*
14. Stipules present
Acrocarpus, *Adenanthera*, *Azadirachta*, *Albizia*, *Aleurites*, *Altingia*, *Anisoptera*, *Archidendron*, *Baccaurea*, *Berrya*, *Betula*, *Bischofia*, *Bombax*, *Broussonetia*, *Caesalpinia*, *Canarium* p.p., *Cassia*, *Castanea*, *Castanopsis*, *Dalbergia*, *Delonix*, *Dialium*, *Dipterocarpus*, *Duabanga*, *Eberhardtia*, *Erythrina*, *Fagraea*, *Hopea*, *Irvingia*, *Liquidambar*, *Madhuca*, *Michelia*, *Parashorea*, *Parkia*, *Peltophorum*, *Pithecellobium*, *Pterocarpus*, *Pterospermum*, *Pyrus*, *Samanea*, *Senna*, *Sindora*, *Tamarindus*, *Vatica*, *Xylocarpus*
15. Stipules absent
Alstonia, *Cananga*, *Canarium* p.p., *Chisocheton*, *Choerospondias*, *Chukrasia*, *Dillenia*, *Diospyros*, *Dracontomelon*, *Gmelina*, *Horsfieldia*, *Knema*, *Lagerstroemia*, *Mesua*, *Oroxylum*, *Polyalthia*, *Sapindus*, *Schima*, *Syzygium*, *Tectona*, *Terminalia*, *Tetrameles*, *Wrightia*, *Xylocarpus*
16. Petioles swollen
Aglaia p.p., *Aleurites*, *Anisoptera*, *Baccaurea*, *Dipterocarpus*, *Endospermum*, *Pterospermum*

17. Petioles wrinkled
Diospyros p.p., *Syzygium* p.p.
18. Winged rhachis or petiole
Dillenia p.p., *Tectona*
19. Rhachis with swollen nodes
Archidendron, *Oroxylum indicum*
20. Leaves opposite
Duabanga, *Fagraea*, *Gmelina*, *Lagerstroemia*, *Markhamia*, *Mesua*, *Oroxylum*, *Syzygium*, *Tectona*, *Terminalia*, *Wrightia*
21. Leaves whorled
Alstonia, *Terminalia* p.p.
22. Leaves spirally arranged
Aleurites, *Dillenia*, *Dracontomelon*, *Endospermum*, *Senna*, *Terminalia* p.p.
23. Leaves alternate (in two rows)
Aquilaria, *Bombax*, *Caesalpinia*, *Cananga*, *Diospyros*, *Dipterocarpus*, *Duabanga*, *Erythrina*, *Polyalthia*, *Terminalia*, *Xylopia*
24. Leaves simple
Aleurites, *Alstonia*, *Altingia*, *Anisoptera*, *Aquilaria*, *Baccaurea*, *Berrya*, *Bischofia*, *Broussonetia*, *Cananga*, *Castanea*, *Castanopsis*, *Dillenia*, *Diospyros*, *Dipterocarpus*, *Duabanga*, *Eberhardia*, *Endospermum*, *Fagraea*, *Gmelina*, *Horsfieldia*, *Knema*, *Lagerstroemia*, *Liquidambar*, *Irvingia*, *Madhuca*, *Mesua*, *Michelia*, *Parashorea*, *Polyalthia*, *Pterospermum*, *Schima*, *Shorea*, *Syzygium*, *Tectona*, *Terminalia*, *Vatica*, *Wrightia*, *Xylopia*
25. Leaves palmately compound or digitate
Bombax
26. Leaves pinnately compound
Aglaia, *Canarium*, *Cassia*, *Chisocheton*, *Choerospondias*, *Chukrasia*, *Dracontomelon*, *Markhamia*, *Pterocarpus*, *Sapindus*, *Senna*
27. Leaves bipinnately compound
Acrocarpus, *Archidendron*, *Caesalpinia*, *Oroxylum* (sometimes 3-pinnate), *Parkia*, *Peltophorum*
28. Leaves peltate
Endospermum p.p., *Pterospermum*
29. Leaves trifoliolate
Bischofia, *Erythrina*
30. Leaflets alternate
Chukrasia, *Dalium*, *Dracontomelon*, *Sapindus*

31. Leaflets opposite

Acrocarpus, *Afzelia*, *Aglaia*, *Caesalpinia*, *Canarium*, *Chisocheton*, *Choerospondias*, *Delonix*, *Dracontomelon*, *Markhamia*, *Oroxylum*, *Peltophorum*, *Sindora*, *Tamarindus*

32. Leaf or leaflet margin entire

Acrocarpus, *Afzelia*, *Aglaia*, *Aleurites*, *Alstonia*, *Anisoptera*, *Aquilaria*, *Archidendron*, *Caesalpinia*, *Cananga*, *Cassia*, *Cinnamomum*, *Delonix*, *Dialium*, *Diospyros*, *Dipterocarpus*, *Dracontomelon*, *Duabanga*, *Eberhardtia*, *Endospermum*, *Fagraea*, *Gmelina*, *Hopea*, *Horsfieldia*, *Knema*, *Lagerstroemia*, *Madhuca*, *Michelia*, *Oroxylum indicum*, *Parashorea*, *Parkia*, *Peltophorum*, *Polyalthia*, *Pterocarpus*, *Pterospermum*, *Senna*, *Shorea*, *Sindora*, *Syzygium*, *Tamarindus*, *Vatica*, *Wrightia*, *Xylopia*

33. Leaf or leaflet margin toothed

Altingia, *Betula*, *Bischofia*, *Castanea*, *Castanopsis*, *Choerospondias*, *Dillenia* p.p., *Gmelina* p.p., *Markhamia*, *Schima*, *Terminalia*, *Tetrameles*

34. Leaves hairy

Broussonetia, *Wrightia*

35. Leaves or leaflets with dots

Aglaia p.p., *Caesalpinia*, *Cananga*, *Cinnamomum*, *Diospyros*, *Syzygium*, *Terminalia*

36. Leaves or leaflets with domatia

Chukrasia, *Dracontomelon*, *Hopea*, *Terminalia*

37. Leaves 3-veined

Cinnamomum

38. Intramarginal vein present

Duabanga, *Syzygium*

39. Leaves with very close parallel veins

Alstonia, *Mesua*

40. Inflorescences a spike

Castanea, *Castanopsis*, *Betula*, *Broussonetia* (male), *Keteleeria* (male), *Liquidambar* (male), *Pinus* (male), *Podocarpus* (male)

41. Inflorescences in a head

Altingia (female), *Broussonetia* (female), *Liquidambar* (female)

42. Flowers large and showy (at least 1.5 cm diam.)

Bombax, *Cananga*, *Delonix*, *Dillenia*, *Gmelina*, *Markhamia*, *Mesua*, *Michelia*, *Oroxylum*, *Senna*

43. Ovary inferior

Altingia, *Anisoptera*, *Anogeissus*, *Betula*, *Castanea*, *Castanopsis*, *Lagerstroemia*, *Liquidambar*, *Pyrus*, *Syzygium*, *Terminalia*, *Tetrameles*

44. Ovary superior

Acrocarpus, Adenanthera, Afzelia, Aglaia, Albizia, Aleurites, Alstonia, Aquilaria, Archidendron, Baccaurea, Berrya, Bischofia, Bombax, Broussonetia, Caesalpinia, Cananga, Canarium, Cassia, Chisocheton, Choerospondias, Chukrasia, Cinnamomum, Dalbergia, Delonix, Dialium, Dillenia, Diospyros, Dipterocarpus, Dracontomelon, Duabanga, Eberhardtia, Endospermum, Erythrina, Fagraea, Gmelina, Hopea, Horsfieldia, Irvingia, Knema, Lagerstroemia, Madhuca, Markhamia, Mesua, Michelia, Oroxylum, Parashorea, Parkia, Peltophorum, Pithecellobium, Polyalthia, Pterocarpus, Pterospermum, Samanea, Sapindus, Schima, Senna, Shorea, Sindora, Tamarindus, Tectona, Vatica, Wrightia, Xylia, Xylopia

45. Fruits compound

Broussonetia

46. Fruits dehiscent

Acrocarpus, Adenanthera, Afzelia, Aglaia, Albizia, Alstonia, Altingia, Aquilaria, Archidendron, Berrya, Bombax, Caesalpinia, Chisocheton, Chukrasia, Delonix, Eberhardtia, Erythrina, Horsfieldia, Knema, Lagerstroemia, Liquidambar, Markhamia, Mesua, Oroxylum, Peltophorum, Pithecellobium, Pterospermum, Schima, Sindora, Tetrameles, Wrightia, Xylia

47. Fruits indehiscent

Anisoptera, Anogeissus, Cananga, Cassia, Choerospondias, Dalbergia, Dialium, Dillenia, Dipterocarpus, Dracontomelon, Gmelina, Hopea, Parashorea, Parkia, Polyalthia, Pterocarpus, Samanea, Senna, Shorea, Tamarindus, Tectona grandis, Terminalia, Vatica, Xylopia p.p.

48. Fruit with wing(s)

Anisoptera, Anogeissus, Betula, Dipterocarpus, Hopea, Parashorea, Pterocarpus, Shorea, Terminalia, Vatica

49. Fruit a berry

Baccaurea, Diospyros, Duabanga, Madhuca, Pyrus, Syzygium

50. Fruit a cone

Cupressus, Dacrycarpus, Dacrydium, Fokienia, Keteleeria, Nageia, Pinus, Podocarpus

51. Fruit a drupe

Aleurites, Baccaurea, Bischofia, Cananga, Canarium, Choerospondias, Cinnamomum, Dracontomelon, Endospermum, Fagraea, Gmelina, Irvingia, Polyalthia, Sapindus, Tectona grandis, Xylopia

52. Fruit a nut

Anisoptera, Betula, Castanea, Castanopsis, Dipterocarpus, Hopea, Parashorea, Shorea p.p., Vatica p.p.

53. Fruit a capsule

Aglaia, Alstonia, Altingia, Aquilaria, Berrya, Bombax, Chisocheton, Chukrasia, Eberhardtia, Horsfieldia, Knema, Lagerstroemia, Liquidambar, Mesua, Pterospermum, Schima, Tetrameles, Wrightia

54. Fruit a pod

Acrocarpus, Adenanthera, Afzelia, Albizia, Alstonia, Archidendron, Bombax, Caesalpinia, Cassia, Dalbergia, Delonix, Dialium, Erythrina, Markhamia, Oroxy- lum, Parkia, Peltophorum, Pithecellobium, Pterocarpus, Samanea, Senna, Sindora, Tamarindus, Wrightia, Xylia

55. Seeds winged

Chukrasia, Keteleeria, Lagerstroemia, Markhamia, Oroxyllum, Pinus, Pterosper- mum, Schima

KEYS

1. KEYS TO THE GROUPS

- 1a. Secondary wood without true vessels, ovules born on the surface of open carpels or scales, usually naked **A. Gymnosperms**
- b. Secondary wood with true vessels, ovules surrounded by carpels, forming a closed chamber **B. Angiosperms**
- 2a. Leaves compound **Group 1**
- b. Leaves simple 3
- 3a. Leaves opposite, rarely subopposite or whorled **Group 2**
- b. Leaves spirally arranged or alternate 4
- 4a. Stipules absent **Group 3**
- b. Stipules present **Group 4**

2. KEYS TO THE FAMILIES

A. GYMNOSPERMS

- 1a. Sap absent, if present not resinous. Leaves solitary 2
- b. Resin present. Leaves solitary, paired or tufted. — Pollen sacs 2. Female bracts in a spiral, seeds usually winged **Pinaceae**
- 2a. Leaves usually scale-like, decussate or whorled. Pollen sacs usually 3 or more, rarely 2. Mature female cones with 2–15 seeds. Seeds not winged or with 1–3 wings **Cupressaceae**
- b. Leaves needle-, scale-, or leaf-like, usually spirally arranged, alternate or opposite. Pollen sacs 2. Mature female cone with only 1 seed. Seeds not winged **Podocarpaceae**

B. ANGIOSPERMS

Group 1: Leaves compound

- 1a. Leaves opposite 2
- b. Leaves spirally arranged or alternate 3
- 2a. Leaves pinnate, bipinnate, or tripinnate. Fruit pod-like **Bignoniaceae**
- b. Leaves trifoliolate or palmate. Fruit a drupe or capsule **Verbenaceae**
- 3a. Stipules absent, rarely present 4
- b. Stipules present 7
- 4a. Sap present, living parts usually with aromatic or turpentine smell 5
- b. Sap usually absent, rarely present, living parts without smell 6
- 5a. Sap black when exposed to the air. Stipules absent. Living parts with turpentine smell **Anacardiaceae**
- b. Sap usually white or watery, rarely black. Stipules present or absent. Living parts usually with aromatic, resinous smell **Burseraceae**
- 6a. Bark usually smooth. True stipules absent but pseudostipules sometimes present. Stamens free. Seeds completely or partially covered by an aril . . . **Sapindaceae**
- b. Bark smooth, fissured, scaly or flaky. Stipules absent. Stamens usually partly or completely united into a tube or globose head. Seeds winged or covered by an aril **Meliaceae**
- 7a. Leaves trifoliolate, palmate, or digitate. Fruit a capsule 8
- b. Leaves usually pinnate or bipinnate. Fruit a pod 9
- 8a. Bark usually with sharp conical thorns. Sap absent. Leaves scaly. Flowers large and showy. Fruit an elliptic capsule, splitting in 5 parts **Bombacaceae** (*Bombax*)
- b. Thorns absent. Sap red. Leaves with simple hairs. Fruit a globose capsule, splitting in 3 parts **Euphorbiaceae** (*Bischofia*)
- 9a. Leaves usually pinnate, rarely bipinnate or digitate, usually without glands on the rachis. Flowers often irregular, rarely regular, usually in racemes, panicles or pseudoracemes 10
- b. Leaves usually bipinnate, often with glands on the rachis. Flowers regular, in globose heads or spikes, rarely racemously arranged **Mimosaceae**
- 10a. Flowers mostly irregular (pea-flower shaped), stamens usually 10, all united in a tube or in 2 groups (1+9) or (5+5), sometimes free **Fabaceae**
- b. Flowers regular or irregular. Stamens 10, or fewer sometimes 1, free, rarely united at the base **Caesalpinaceae**

Group 2: Leaves simple: opposite, rarely subopposite or whorled

- 1a. Stipules present 2
- b. Stipules absent 3
- 2a. Twigs angular. Flowers large and showy, sepals connate into tube, leathery. Fruit indehiscent resting on the calyx tube **Sonneratiaceae** (*Duabanga*)
- b. Twigs terete. Flowers usually not large and showy, sepals united or free. Fruit indehiscent or dehiscent, calyx not persistent **Loganiaceae** (*Fagraea*)
- 3a. Sap present 4
- b. Sap absent 5