ORDERS AND FAMILIES OF SEED PLANTS OF CHINA

This page is intentionally left blank

ORDERS AND FAMILIES OF SEED PLANTS OF CHINA

Hsuan Keng

Department of Botany
National University of Singapore

De-Yuan Hong

Institute of Botany
Academia Sinica, Beijing

Chia-Jui Chen

Institute of Botany
Academia Sinica, Beijing

World Scientific

Singapore • New Jersey • London • Hong Kong

Published by

World Scientific Publishing Co. Pte. Ltd.

P O Box 128, Farrer Road, Singapore 9128

USA office: Suite 1B, 1060 Main Street, River Edge, NJ 07661

UK office: 73 Lynton Mead, Totteridge, London N20 8DH

ORDERS AND FAMILIES OF SEED PLANTS OF CHINA

Copyright © 1993 by World Scientific Publishing Co. Pte. Ltd.

All rights reserved. This book, or parts thereof, may not be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage and retrieval system now known or to be invented, without written permission from the Publisher.

For photocopying of material in this volume, please pay a copying fee through the Copyright Clearance Center, Inc., 27 Congress Street, Salem, MA 01970, USA.

ISBN 981-02-1481-2

Printed in Singapore.

CONTENTS

Introduction	xiii
Some Aspects of the Flora of China	xv
List of Illustrations	xvii
The Seed Plants (Division Spermatophyta)	1
Gymnosperms (Subdivision 1. Gymnospermae)	2
ORDER 1. CYCADALES	3
1.1 Cycadaceae	3
ORDER 2. GINKGOALES	3
2.1 Ginkgoaceae	6
ORDER 3. CONIFERAE	6
3.1 Taxaceae	7
3.2 Cephalotaxaceae	7
3.3 Podocarpaceae	10
Araucariaceae	6
3.4 Pinaceae	10
3.5 Taxodiaceae	13
3.6 Cupressaceae	16
ORDER 4. GNETALES	16
4.1 Ephedraceae	17
4.2 Gnetaceae	17
Angiosperms (Subdivision 2. Angiospermae)	20
Dictoyledons (Class 1. Dicotyledoneae)	21
ORDER VERTICILLATAE	27
Casuarinaceae	27
ORDER 5. PIPERALES	21
5.1 Saururaceae	21
5.2 Piperaceae	24
5.3 Chloranthaceae	24
ORDER 6. SALICALES	24
6.1 Salicaceae	27
ORDER 7. MYRICALES	27
7.1 Myricaceae	28
ORDER 8. JUGLANDALES	30
8.1 Juglandaceae	30
ORDER 9. FAGALES	30
9.1 Betulaceae	30
9.2 Fagaceae	33
ORDER 10. URTICALES	35
10.1 Ulmaceae	35
10.2 Rhoipteleaceae	37
10.3 Moraceae	37
10.4 Urticaceae	39
ORDER 11. PODOSTEMALES	41
11.1 Podostemaceae	41
ORDER 12. PROTEALES	41
12.1 Proteaceae	43

ORDER 13. SANTALALES	43
13.1 Olacaceae	43
13.2 Opiliaceae	44
13.3 Santalaceae	44
13.4 Loranthaceae	45
ORDER 14. ARISTOLOCHIALES	45
14.1 Aristolochiaceae	46
14.2 Rafflesiaceae	46
ORDER 15. BALANOPHORALES	48
15.1 Balanophoraceae	48
ORDER 16. POLYGONALES.....	48
16.1 Polygonaceae	50
ORDER 17. CENTROSPERMAE	50
17.1 Chenopodiaceae	51
17.2 Amaranthaceae	52
17.3 Nyctaginaceae	53
17.4 Phytolaccaceae	53
17.5 Aizoaceae	53
17.6 Portulacaceae	55
17.7 Basellaceae	55
17.8 Caryophyllaceae	56
ORDER 18. RANALES	58
18.1 Nymphaeaceae	59
18.2 Ceratophyllaceae	60
18.3 Trochodendraceae	60
18.4 Cercidiphyllaceae	61
18.5 Ranunculaceae	61
18.6 Lardizabalaceae	68
18.7 Berberidaceae	68
18.8 Menispermaceae	71
18.9 Magnoliaceae	72
18.10 Calycanthaceae	78
18.11 Annonaceae	78
18.12 Myristicaceae	80
18.13 Lauraceae	80
18.14 Hernandiaceae	83
ORDER 19. RHOEADALES.....	83
19.1 Papaveraceae	84
19.2 Capparidaceae	87
19.3 Cruciferae	87
19.4 Resedaceae	90
Moringaceae	83
19.5 Bretschneideraceae	90
ORDER 20. SARRACENIALES	90
20.1 Nepenthaceae	90
20.2 Droseraceae	93

ORDER 21. ROSALES	93
21.1 Crassulaceae	95
21.2 Saxifragaceae	96
21.3 Pittosporaceae	100
21.4 Hamamelidaceae	100
21.5 Eucommiaceae	102
Platanaceae	93
21.6 Rosaceae	102
21.7 Connaraceae	106
21.8 Leguminosae	107
ORDER 22. GERANIALES	115
22.1 Oxalidaceae	116
22.2 Geraniaceae	116
Tropaeolaceae	115
22.3 Linaceae	116
22.4 Erythroxylaceae	116
22.5 Zygophyllaceae	119
22.6 Rutaceae	119
22.7 Simaroubaceae	124
22.8 Burseraceae	124
22.9 Meliaceae	126
22.10 Malpighiaceae	127
22.11 Polygalaceae	127
22.12 Dichapetalaceae	128
22.13 Euphorbiaceae	128
22.14 Daphniphyllaceae	131
22.15 Callitrichaceae	132
ORDER 23. SAPINDALES	132
23.1 Buxaceae	133
23.2 Empetraceae	134
23.3 Coriariaceae	134
23.4 Anacardiaceae	134
23.5 Pentaphylacaceae	138
23.6 Aquifoliaceae	138
23.7 Celastraceae	139
23.8 Hippocrateaceae	142
23.9 Salvadoraceae	142
23.10 Staphyleaceae	142
23.11 Icacinaceae	144
23.12 Aceraceae	144
23.13 Hippocastanaceae	145
23.14 Sapindaceae	145
23.15 Sabiaceae	148
23.16 Balsaminaceae	148
ORDER 24. RHAMNALES	151
24.1 Rhamnaceae	151
24.2 Vitaceae	153

ORDER 25. MALVALES	155
25.1 Elaeocarpaceae	155
25.2 Tiliaceae	158
25.3 Malvaceae	158
25.4 Bombacaceae	159
25.5 Sterculiaceae	159
ORDER 26. PARIETALES	163
26.1 Dilleniaceae	164
26.2 Actinidiaceae	166
26.3 Ochnaceae	166
26.4 Theaceae	168
26.5 Guttiferae	168
26.6 Dipterocarpaceae	171
26.7 Elatinaceae	172
26.8 Frankeniaceae	172
26.9 Tamaricaceae	172
26.10 Cistaceae	175
Bixaceae	163
26.11 Violaceae	175
26.12 Flacourtiaceae	175
26.13 Stachyuraceae	176
26.14 Passifloraceae	176
Caricaceae	163
26.15 Datisceae	179
26.16 Begoniaceae	179
26.17 Ancistrocladaceae	179
ORDER OPUNTIALES	163
Cactaceae	163
ORDER 27. MYRTIFLORAE	179
27.1 Thymelaeaceae	183
27.2 Elaeagnaceae	186
27.3 Lythraceae	186
27.4 Sonneratiaceae	187
27.5 Crypteroniaceae	187
Punicaceae	182
27.6 Lecythidaceae	187
27.7 Rhizophoraceae	187
27.8 Nyssaceae	189
27.9 Alangiaceae	191
27.10 Combretaceae	191
27.11 Myrtaceae	191
27.12 Melastomataceae	192
27.13 Trapaceae	194
27.14 Onagraceae	195
27.15 Haloragaceae	195
27.16 Hippuridaceae	195
27.17 Theligonaceae	197

27.18	Cynomoriaceae	197
ORDER 28.	UMBELLIFLORAE	197
28.1	Araliaceae	197
28.2	Umbelliferae	200
28.3	Cornaceae	204
ORDER 29.	DIAPENSIALES	206
29.1	Diapensiaceae	206
ORDER 30.	ERICALES	206
30.1	Clethraceae	208
30.2	Pyrolaceae	208
30.3	Ericaceae	208
ORDER 31.	PRIMULALES	214
31.1	Myrsinaceae	214
31.2	Primulaceae	217
ORDER 32.	PLUMBAGINALES	218
32.1	Plumbaginaceae	218
ORDER 33.	EBENALES	218
33.1	Sapotaceae	220
33.2	Ebenaceae	220
33.3	Symplocaceae	222
33.4	Styracaceae	222
ORDER 34.	CONTORTAE	225
34.1	Oleaceae	225
34.2	Loganiaceae	227
34.3	Gentianaceae	227
34.4	Apocynaceae	230
24.5	Asclepiadaceae	234
ORDER 35.	TUBIFLORAE	236
35.1	Convolvulaceae	238
35.2	Polemoniaceae	240
35.3	Hydrophyllaceae	240
35.4	Boraginaceae	242
35.5	Verbenaceae	244
35.6	Labiatae	246
35.7	Solanaceae	252
35.8	Scrophulariaceae	254
35.9	Bignoniaceae	258
35.10	Pedaliaceae	259
	Martyniaceae	262
35.11	Orobanchaceae	262
35.12	Gesneriaceae	262
35.13	Lentibulariaceae	266
35.14	Acanthaceae	267
36.15	Myoporaceae	269
35.16	Phrymataceae	271
ORDER 36.	PLANTAGINALES	271
36.1	Plantaginaceae	271

ORDER 37. RUBIALES	271
37.1 Rubiaceae	273
37.2 Caprifoliaceae	275
37.3 Adoxaceae	277
37.4 Valerianaceae	280
37.5 Dipsacaceae	280
ORDER 38. CUCURBITALES.....	283
38.1 Cucurbitaceae	283
ORDER 39. CAMPANULALES.....	285
39.1 Campanulaceae	286
39.2 Goodeniaceae	288
39.3 Stylidiaceae	288
39.4 Compositae	288
Monocotyledons (Class 2. Monocotyledoneae)	300
ORDER 40. PANDANALES.....	300
40.1 Typhaceae	300
40.2 Pandanaceae	300
40.3 Sparganiaceae	303
ORDER 41. HELOBIAE	303
41.1 Aponogetonaceae	305
41.2 Potamogetonaceae	305
41.3 Najadaceae	305
41.4 Juncaginaceae	307
41.5 Alismataceae	307
41.6 Butomaceae	307
41.7 Hydrocharitaceae	309
ORDER 42. TRIURIDALES.....	309
42.1 Triuridaceae	309
ORDER 43. GLUMIFLORAE.....	311
43.1 Gramineae	311
43.2 Cyperaceae	321
ORDER 44. PRINCIPES	324
44.1 Palmae	324
ORDER SYNANTHAE	324
Cyclanthaceae	324
ORDER 45. SPATHIFLORAE.....	325
45.1 Araceae	325
45.2 Lemnaceae	328
ORDER 46. FARINOSAE	330
46.1 Flagellariaceae	331
46.2 Restionaceae	331
46.3 Centrolepidaceae	331
46.4 Xyridaceae	331
46.5 Eriocaulaceae	335
Bromeliaceae	330
46.6 Commelinaceae	335
46.7 Pontederiaceae	338

46.8	Philydraceae	338
ORDER 47.	LILIFLORAE	342
47.1	Juncaceae	342
47.2	Stemonaceae	345
47.3	Liliaceae	345
47.4	Amaryllidaceae	350
47.5	Taccaceae	350
47.6	Dioscoreaceae	353
47.7	Iridaceae	353
ORDER 48.	SCITAMINEAE	355
48.1	Musaceae	355
48.2	Zingiberaceae	356
	Cannaceae	355
48.3	Marantaceae	358
ORDER 49.	MICROSPERMAE	358
49.1	Burmanniaceae	359
49.2	Orchidaceae	359

APPENDIX I.	Outline of Classification of Angiosperms or Magnoliophyta, based on A. Cronquist, 1988.	367
APPENDIX II.	Key to the families.	375
INDEX		421

This page is intentionally left blank

INTRODUCTION

The present volume is an enlarged and improved version of a previously published book on the seed plants of Taiwan (Keng 1987). It is an attempt to give a concise account of the orders and families of seed plants which are native to China. For the arrangement and circumscription of these orders and families, we followed closely the plan of *Flora Reipublicae Popularis Sinicae* (in progress) which in turn, was largely based on the 11th edition of Engler's *Syllabus* (1936).

Within each order, a list of the native families, a brief account of the diagnostic characters and a key to these families, if more than one, are presented. And within each family, there are also a simple description of the family and, in most cases, a synoptic key to all the native genera. Families and genera which are endemic to China, and plants of special interest or of significant importance are generally mentioned. Many major taxonomic changes in modern systems such as regrouping or transposition of some families or genera are often briefly noted.

For the keys to genera, especially those in the larger families, we followed those that appeared in Anonymous' *Claves* (1979). In general, these keys have been much condensed and simplified into synoptic forms and some modifications have been made. For this we are deeply indebted to the contributors and editors of the *Claves*, without those superbly constructed dichotomous keys, the present work would be much more difficult to compile. The reduction of a small number of genera listed in the *Claves* into synonyms is largely based on Willis (1973), How (1982) or Mabberley (1987).

The sequence and delimitation of orders and families of Gymnosperms are maintained with minimal changes in modern classification systems. Those of Angiosperms, however, have been significantly altered during the past few decades. For comparison, an outline of classification of Angiosperms or Magnoliophyta adapted from Cronquist's system (1988) is chosen as an example and presented in Appendix I. A lengthy key to the families of Chinese seed plants largely adapted from the *Claves* (1979) is presented in Appendix II at the end of this volume.

The authors wish to express their gratitude to Professor Wu Chen-yih (吳征鎰) for reading the entire manuscript and making numerous useful suggestions, and to Profs. Wang Fu-hsiung (王伏雄), Chen Feng-hua (陳封懷) and Lin Ying (林英) for their encouragement. Thanks also due to Profs. Chen Sing-chi (陳心啓), Chen Shou-liang (陳守良), Chen Yi-lin (陳藝林), Fu Li-guo (傅立國), Goh Chong-Jin (吳宗仁), Hew Choy-sin (丘才新), Hou Ding (侯定), Law Yuh-wu (劉玉登), Liu Liang (劉亮), Lo Hsien-shui (羅獻瑞), Lu An-ming (路安民), Lu Ling-ti (陸玲娣), She Mong-lan (余孟蘭), Wang Wen-tsia (王文采), Yang Han-pi (楊漢碧) and many others who either read part of the manuscript or extended their help in various ways.

Illustrations of over 160 species are mostly reproduced from the 5-volumed Anonymous' *Iconographia* (1972-76), a few others from *Flora Reipublicae*

Popularis Sinicae and *Flora Yunnanica*. The artists whose skilful drawings appeared in this book include, among others, Milles. Zhang Tai-li (張泰莉) (her colour drawing of *Ginkgo* is reproduced on the cover of this book), Wang Jin-feng (王金鳳), Cai Shu-qin (蔡淑琴), Messrs. Feng Jing-yong (馮晉鏞), Liu Chung-rong (劉春榮), Wu Zhang-hua (吳彰樺), Ji Chao-ding (冀朝鼎), Zhang Chung-fang (張春芳). Madam Sally Soh typed the entire manuscript; Mrs. Ro-siu Keng went through the text and corrected numerous errors and misspellings especially amongst the generic names; finally, Ms. Jennifer Gan, the editor of World Scientific Publishing Co. offered useful technical advice and assistance. To all of them, the authors wish to express their sincere thanks.

References

Anonymous (1972-76)

Iconographia Cormophytorum Sinicorum (中國高等植物圖鑑). 5 vols. edited by the Botanical Institute, Academia Sinica. Beijing: Science Press.

Anonymous (1979)

Claves Familiarum Generumque Cormophytorum Sinicorum (中國高等植物科屬檢索表) edited by the Botanical Institute, Academia Sinica. Beijing: Science Press.

Cronquist, A. (1988)

The Evolution and Classification of Flowering Plants. 2nd. ed. N.Y.: New York Botanical Garden.

Engler, A. (1936)

Syllabus der Pflanzenfamilien. 11th ed. revised by L. Diels. Berlin: Gebrueder Borntraeger.

How, F. C. (1982)

A dictionary of the families and genera of Chinese Seed Plants (中國種子植物科屬詞典). 2nd ed. revised by T. L. Wu et al. Beijing: Science Press.

Keng, H. (1987)

Orders and Families of seed plants of Taiwan. Taipei: Council of Agriculture.

Mabberley, D. J. (1987)

The Plant Book -- A portable dictionary of the higher plants. Cambridge University Press.

Willis, J. C. (1973)

A Dictionary of the Flowering Plants and Ferns. 8th ed., revised by H. K. Airy Shaw. Cambridge University Press.

Some Aspects of the Flora of China

1. Number of families, genera and species of Seed Plants native to China.

	Family		Genera	Species
Gymnosperms	10		34	192
Angiosperms	E	C		
Dicotyledons	179	205	2,190	c.21,902
Monocotyledons	36	45	613	c. 4,660
Total	225	260	2,837	c.26,754

(E = Engler's system, 1936. C = Cronquist's system, 1988)

2. Some of the larger families

- a. Families with about 1,000 native species and above:
 - Compositae 230 genera and c.2,800 species
 - Leguminosae 130 gen. and c.1,450 spp.
 - Gramineae 225 gen. and c.1,300 spp.
 - Orchidaceae 166 gen. and c.1,200 spp.
 - Rosaceae 500 gen. and c.1,000 spp.
- b. Families with about 500-900 native species:
 - Labiatae 99 genera and c.800 species.
 - Cyperaceae 31 gen. and c.750 spp.
 - Ranunculaceae 40 gen. and c.720 spp.
 - Ericaceae 16 gen. and c.700 spp.
 - Liliaceae 54 gen. and c.620 spp.
 - Scrophulariaceae 60 gen. and c.600 spp.
 - Umbelliferae 95 gen. and c.525 spp.
 - Saxifragaceae 28 gen. and c.500 spp.
 - Primulaceae 11 gen. and c.500 spp.

3. Families endemic to China.

Ginkgoaceae
 Bretschneideraceae
 Eucommiaceae

4. Number of genera endemic to China.

About 145 genera (Gymnosperms 8, Dicots 122, Monocots 15)
 or 0.05 per cent are endemic.

This page is intentionally left blank

List of Illustrations

Cover		<i>Ginkgo biloba</i> L. (by Ms Zhang Tai-li)
Fig. 1	1.1	<i>Cycas revoluta</i> Thunb. (1-6) and <i>C. szechuanensis</i> Cheng et L. K. Fu (7-8) (Cycadaceae)
Fig. 2	2.1	<i>Ginkgo biloba</i> L. (Ginkgoaceae)
Fig. 3	3.1	<i>Amentotaxus yunnanensis</i> Li (Taxaceae)
Fig. 4	3.2	<i>Cephalotaxus hainanensis</i> Li (1) and <i>C. sinensis</i> Li (2) (Cephalotaxaceae)
Fig. 5	3.3	<i>Podocarpus nagi</i> Zoll. et Mor. (Podocarpaceae)
Fig. 6	3.4	<i>Cathaya argyrophylla</i> Chun et Kuang (Pinaceae)
Fig. 7	3.5	<i>Metasequoia glyptostroboides</i> Hu et Cheng (Taxodiaceae)
Fig. 8	3.6	<i>Juniperus chinensis</i> L. (Cupressaceae)
Fig. 9	4.1	<i>Ephedra sinica</i> Stapf. (Ephedraceae)
Fig. 10	4.2	<i>Gnetum cleistostachyum</i> C. Y. Cheng (1-3) and <i>G. pendulum</i> C. Y. Cheng (4-5) (Gnetaceae)
Fig. 11	5.1	<i>Houttuynia cordata</i> Thunb. (Saururaceae)
Fig. 12	5.2	<i>Piper hainanense</i> Hemsl. (Piperaceae)
Fig. 13	5.3	<i>Chloranthus spicatus</i> Makino (Chloranthaceae)
Fig. 14	6.1	<i>Populus alba</i> L. (Salicaceae)
Fig. 15	8.1	<i>Juglans cathayensis</i> Dode (Juglandaceae)
Fig. 16	9.1a	<i>Betula albo-sinensis</i> Burck. (Betulaceae)
Fig. 17	9.1b	<i>Corylus heterophylla</i> Fisch. ex Bess. (Betulaceae)
Fig. 18	9.2	<i>Fagus longipetiolata</i> Seem. (Fagaceae)
Fig. 19	10.1	<i>Ulmus parvifolia</i> Jacq. (Ulmaceae)
Fig. 20	10.2	<i>Rhoiptelea chiliantha</i> Diels et Hand. -Mazz. (Rhoipteleaceae)
Fig. 21	10.3	<i>Humulus scandens</i> Merr. (Moraceae)
Fig. 22	10.4	<i>Boehmeria nivea</i> Gaud. (Urticaceae)
Fig. 23	14.1	<i>Aristolochia debilis</i> Sieb. et Zucc. (Aristolochiaceae)
Fig. 24	15.1	<i>Balanophora japonica</i> Makino (Balanophoraceae)
Fig. 25	17.4	<i>Phytolacca acinosa</i> Roxb. (Phytolaccaceae)
Fig. 26	17.8	<i>Dianthus chinensis</i> L. (Caryophyllaceae)
Fig. 27	18.3a	<i>Euptelea pleiospermum</i> Hook. f. et Thoms. (Trochodendraceae)
Fig. 28	18.3b	<i>Trochodendron aralioides</i> Sieb. et Zucc. (Trochodendraceae)
Fig. 29	18.4	<i>Cercidiphyllum japonicum</i> Sieb. et Zucc. var. <i>sinense</i> Rehd. et Wils. (Cercidiphyllaceae)
Fig. 30	18.5a	<i>Kingdonia uniflora</i> Balf. f. et W. W. Sm. (Ranunculaceae)
Fig. 31	18.5b	<i>Paeonia papaveracea</i> Andr. (Ranunculaceae)
Fig. 32	18.6	<i>Sargentodoxa cuneata</i> (Oliv.) Rehd. et Wils. (Lardizabalaceae)
Fig. 33	18.7	<i>Dysosma versipellis</i> (Hance) M. Cheng (Berberidaceae)
Fig. 34	18.9a	<i>Liriodendron chinense</i> (Hemsl.) Sarg. (Magnoliaceae)
Fig. 35	18.9b	<i>Magnolia officinalis</i> Rehd. et Wils. (Magnoliaceae)
Fig. 36	18.9c	<i>Tetracentron sinense</i> Oliv. (Magnoliaceae)
Fig. 37	18.10	<i>Calycanthus chinensis</i> Cheng et S. Y. Chang (Calycanthaceae)
Fig. 38	18.11	<i>Mitrephora thorelii</i> Pierre (Annonaceae)
Fig. 39	18.13	<i>Sassafras tzumu</i> Hemsl. (Lauraceae)

- Fig. 40 19.1a *Corydalis yanhusuo* W. T. Wang (Papaveraceae)
Fig. 41 19.1b *Papaver nudicaule* L. (Papaveraceae)
Fig. 42 19.4 *Oligomeris linifolia* Machride (Resedaceae)
Fig. 43 19.5 *Bretschneidera sinensis* Hemsl. (Bretschneideraceae)
Fig. 44 20.1 *Nepenthes mirabilis* Druce (Nepenthaceae)
Fig. 45 21.2a *Deutzia grandiflora* Bge. (Saxifragaceae)
Fig. 46 21.2b *Oresitrophe rupifraga* Bge. (Saxifragaceae)
Fig. 47 21.4 *Corylopsis sinensis* Hemsl. (Hamamelidaceae)
Fig. 48 21.5 *Eucommia ulmoides* Oliv. (Eucommiaceae)
Fig. 49 21.6 *Crataegus pinnatifida* Bge. (Rosaceae)
Fig. 50 21.8a *Caesalpinia sepiaria* Roxb. (Leguminosae)
Fig. 51 21.8b *Astragalus mongholicus* Bge. (Leguminosae)
Fig. 52 22.2 *Geranium delavayi* Franch. (Geraniaceae)
Fig. 53 22.5 *Peganum nigellastrum* Bge. (Zygophyllaceae)
Fig. 54 22.6a *Zanthoxylum planispinum* Sieb. et Zucc. (Rutaceae)
Fig. 55 22.6b *Phellodendron amurense* Rupr. (Rutaceae)
Fig. 56 22.7 *Ailanthus altissima* Swingle (Simaroubaceae)
Fig. 57 22.13 *Euphorbia helioscopia* L. (Euphorbiaceae)
Fig. 58 23.1 *Buxus microphylla* Sieb. et Zucc. var. *sinica* Rehd. et Wils. (Buxaceae)
Fig. 59 23.3 *Coriaria sinica* Maxim. (Coriariaceae)
Fig. 60 23.4 *Rhus verniciflua* Stokes (Anacardiaceae)
Fig. 61 23.6 *Ilex chinensis* Sims (Aquifoliaceae)
Fig. 62 23.7 *Celastrus paniculatus* Willd. (Celastraceae)
Fig. 63 23.10 *Tapiscia sinensis* Oliv. (Staphyleaceae)
Fig. 64 23.12 *Acer oliverianum* Pax (Aceraceae)
Fig. 65 23.13 *Aesculus wilsonii* Rehd. (Hippocastanaceae)
Fig. 66 23.14 *Koelreuteria paniculata* Laxm. (Sapindaceae)
Fig. 67 23.15 *Meliosma cuneifolia* Franch. (Sabiaceae)
Fig. 68 23.16 *Impatiens furcillata* Hemsl. (Balsaminaceae)
Fig. 69 24.2 *Vitis amurensis* Rupr. (Vitaceae)
Fig. 70 25.1 *Elaeocarpus decipiens* Hemsl. (Elaeocarpaceae)
Fig. 71 25.2 *Tilia henryana* Szyszyl. var. *subglabra* V. Engl. (Tiliaceae)
Fig. 72 25.3 *Abelmoschus manihot* Medic. (Malvaceae)
Fig. 73 25.5 *Heritiera littoralis* Dryand. (Sterculiaceae)
Fig. 74 26.1 *Dillenia turbinata* Finet et Gagnep. (Dilleniaceae)
Fig. 75 26.2 *Actinidia latifolia* Merr. (Actinidiaceae)
Fig. 76 26.4 *Camellia hongkongensis* Seem. (Theaceae)
Fig. 77 26.5 *Hypericum delavayi* Franch. (Guttiferae)
Fig. 78 26.6 *Hopea hainanensis* Merr. et Chun (Dipterocarpaceae)
Fig. 79 26.9 *Tamarix juniperina* Bge. (Tamaricaceae)
Fig. 80 26.12 *Idesia polycarpa* Maxim. (Flacourtiaceae)
Fig. 81 26.13 *Stachyurus yunnanensis* Franch. (Stachyuraceae)
Fig. 82 26.15 *Tetrameles nudiflora* R. Br. (Datiaceae)
Fig. 83 26.16 *Begonia pedatifida* Levl. (Begoniaceae)
Fig. 84 27.1 *Daphne tangutica* Maxim. (Thymelaeaceae)
Fig. 85 27.2 *Elaeagnus lanceolata* Warb. (Elaeagnaceae)
Fig. 86 27.4 *Sonneratia caseolaris* Engl. (Sonneratiaceae)

Fig. 87	27.8	<i>Davidia involucrata</i> Baill. (Nyssaceae)
Fig. 88	27.12	<i>Melastoma dodecandrum</i> Lour. (Melastomataceae)
Fig. 89	27.14	<i>Epilobium amurense</i> Hausskn. (Onagraceae)
Fig. 90	28.1	<i>Panax schinseng</i> Nees. (Araliaceae)
Fig. 91	28.2	<i>Daucus carota</i> L. (Umbelliferae)
Fig. 92	28.3	<i>Cornus macrophylla</i> Wall. (Cornaceae)
Fig. 93	29.1	<i>Shortia sinensis</i> Hemsl. (Diapensiaceae)
Fig. 94	30.1	<i>Clethra cavaleriei</i> Levl. (Clethraceae)
Fig. 95	30.2	<i>Cheilotheca humilis</i> (D. Don) H. Keng (<i>Monotropastrum macrocarpum</i> H. Andres) (Pyrolaceae)
Fig. 96	30.3a	<i>Rhododendron taggianum</i> Hutch. (Ericaceae)
Fig. 97	30.3b	<i>Vaccinium retusum</i> Hook. f. (Ericaceae)
Fig. 98	31.1	<i>Ardisia virens</i> Kurz (Myrsinaceae)
Fig. 99	31.2	<i>Trientalis europaea</i> L. (Primulaceae)
Fig. 100	32.1	<i>Ceratostigma griffithii</i> Clarke (Plumbaginaceae)
Fig. 101	33.2	<i>Diospyros diversilimba</i> Merr. et Chun (Ebenaceae)
Fig. 102	33.4a	<i>Meliiodendron xylocarpum</i> Hand. -Mazz. (Styracaceae)
Fig. 103	33.4b	<i>Parastyrax macrophylla</i> C. Y. Wu et K. M. Feng (Styracaceae)
Fig. 104	34.1	<i>Syringa sweginzowii</i> Kohne et Lingelsh (Oleaceae)
Fig. 105	34.2	<i>Buddleja davidii</i> Franch. (Loganiaceae)
Fig. 106	34.3a	<i>Gentiana davidii</i> Franch. (Gentianaceae)
Fig. 107	34.3b	<i>Nymphoides indica</i> O. Ktze. (Gentianaceae)
Fig. 108	35.1	<i>Calystegia sepium</i> R. Br. (Convolvulaceae)
Fig. 109	35.2	<i>Polemonium laxiflorum</i> Kitam. (Polemoniaceae)
Fig. 110	35.4	<i>Bothriospermum chinense</i> Bge. (Boraginaceae)
Fig. 111	35.6	<i>Lamium barbatum</i> Sieb. et Zucc. (Labiatae)
Fig. 112	35.7	<i>Leucophysalis sinicum</i> (Kuang et Lu) Averett (<i>Physaliastrum sinicum</i> Kuang et Lu) (Solanaceae)
Fig. 113	35.8a	<i>Paulownia tomentosa</i> (Thunb.) Steud. (Scrophulariaceae)
Fig. 114	35.8b	<i>Pedicularis decora</i> Franch. (Scrophulariaceae)
Fig. 115	35.9	<i>Catalpa bungei</i> C. A. Mey. (Bignoniaceae)
Fig. 116	35.10	<i>Sesamum indicum</i> L. (Pedaliaceae)
Fig. 117	35.11	<i>Boschniakia rossica</i> Fedtsch. et Flerov. (Orobanchaceae)
Fig. 118	35.12	<i>Didymocarpus stenanthos</i> Clarke (Gesneriaceae)
Fig. 119	35.14	<i>Pararuellia delavayana</i> (Baill.) E. Hossain (Acanthaceae)
Fig. 120	35.15	<i>Myoporum bontioides</i> A. Gray (Myoporaceae)
Fig. 121	36.1	<i>Plantago major</i> L. (Plantaginaceae)
Fig. 122	37.2a	<i>Kolkwitzia amabilis</i> Graebn. (Caprifoliaceae)
Fig. 123	37.2b	<i>Lonicera hypoglauca</i> Miq. (Caprifoliaceae)
Fig. 124	37.3	<i>Adoxa moschatellina</i> L. (Adoxaceae)
Fig. 125	37.4	<i>Patrinia angustifolia</i> Hemsl. (Valerianaceae)
Fig. 126	37.5	<i>Dipsacus japonicus</i> Miq. (Dipsacaceae)
Fig. 127	38.1	<i>Trichosanthes kirilowii</i> Maxim. (Cucurbitaceae)
Fig. 128	39.1	<i>Adenophora wawreana</i> A. Zahlbr. (Campanulaceae)
Fig. 129	39.4a	<i>Crepis crocea</i> Babcock (Compositae)
Fig. 130	39.4b	<i>Chrysanthemum indicum</i> L. (Compositae)
Fig. 131	40.1	<i>Typha orientalis</i> Presl (Typhaceae)

- Fig. 132 40.2 *Pandanus forceps* Mart. (Pandanaaceae)
 Fig. 133 40.3 *Sparganium simplex* Huds. (Sparganiaceae)
 Fig. 134 41.2 *Potamogeton distinctus* A. Benn. (Potamogetonaceae)
 Fig. 135 41.5 *Alisma orientalis* Juzep. (Alismataceae)
 Fig. 136 41.7 *Ottelia esquirolii* Dandy (Hydrocharitaceae)
 Fig. 137 43.1a *Bambusa sinospinosa* Maclure (Gramineae)
 Fig. 138 43.1b *Festuca modesta* Stued. (Gramineae)
 Fig. 139 43.1c *Hymenachne pseudointerrupta* C. Muell. (Gramineae)
 Fig. 140 43.2 *Carex stipata* Muhlenb. (Cyperaceae)
 Fig. 141 45.1a *Acorus calamus* L. (Araceae)
 Fig. 142 45.1b *Pinellia ternata* (Thunb.) Breitenb. (Araceae)
 Fig. 143 45.2 *Spirodela polyrrhiza* (L.) Schleid. (Lemnaceae)
 Fig. 144 46.1 *Flagellaria indica* L. (Flagellariaceae)
 Fig. 145 46.2 *Leptocarpus disjunctus* Mast. (Restionaceae)
 Fig. 146 46.3 *Centrolepis banksii* (R. Br.) R. et S. (Centrolepidaceae)
 Fig. 147 46.4 *Xyris indica* L. (Xyridaceae)
 Fig. 148 46.5 *Eriocaulon truncatum* Ham. (Eriocaulaceae)
 Fig. 149 46.4 *Murdannia keisak* (Hassk.) Hand.-Mazz. (Commelinaceae)
 Fig. 150 46.7 *Monochoria korsakowii* Regel et Maack (Pontederiaceae)
 Fig. 151 46.8 *Philydrum lanuginosum* Banks (Philydraceae)
 Fig. 152 47.1 *Juncus elatus* Franch. et Sav. (Juncaceae)
 Fig. 153 47.2 *Stemona tuberosa* Lour. (Stemonaceae)
 Fig. 154 47.3a *Lilium brownii* F. E. Br. var. *viridulum* Baker (Liliaceae)
 Fig. 155 47.3b *Veratrum nigrum* L. (Liliaceae)
 Fig. 156 47.4 *Lycoris aurea* Herb. (Amaryllidaceae)
 Fig. 157 47.5 *Tacca chantrieri* Andre (Taccaceae)
 Fig. 158 47.7 *Belamcanda chinensis* (L.) DC. (Iridaceae)
 Fig. 159 48.2 *Zingiber officinale* Rosc. (Zingiberaceae)
 Fig. 160 49.1 *Burmannia disticha* L. (Burmanniaceae)
 Fig. 161 49.2a *Apostasia odorata* Bl. (Orchidaceae)
 Fig. 162 49.2b *Paphiopedilum appletonianum* Pfitzer (Orchidaceae)
 Fig. 163 49.2c *Dendrobium hancockii* Rolfe (Orchidaceae)