

A PRELIMINARY SURVEY OF PTYXIS (VERNATION) IN THE ANGIOSPERMS

J. CULLEN

ABSTRACT. The manner in which Angiosperm leaves are rolled or folded in bud is described, and the distribution of the various types is presented in a survey covering 187 families, 1000 genera and approximately 2000 species. Some taxonomic implications of the use of the character are briefly discussed.

INTRODUCTION

The current revived interest in the building of large-scale taxonomic systems (whether purportedly phylogenetic, natural or phenetic) has been largely prompted by the influx of new information provided by studies in disciplines not available to the system-builders of the 19th and early 20th centuries. The systems of the Angiosperms presented over the last fifteen years (e.g. Cronquist, *The Evolution and Classification of Flowering Plants*, 1968; Takhtajan, *Flowering Plants: Origin and Dispersal*, 1969; Stebbins, *Flowering Plants: Evolution above the Species Level*, 1974; Dahlgren, A System of Classification of the Angiosperms to be used to demonstrate the Distribution of Characters, *Bot. Not.* 128:119-147, 1975; Thorne, A Phylogenetic Classification of the Angiosperms, *Evolutionary Biology* 9:35-106, 1976) are based not only on the traditional features of morphology and anatomy, but also on data from phytochemistry, palynology, electron-microscope studies, embryology, etc.

The introduction of all these new data has revealed defects and possible misinterpretations in the more traditional characters, and has stimulated a renewed interest in them. Recent publications have covered leaf venation (Hickey, Classification of the Architecture of Dicotyledonous Leaves, *Amer. J. Bot.* 60:17-33, 1973), tree form (Halle & Oldemans, *An Essay on the Architecture and Dynamics of Growth of Tropical Trees*, 1975), seed structure (Corner, *The Seeds of Dicotyledons*, 1976); and many other investigations are in progress. Many characters which were studied by the older morphologists and taxonomists have fallen into disuse, either because they seemed to offer no useful information, or because interest shifted to other attributes. Several of these neglected characters are relatively easy to observe, and the existence of large botanic garden collections makes rapid and extensive surveys of them practicable. The present survey of leaf ptyxis is one such; others, e.g. a survey of aestivation types, could easily be accomplished.

The manner in which leaves are folded in the bud (ptyxis, vernation and prefoliation are three broadly synonymous terms in use for the phenomenon—see below) is, in general, a simple character to observe. It was well known to Linnaeus, De Candolle, de Jussieu and others of the founding fathers of descriptive taxonomy, but during the 19th century interest fell away, except in a few groups (e.g. *Primula*, *Rhododendron*) where the character has been traditionally used in the definition of taxa at different levels. The present



FIG. 1. Diagrams illustrating various forms of ptyxis, redrawn from A. de Jussieu, 1855 (A, reclinate; B, conduplicate; C, plicate; D, convolute; E, involute; F, revolute; G, circinate); Linnaeus, 1751 (H, convolute; I, involute; J, revolute; K, conduplicate; L, plicate); Lindley, 1832 (M, involute; N, revolute; O, supravolute; P, conduplicate; Q, plicate; R, circinate); and Gray, 1881 (S, conduplicate; T, plicate; U, revolute; V, circinate; W, involute).

survey, which was started in 1964, is the most extensive since that published by Linnaeus in his *Philosophia Botanica* of 1751.

GENERAL TERMINOLOGY

As mentioned above, three terms are used to describe the phenomenon of leaf folding: *ptyxis*, *vernation* and *prefoliation*. These terms have been used in slightly different senses by different authors, and it seems useful to discriminate between them. I have used the most recent term, *ptyxis*, to describe the rolling or folding of individual leaves. This term was apparently first used by Asa Gray (cf. *Oxford English Dictionary*) in his *Structural Botany* of 1881. He comments: '... Ptyxis (the Greek term) is coming into use as a general term for the folding (etc.) of single parts.' He continues: '... the ptyxis of an individual leaf ... should be distinguished from the arrangement in the bud of the leaves in a circle or spiral with respect to each other.' In distinguishing between these two phenomena he is following A. de Jussieu rather than Linnaeus or De Candolle (see below), who used the terms 'vernation' or 'prefoliation' to cover both. I prefer Gray's terminology as being more precise, and would restrict the term 'vernation' (prefoliation being more or less obsolete) to describe the vegetative equivalent of (floral) aestivation.

HISTORY

The history of the subject is essentially one of terminology: various accounts of it have been published in dictionaries and glossaries. I have not pursued it any further back than the publications of Linnaeus, whose first systematic account of it is given in his *Philosophia Botanica* (ed. 1, 1751; account reproduced in several subsequent editions). In this work, on pp. 105-6, he defines ten terms, most of them referring to ptyxis as defined above, but three of them (nos. 3, 5 & 6) referring to vernation. The seven terms relevant to ptyxis are: 1. Involuta; 2. Revoluta; 4. Convoluta; 7. Con-duplicata; 8. Plicata; 9. Reclinata; 10. Circinalia. He gives illustrations of all of these except the last two, by means of cross-sections of leaves (tab. X); these are reproduced here as fig. 1, H-L. Following the definitions there is a list of plants exhibiting the various types—as far as I know the most extensive in existence before the present work.

These Linnaean terms have been used as a basis by all subsequent authors, though alterations and additions have been made, as well as changes in the definitions of the individual terms. Linnaeus himself made a number of deletions in his *Termini Botanici* (*Amoen. Acad.* 6: 217-246, 1762), but the logic behind these is unclear.

The next important publication in which the subject is discussed is De Candolle's *Théorie Élémentaire de la Botanique* (1813). On pp. 318-320, under the heading 'Glossologie', he provides a more complex scheme than Linnaeus, with a hierarchy of terms. Ptyxis and vernation are mixed, as in Linnaeus' list, and the terminology is given in French and Latin, though the extremely terse definitions are in French only. In the following outline the French terms and definitions are excluded, and terms referring to vernation are printed in italics:

1. *Folia adpressa*
2. *Folia plicata*
 - 2a. *Folia plicativa*
 - 2b. *Folia replicativa*
 - 2c. *Folia equitantia*
 - 2cα. *Folia equitativa*
 - 2cβ. *Folia semi-amplexa*
 - 2cγ. *Folia conduplicativa*
 - 2d. *Folia imbricativa*
3. *Folia voluta*
 - 3a. *Folia circinalia*
 - 3b. *Folia convolutiva*
 - 3c. *Folia supervolutiva*
 - 3d. *Folia involutiva*
 - 3e. *Folia revolutiva*
 - 3f. *Folia curvativa*

De Candolle's definitions are not always clear; and there are no illustrations to provide guidance as to the interpretation of the definitions. However, the examples that he cites help to provide cross-references between this scheme and Linnaeus' (cf. the table on p. 166). De Candolle was apparently the first to notice that leaves may be flat (1) or just curved (3f) in bud, though the terms he introduced (*adpressa* and *curvativa*) have not been widely taken up. He was also the first to try to distinguish between convolute (3b) and supervolute (3c); both these terms refer to leaves rolled up like those of the banana, but convolute is really a term for vernation (one leaf rolled up inside another), whereas supervolute refers to the folding of the individual leaf.

Various later authors adopted this or that aspect of the Linnaean and Candollean schemes, adding, subtracting, and modifying definitions. One of the most detailed later treatments is that given by Bischoff in vol. 1 of his *Handbuch der botanischen Terminologie und Systematik* (1830-1844). Like De Candolle's, his scheme is hierarchical, and retains the confusion between ptyxis and vernation. He attempts a synonymisation between the Linnaean and Candollean terms which is included in the outline given here (as before, terms referring to vernation are printed in italics; the numbers which are included here are those of Bischoff's sequence of characters):

- α *Folia plana*
31. *Folia applicativa* (*adpressa* DC.)
- β *Folia plicata*
32. *Folia conduplicata* (*conduplicativa* DC.)
33. *Folia imbricata* (*imbricativa* & *equitantia* DC.)
34. *Folia equitativa* (*amplexa* DC.)
 - a. *equitantia ancipitia*
 - b. *equitantia triquetra*
 - c. *equitantia quadriquetra*
 - d. *equitantia teretia*
35. *Folia obvoluta* (*semi-amplexa* DC.)
36. *Folia plicata* (*plicativa* DC.)
37. *Folia reclinata* (*replicativa* DC.)
- γ *Folia voluta*

38. *Folia involuta* (involutiva DC.)
39. *Folia revoluta* (revolutiva DC.)
40. *Folia convoluta* (supervolutiva DC.)
41. *Folia curvativa*
42. *Folia circinalia*

Bischoff's treatment was too complex for easy use, and, lacking illustrations, too difficult to apply to individual cases. A much simpler scheme was provided by Lindley in the Glossology of his *Introduction to Botany* (1832, pp. 410-412). Lindley still perpetuates the confusion between ptyxis and veneration, has no term to describe flat leaves, and includes some terms which refer only to floral organs. Most of his terms are illustrated (the relevant diagrams are redrawn here as fig. 1, M-R.) and are relatively easy to use: 1. Involute; 2. Revolute; 5. Supervolute; 7. Conduplicate; 8. Plicate; 9. Replicate; 10. Curvative; 14. Reclinate; 15. Circinate. This is basically the Linnaean list with a few additions.

The step of separating the terms for ptyxis and veneration was taken by A. de Jussieu in his *Cours Élémentaire d'Histoire Naturelle, Botanique* (1855)—of which I have used the English translation made by J. H. Wilson (1859)—though the general term ptyxis is not used. De Jussieu has the following list of terms: reclinate, conduplicate, plicate, convolute, involute, revolute and circinate. These are illustrated (his fig. 164) and the relevant parts are redrawn here as fig. 1, A-G.

Asa Gray followed de Jussieu in separating ptyxis and veneration (see above). His list of terms is essentially the same as that of de Jussieu, but he adds the term 'corrugate', though this apparently applies to petals only. His illustrations of the terms are reproduced here as fig. 1, S-W. Gray's list, and his diagrams are reproduced in Lubbock's *On Buds and Stipules* (1897).

Finally, mention must be made of J. W. Moll's account, published in his remarkable *Phytography as a Fine Art* (1934). Here, on pp. 153-5, under Section 257, he gives a brief outline, with the heading 'Veneration'. The terms he gives are basically those of Lindley, and he includes terms that refer only to floral organs. He accepts the distinction between ptyxis and veneration, but refers to the former as veneration, the latter as aestivation.

A comparison of the terminology of the various schemes is given in Table I.

PRESENT USAGE OF TERMS

My first attempt at providing a synopsis of ptyxis was published in Davis & Heywood's *Principles of Angiosperm Taxonomy* (1963). There some fourteen different types of ptyxis were described and named. Now, after examining many more vegetative buds, I would simplify the scheme considerably, as presented in the following synoptic key:

- A. Lamina folded parallel to the main vein, or along it
 1. Lamina folded adaxially with 1 fold *Conduplicate*
 2. Lamina with many parallel folds, or folded along each main vein *Plicate*

TABLE I
COMPARISON OF VARIOUS SCHEMES OF TERMINOLOGY FOR LEAF PTYXIS

THIS PAPER	LINNAEUS	DE CANDOLLE	BISCHOFF	LINDLEY	DE JUSSIEU	GRAY
Conduplicate	Conduplicata	Conduplicativa	Conduplicata	Conduplicate	Conduplicate	Conduplicate
Plicate	Plicata	Plicativa	—	Plicate	Plicate	Plicate
Explicative	—	—	—	—	—	—
Involute	Involuta	Involuta	Involuta	Involute	Involute	Involute
Revolute	Revoluta	Revoluta	Revoluta	Revolute	Revolute	Revolute
Supervolute	Convoluta	{ Convolutiva Supervolutiva	Convoluta	{ Convolute Supervolute	Convolute	Convolute
Circinate	Circinalia	Circinalia	Circinalia	Circinate	Circinate	Circinate
Curved	—	Curvativa	Curvativa	Curvative	—	—
Flat	—	Adpressa	Applicativa	—	—	—
—	Reclinata	Replicativa	Reclinata	{ Replicate Reclineate	Reclineate	Reclineate

- | | | |
|----|--|--------------------|
| 3. | The margins folded sharply abaxially | <i>Explicative</i> |
| B. | Lamina rolled parallel to margins and/or main vein | |
| 4. | Margins rolled adaxially | <i>Involute</i> |
| 5. | Margins rolled abaxially | <i>Revolute</i> |
| 6. | One margin rolled inside the other | <i>Supervolute</i> |
| C. | Lamina rolled from apex to base | <i>Circinate</i> |
| D. | Lamina curved in an arc | <i>Curved</i> |
| E. | Lamina flat | <i>Flat</i> |

These terms are illustrated in fig. 2, 1-10. Those rejected from my previous synopsis are as follows:

(a) *Replicative*. This term was used to describe a leaf with 1 abaxial fold along the main vein. No examples of this type have been found. Some palm leaves, which are plicate, split into leaflets folded in this manner, but this is a secondary development. The term 'reduplicate' is used for such leaflets in palm literature generally.

(b) *Convolute*. A term describing the situation in which one leaf is rolled up inside another; this is vernation rather than ptyxis, and the term *supervolute* is adequate to cover all the situations described as convolute by earlier authors.

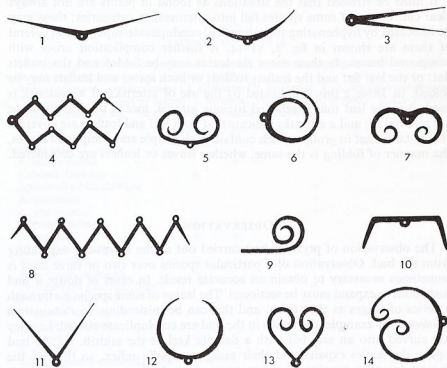


FIG. 2. Types of ptyxis. All the leaves are shown in transverse section, except 9, which is in longitudinal section. 1, flat; 2, curved; 3, conduplicate; 4, conduplicate-plicate; 5, involute; 6, supervolute; 7, revolute; 8, plicate; 9, circinate; 10, explicative; 11, conduplicate-flat; 12, supervolute-curved; 13, conduplicate-involute; 14, supervolute-involute.

(c) *Implicative*. A term referring to the adaxial infolding of the margins (i.e. the reverse of *explicative*). I have not found any leaves with this type of ptyxis, but it does occur in floral organs (e.g. the tepals of many species of *Clematis*).

(d) *Corrugate*. Like *implicative*, this type of ptyxis (the organ irregularly crumpled) is not often found in vegetative organs; it can be seen, however, in the petals of many species of *Papaver*.

(e) *Reclinate*. Leaves with the apical part curved under the main part of the lamina do certainly occur, particularly in climbers; but such curving of the leaf seems to be merely the effect of earlier maturation of the petiole or more rapid expansion of the upper leaf surface.

(f) *Inclinative*. Like *implicative* and *corrugate*, this term (referring to the adaxial inrolling of the apex of an organ) is not applicable to leaves. *Inclinative* petals do, however, occur (e.g. many *Umbelliferae*).

The one term added to my previous synopsis, *explicative*, is used to describe the leaves of some species of *Galanthus* and other Amaryllidaceae. In the literature these leaves are usually referred to as 'plicate', but this is incorrect. The word *explicative* is derived as the reverse of *implicative* (margins folded sharply inwards); the more appropriate term would be *replicative*, but this has already been used in another sense—see (a) above.

It must be stressed that the situations as found in plants are not always clear cut. Leaves of some species fall into intermediate categories: these may be indicated by hyphenating the terms, e.g. *conduplicate-supervolute*; several of them are shown in fig. 2, 11–14. A further complication arises with compound leaves. In these cases the leaves may be folded and the leaflets flat; or the leaf flat and the leaflets folded; or both leaves and leaflets may be folded. In Table 2 this is indicated by the use of asterisks: if no asterisk is used, it is the leaf that is referred to; one asterisk means the leaflets alone are referred to; and 2 asterisks indicate that both leaf and leaflets are covered. It is notable that in groups which contain both simple and compound leaves, the manner of folding is the same, whether leaves or leaflets are considered.

OBSERVATION

The observation of ptyxis is best carried out as the leaves are expanding from the bud. Observation of a particular species over two or three days is sometimes necessary to obtain an accurate result. In cases of doubt a bud just about to expand must be sectioned. The leaves of some species go through a series of stages as they open, and this can be misleading. In *Pittosporum erioloma*, for example, the leaves in the bud are *conduplicate-curved*, i.e. they are curved into an arc, but with a definite keel at the midrib. As the bud opens the leaves expand and their margins rapidly reflex, so that on the second day after opening, they appear *revolute*. As they mature, they flatten and assume their normal posture. Other leaves that are *supervolute* in bud can appear *involute* in the early stages of expansion. Care must also be taken to distinguish bud scales from true leaves in certain genera. It is usually very difficult, if not impossible, to determine ptyxis from herbarium specimens.

FUNCTION AND EVOLUTION

Why leaves are rolled and folded in different ways is an impossible question to answer. While it is clear that young leaves must be packed in some way to occupy the least possible space in the unopened bud, it is difficult to understand the adaptive significance of any particular method of packing. Clearly, the way the leaves fold is related to the size of the bud and the number of young leaves in it; to whether these leaves are opposite or alternate; and to various differential growth rates in the primordia and developing leaves. But the interrelationships of these factors are complex, and do not help us to arrange the various types in an evolutionary sequence. Systematic comparison is perhaps the only way in which such a sequence might be derived, but the results of the survey do not suggest any particular one.

Table 2 gives the results of the survey. The plants observed are all growing in botanic gardens and it has not been possible to check their identification, particularly at species level. The names used are those under which the plants are cultivated; authorities have not been cited in the table since their verification would have been an enormous task. The families recognised, and the assignment of genera to them are those of the *Syllabus der Pflanzenfamilien*, ed. 12 (1964). For convenience of reference, all taxa are listed in alphabetical order.

TABLE 2
SURVEY OF PTYXIS

The type of ptyxis for each species is indicated by a + in the appropriate column; species with intermediate types have a + in two columns.

Abbreviations: C, conduplicate; Ci, circinate; Cr, crumpled; C-P, conduplicate-plicate; Ex, explicate; F/C, flat or curved; I, involute; Pl, plicate; R, revolute; S, supervolute.

* Leaflets referred to; ** both leaves and leaflets referred to.

	F/C	C	C-P	I	S	R	Other
Acanthaceae							
<i>Acanthus mollis</i>		+					Cr
<i>Anisotes dumosus</i>	+						
<i>Aphelandra blanchetiana</i>				+			
<i>A. liboniana</i>				+			
<i>A. sinclairiana</i>				+			
<i>Asystasia bella</i>	+	+					
<i>A. scandens</i>	+	+					
<i>Barleria albo-stellata</i>	+						
<i>B. gossewileri</i>	+						
<i>Beloperone oblongata</i>	+						
<i>Eranthemum macrophyllum</i>				+			
<i>Filetia brookeae</i>		+					
<i>Hypoestes aristata</i>	+						
<i>Jacobinia pohliana</i>	+						
<i>J. spicigera</i>	+	+					
<i>J. suberecta</i>				+			
<i>Megaskepasma erythrochlamys</i>	+						
<i>Odontonema strictum</i>	+	+					
<i>Peristrophe speciosa</i>	+						
<i>Pseuderanthemum versicolor</i>	+						
<i>Ruellia malacosperma</i>	+	+					
<i>Sanchezia nobilis</i>				+			Pl
<i>Sclerochiton odoratissimus</i>	+						

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>Strobilanthes pentastemonoides</i>				+			
<i>Thunbergia chlorops</i>		+					
<i>T. gibsonii</i>		+					
<i>T. mysorensis</i>	+						
<i>Thysacanthus lemaireanus</i>	+	+					
<i>Whitefieldia lateritia</i>	+						
Aceraceae							
<i>Acer acuminatum</i>			+				
<i>A. caudatum</i>			+				
<i>A. distylum</i>			+				
<i>A. franchetii</i>			+				
<i>A. grosseri</i>			+				
<i>A. hookeri</i>			+				
<i>A. japonicum</i>			+				
<i>A. negundo</i>		+	*				
<i>A. palmatum</i>			+				
<i>A. sieboldianum</i>			+				
<i>A. stachyophyllum</i>			+				
<i>A. tataricum</i>			+				
<i>A. tetramerum</i>			+				
<i>Dipteronia sinensis</i>			+				
Actinidiaceae							
<i>Actinidia kolomikta</i>					+		
<i>A. melanandra</i>					+		
<i>Clematoclethra lasioclada</i>					+		
<i>Sauraujia nepalensis</i>		+	+				
<i>S. subspinosa</i>		+	+				
Agavaceae							
<i>Agave attenuata</i>					+		
<i>Dasyllirion hookeri</i>	+						
<i>D. wheeleri</i>	+						
<i>Dracaena congesta</i>					+		
<i>D. godseffiana</i>					+		
<i>D. gracilis</i>					+		
<i>D. sanderiana</i>					+		
<i>Furcraea macrophylla</i>					+		
<i>Yucca flaccida</i>					+		
Alismataceae							
<i>Echinodorus macrophyllum</i>					+		
Alstroemeriaceae							
<i>Alstroemeria aurantiaca</i>					+		
<i>Bomarea hirtella</i>					+		
<i>B. edulis</i>	+						
<i>B. patacoccensis</i>					+		
Amaranthaceae							
<i>Bosea amherstiana</i>	+	+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Amaryllidaceae							
<i>Agapanthus longispatus</i>	+						
<i>A. praecox</i>	+						
<i>Beschorneria tubiflora</i>					+		
<i>Clivia miniata</i>	+						
<i>Crinum argenteum</i>					+		
<i>C. asiaticum</i>					+		
<i>C. pacificum</i>					+		
<i>C. pedunculatum</i>					+		
<i>Cyrtanthus falcatus</i>	+						
<i>C. herrae</i>	+						
<i>Galanthus elwesii</i>					+		
<i>G. nivalis</i>	+						
<i>G. plicatus</i>							Ex
<i>Haemanthus albilos</i>	+						
<i>H. coccineus</i>	+						
<i>Hippeastrum calyptrum</i>	+						
<i>Hymenocallis littoralis</i>	+						
<i>Nerine bowdenii</i>	+						
<i>Pancratium maritimum</i>	+						
<i>Phaedranassa chloracra</i>							Ex
Anacardiaceae							
<i>Botryceras laurinum</i>		+	*				
<i>Dracontomelon edule</i>		+	**				
<i>Lithraea brasiliensis</i>		+	*				
<i>Pistacia terebinthus</i>		+					
<i>Rhus ambigua</i>		+	**				
<i>R. nervosa</i>		+	**				
<i>R. undulata</i>	+	+					
<i>R. verniciflua</i>		+	*				
<i>Spondias dulcis</i>		+	**				
Annonaceae							
<i>Annona cherimolia</i>		+					
<i>A. muricata</i>		+					
<i>A. reticulata</i>		+					
<i>A. squamosa</i>		+					
<i>Artabotrys hexapetalus</i>		+					
Apocynaceae							
<i>Alyxia pubescens</i>		+					
<i>Carissa edulis</i>		+					
<i>Cerbera tanghin</i>		+					
<i>Landolphia ella</i>		+		+			
<i>Ochrosia davensis</i>	+						
<i>Plumeria rubra</i>		+					
<i>Rauwolfia verticillata</i>	+						
<i>Schizozygia coffaeoides</i>	+						
<i>Trachelospermum crocostomum</i>	+						
<i>Vinca major</i>				+			
<i>V. minor</i>	+						
Aquifoliaceae							
<i>Ilex aquifolium</i>					+		
<i>I. pedunculosa</i>					+		
<i>I. sandwichense</i>					+		
<i>I. wangiana</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Araceae							
<i>Aglaonema costatum</i>					+		
<i>Alocasia indica</i>					+		
<i>Anthurium hookeri</i>					+		
<i>Arisaema filiforme</i>					+		
<i>Arum creticum</i>					+		
<i>A. palaestinum</i>					+		
<i>Colocasia indica</i>					+		
<i>Dieffenbachia bowmannii</i>					+		
<i>Monstera deliciosa</i>					+		
<i>Philodendron selloum</i>					+		
<i>Schismatoglottis lavalleyi</i>					+		
<i>Spathicarpa sagittifolia</i>					+		
<i>Spathiphyllum cuneifolium</i>					+		
<i>S. wallisii</i>					+		
<i>Steudnera colocasifolia</i>					+		
<i>Symplocarpus foetidus</i>					+		
<i>Syngonium auritum</i>					+		
<i>Xanthosoma violacea</i>					+		
Araliaceae							
<i>Acanthopanax henryi</i>			+	*			
<i>A. echinorhizus</i>			+	*			
<i>Aralia elata</i>			+	**			
<i>Cussonia spicata</i>			+	*			
<i>Dizygotheca elegantissima</i>	+						
<i>Fatsia papyrifera</i>			+	*			
<i>Hedera colchica</i>			+				
<i>Kalopanax pictum</i>			+	*			
<i>Panax obtusum</i>			+				
<i>Pseudopanax crassifolium</i>					+		
<i>Schefflera delavayi</i>			+	*			
<i>S. digitata</i>			+	*			
<i>Trevesia sanderi</i>			+				
Aristolochiaceae							
<i>Aristolochia argyroneura</i>			+				
<i>A. brasiliensis</i>			+				
<i>A. cymbifera</i>			+				
<i>A. elegans</i>			+				
<i>A. fimbriata</i>			+				
<i>A. lobata</i>			+				
<i>A. tricaudata</i>			+				
<i>A. trilobata</i>			+				
<i>A. veraguensis</i>			+				
<i>Asarum caudatum</i>			+				
<i>A. hartwegii</i>			+				
Asclepiadaceae							
<i>Ceropegia carnea</i>	+						
<i>C. madagascariensis</i>	+						
<i>C. robyniana</i>	+						
<i>C. woodii</i>	+						
<i>Stephanotis floribunda</i>	+						

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Balsaminaceae							
<i>Impatiens hookeri</i>				+			
<i>I. niamniamensis</i>				+			
<i>I. pseudoviola</i>				+			
<i>I. sodenii</i>				+			
<i>I. teitensis</i>				+			
<i>I. walleriana</i>				+			
Begoniaceae							
<i>Begonia acida</i>			+				
<i>B. bradei</i>		+					
<i>B. conchifolia</i>			+				
<i>B. egregia</i>		+					
<i>B. evansiana</i>			+				
<i>B. fagifolia</i>			+				
<i>B. foliosa</i>					+		
<i>B. herbacea</i>		+					
<i>B. kellermannii</i>		+					
<i>B. mexicana</i>			+				
<i>B. micranthera</i>			+				
<i>B. oxyphylla</i>		+					
<i>B. rufo-sericea</i>			+				
Berberidaceae							
<i>Berberis amurensis</i>	+						
<i>B. chinensis</i>					+		
<i>B. edgeworthiana</i>					+		
<i>B. helenae</i>	+				+		
<i>B. koreana</i>					+		
<i>B. mitifolia</i>	+				+		
<i>B. montana</i>					+		
<i>B. prattii</i>					+		
<i>B. stearnii</i>	+						
<i>Epimedium alpinum</i>				+			
<i>Mahonia aquifolium</i>		+					
<i>M. pinnata</i>		+					
<i>Nandina domestica</i>		+					
<i>Podophyllum versipelle</i>					+		
<i>Vancouveria hexandra</i>					+		
<i>V. planipetala</i>					+		
Betulaceae							
<i>Alnus glutinosa</i>			+				
<i>A. incana</i>			+				
<i>A. japonica</i>			+				
<i>A. mayrii</i>			+				
<i>A. sinuata</i>			+				
<i>Betula pubescens</i>			+				
<i>B. raddeana</i>			+				
<i>B. resinifera</i>			+				
<i>B. szechuanica</i>			+				
<i>Carpinus betulus</i>			+				
<i>Corylus avellana</i>			+				
<i>C. columna</i>			+				
<i>C. maximus</i>			+				
<i>C. sieboldiana</i>			+				
<i>Ostrya virginiana</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Bignoniaceae							
<i>Adenocalymma comosa</i>		+	*				
<i>Catalpa fargesii</i>		+					
<i>Doxantha capreolata</i>		+	*				
<i>Eccremocarpus scaber</i>		+	*				
<i>Incarvillea arguta</i>		+					
<i>Jacaranda mimosifolia</i>		+	*				
<i>Pandorea pandorana</i>		+	*				
<i>Pithecoctenium cynanchoides</i>		+					
<i>Tabebuia serratifolia</i>		+	*				
<i>Tanaecium jaroba</i>		+	*				
<i>Tecoma garrocha</i>		+	*				
<i>Tecomaria capensis</i>		+	*				
Bixaceae							
<i>Bixa orellana</i>		+					
Bombacaceae							
<i>Bombacopsis quinata</i>		+	*				
<i>Bombax martianum</i>		+	*				
<i>Ceiba pentandra</i>		+	*				
<i>Chorisia speciosa</i>		+	*				
<i>Ochroma lagopus</i>				+			
<i>Pachira aquatica</i>		+	*				
<i>P. macrocarpa</i>		+	*				
Boraginaceae							
<i>Anchusa caespitosa</i>		+					
<i>Brunnera macrophylla</i>					+		
<i>Cordia alba</i>		+					
<i>C. curassavica</i>		+					
<i>Cynoglossum nervosum</i>		+					
<i>Ehretia cymosa</i>		+					
<i>Lithospermum oleifolium</i>		+					
<i>Mertensia asiatica</i>		+					
<i>M. paniculata</i>					+		
<i>M. primuloides</i>		+					
<i>M. virginica</i>					+		
<i>Myosotis rakiura</i>		+					
<i>Omphalodes cappadocica</i>		+					
<i>O. verna</i>					+		
<i>Pulmonaria mollis</i>		+					
<i>Trachystemon orientale</i>					+		
Bromeliaceae							
<i>Aechmea graveolens</i>					+		
<i>Cryptanthus zonatus</i>					+		
<i>C. viridis</i>					+		
<i>Fascicularia pitcairniifolia</i>	+						
<i>Neoregelia spectabilis</i>					+		
<i>Ochagavia lindleyana</i>	+						
<i>Puya spathacea</i>	+						
<i>Tillandsia tricolor</i>	+						
<i>Vriesia scalaris</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Buddleiaceae							
<i>Buddleia alternifolia</i>	+						
<i>B. colvillei</i>	+	+					
<i>B. fallowiana</i>	+	+					
<i>B. limitanea</i>	+	+					
<i>B. nappii</i>	+	+					
Butomaceae							
<i>Hydrocleis nymphoides</i>					+		
Cactaceae							
<i>Pereskia aculeata</i>					+		
<i>P. saccharosa</i>					+		
Calycanthaceae							
<i>Calycanthus occidentalis</i>	+						
<i>Chimonanthus praecox</i>	+						
Campanulaceae							
<i>Asyneuma lobelioides</i>					+		
<i>Campanula aucheri</i>					+		
<i>C. barbata</i>						+	
<i>C. carpatica</i>					+		
<i>C. elatines</i>				+			
<i>C. formanekiana</i>					+		
<i>C. glomerata</i>					+		
<i>C. isophylla</i>		+					
<i>C. poscharskyana</i>				+			
<i>C. lanata</i>		+					
<i>C. tridentata</i>		+					
<i>Codonopsis vinciflora</i>	+						
<i>Cyanea angustifolia</i>			+				
<i>Lobelia gibberosa</i>					+		
<i>L. laxiflora</i>					+		
<i>L. longiflora</i>					+		
<i>L. mildbraedii</i>					+		
<i>L. tupa</i>					+		
<i>Michauxia laevigata</i>		+					
<i>Musschia aurea</i>					+		
<i>Phyteuma scheuchzeri</i>					+		
<i>Symphyandra hoffmannii</i>					+		
Cannaceae							
<i>Canna indica</i>					+		
Capparidaceae							
<i>Capparis acutifolia</i>		+					
<i>C. baduca</i>		+					
<i>C. cynophallophora</i>		+					
<i>C. erythrocarpus</i>		+					
<i>C. linearis</i>		+					
<i>Euadenia eminens</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Caprifoliaceae							
<i>Abelia chinensis</i>					+		
<i>A. spathulata</i>					+		
<i>Dipelta yunnanensis</i>					+		
<i>Kolkwitzia amabilis</i>					+		
<i>Leycesteria formosa</i>				+			
<i>Lonicera caprifolium</i>					+		
<i>L. etrusca</i>					+		
<i>L. giraldii</i>					+		
<i>L. gynochlamydea</i>				+			
<i>L. henryi</i>					+		
<i>L. hildebrandtiana</i>	+	+					
<i>L. koehneana</i>	+	+					
<i>L. korolkowii</i>	+	+					
<i>L. morrowii</i>	+	+					
<i>L. sempervirens</i>					+		
<i>L. standishii</i>					+		
<i>L. tangutica</i>		+					
<i>L. tragophylla</i>					+		
<i>Sambucus racemosus</i>				+			
<i>Viburnum brevipes</i>				+			
<i>V. bitchiuense</i>				+			
<i>V. carlesii</i>				+			
<i>V. cotinifolium</i>			+				
<i>V. dasyanthum</i>			+				
<i>V. farreri</i>					+		
<i>V. lantana</i>				+			
<i>V. macrocephala</i>				+			
<i>V. plicatum</i>				+			
<i>V. rhytidophyllum</i>		+					
<i>V. veitchii</i>		+					
<i>Weigela hortensis</i>				+			
Caricaceae							
<i>Carica chilensis</i>	+			+			
<i>C. hastata</i>	+						
Caryophyllaceae							
<i>Arenaria gypsophiloides</i>	+	+					
<i>Dianthus brevicaulis</i>	+	+					
<i>D. knappii</i>	+	+					
<i>D. neglectus</i>	+						
<i>Gypsophila transylvanica</i>	+	+					
<i>Paronychia capitata</i>	+						
<i>Silene delavayi</i>					+		
<i>S. dioica</i>		+					
<i>S. hookeri</i>		+					
<i>S. schafta</i>		+					
<i>S. quadrifida</i>		+					
<i>Stellaria holostea</i>	+	+					
<i>S. media</i>	+	+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Celastraceae							
<i>Celastrus glaucophyllus</i>				+			
<i>Euonymus alatus</i>				+			
<i>E. bungeanus</i>				+			
<i>E. europaeus</i>				+			
<i>E. fortunei</i>					+		
<i>E. grandiflorus</i>				+			
<i>E. hamiltonianus</i>				+			
<i>E. hians</i>				+			
<i>E. hupehensis</i>				+			
<i>E. kiautschovicus</i>					+		
<i>E. latifolius</i>				+			
<i>E. maackii</i>				+			
<i>E. nikoensis</i>				+			
<i>E. pauciflorus</i>				+			
<i>E. planipes</i>					+		
<i>E. sanguineus</i>					+		
<i>E. semiexsertus</i>				+			
<i>E. tanakae</i>				+			
<i>Maurocena capensis</i>		+		+			
<i>Maytenus canariensis</i>				+			
Cercidiphyllaceae							
<i>Cercidiphyllum japonicum</i>				+			
Chloranthaceae							
<i>Chloranthus glaber</i>		+					
Cistaceae							
<i>Cistus albidus</i>		+					
<i>C. palinhiae</i>		+					
<i>C. salviifolius</i>		+					
<i>C. villosus</i>		+					
<i>Helium lasianthum</i>		+					
<i>Helianthemum nummularium</i>	+	+					
Cneoraceae							
<i>Cneorum tricoccum</i>		+					
Clethraceae							
<i>Clethra arborea</i>	+				+		
<i>C. barbinervis</i>					+		
Cochlospermaceae							
<i>Cochlospermum insignis</i>		+					
Combretaceae							
<i>Combretum bracteosum</i>		+					
<i>C. paniculatum</i>		+					
<i>Quisqualis mussaendifolia</i>					+		
<i>Terminalia catappa</i>					+		
<i>T. serpicana</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Commelinaceae							
<i>Commelina benghalensis</i>				+			
<i>C. suffruticosa</i>					+		
<i>Cyanotis foecunda</i>					+		
<i>C. longiflora</i>					+		
<i>C. longifolia</i>					+		
<i>C. nodiflorus</i>					+		
<i>C. somaliensis</i>					+		
<i>Geogenanthus undatus</i>				+			
<i>Hadrodemas warszewiczianum</i>					+		
<i>Palisota hirsuta</i>				+			
<i>Polyspatha paniculata</i>				+			
<i>Pyrrheimia fuscata</i>				+			
<i>Rhoeo discolor</i>					+		
<i>Setcreasea purpurea</i>					+		
<i>Tradescantia sillamontana</i>					+		
<i>T. subaspera</i>					+		
<i>Weldenia candida</i>					+		
Compositae							
<i>Achillea claveneae</i>		+					
<i>Anaphalis triplinervia</i>	+						
<i>Anisopappus kirkii</i>		+					
<i>Antennaria dioica</i>		+					
<i>Anthemis tinctoria</i>		+					
<i>Arctotis auriculata</i>		+					
<i>Artemisia sacrorum</i>			+				
<i>Aster harrovianus</i>						+	
<i>A. perfoliatus</i>		+					
<i>Bellis perennis</i>		+					
<i>Berkheya speciosa</i>						+	
<i>Brachyglottis repanda</i>		+					
<i>Celmisia angustifolia</i>						+	
<i>C. bonplandii</i>						+	
<i>C. brevifolia</i>		+					
<i>C. coriacea</i>						+	
<i>C. hieraciifolia</i>						+	
<i>C. hookeri</i>						+	
<i>C. incana</i>		+					
<i>C. lindsayi</i>						+	
<i>C. major</i>						+	
<i>C. petiolata</i>						+	
<i>C. spectabilis</i>						+	
<i>C. walkeri</i>						+	
<i>Centaurea crassifolia</i>					+		
<i>C. simplicicaulis</i>		++					
<i>Cosmos atrosanguinea</i>		+					
<i>Cotula lineariloba</i>		+					
<i>C. pyrethrifolia</i>		+					
<i>C. reptans</i>		+					
<i>Dimorphotheca jucunda</i>		+					
<i>Doronicum carpetanum</i>		+			+		
<i>D. caucasicum</i>					+		
<i>D. pardalianches</i>					+		
<i>Eriophyllum lanatum</i>		+					
<i>Haplocarpha nervosa</i>						+	
<i>Haplopappus suffruticosus</i>		+					
<i>Helichrysum cordatum</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>H. guglielmi</i>						+	
<i>H. melanophthalmum</i>					+		
<i>H. petiolare</i>		+		+			
<i>H. scopulorum</i>		+					
<i>Helipterum albicans</i>	+						
<i>Homogyne alpina</i>	+						
<i>Kleinia neriifolia</i>	+						
<i>Leontopodium calocephalus</i>		+					
<i>L. leontopodioides</i>		+					
<i>Ligularia dentata</i>						+	
<i>L. macrophylla</i>						+	
<i>L. wilsonii</i>						+	
<i>Microglossa albescens</i>						+	
<i>Mutisia retusa</i>						+	
<i>Notonia grantii</i>						+	
<i>Olearia paniculata</i>	+						
<i>O. rotundifolia</i>		+					
<i>O. traversii</i>	+	+					
<i>Raillardia arborea</i>					+		
<i>Raoulia hookeri</i>		+					
<i>Rudbeckia speciosa</i>		+					
<i>Senecio auriculatissimus</i>						+	
<i>S. angulatus</i>	+						
<i>S. bryoniifolius</i>	+						
<i>S. elaeagnifolius</i>		+					
<i>S. incanus</i>				+			
<i>S. laxifolium</i>	+	+					
<i>S. ludens</i>						+	
<i>S. monroi</i>		+					
<i>S. petasites</i>						+	
<i>S. smithii</i>						+	
<i>Sonchus pinnatifidus</i>	+						
<i>Spyridium globulosum</i>		+					
<i>Stokesia laevis</i>		+					
<i>Tarchonanthus trilobus</i>					+		
<i>Tolpis crassiuscula</i>				+			
Convolvulaceae							
<i>Argyrea wallichii</i>		+					
<i>Convolvulus cneorum</i>		+					
<i>Ipomoea batatas</i>		+					
<i>I. nitida</i>		+					
<i>Jacquemontia glaucescens</i>		+					
<i>Pharbitis learii</i>		+					
Coriariaceae							
<i>Coriaria thymifolia</i>	+						
Cornaceae							
<i>Corokia buddleioides</i>		+					
<i>C. cheesemanii</i>		+					
<i>C. macrocarpa</i>		+					
<i>Cornus alba</i>		+					
<i>C. canadensis</i>				+			
<i>C. capitata</i>				+			

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>C. kousa</i>				+			
<i>C. mas</i>				+			
<i>C. monbeigii</i>		+					
<i>C. sanguinea</i>		+					
<i>C. stolonifera</i>		+					
<i>C. walteri</i>				+			
<i>Curtisia faginea</i>			+				
<i>Griselinia littoralis</i>		+					
Corynocarpaceae							
<i>Corynocarpus laevigatus</i>		+					
Cruciferae							
<i>Aethionema iberideum</i>	+						
<i>Alyssum purpureum</i>		+					
<i>Arabis alpina</i>		+					
<i>A. caucasica</i>		+					
<i>A. procurrens</i>		+		+			
<i>Aubrieta deltoidea</i>	+						
<i>Aurinia saxatilis</i>		+					
<i>Cardamine bulbifera</i>					+		
<i>C. pentaphyllos</i>					+		
<i>Crambe strigosa</i>		+					
<i>Draba magellanica</i>	+						
<i>Erysimum perenne</i>		+					
<i>Fibigia eriocarpa</i>		+					
<i>Lunaria rediviva</i>				+			
<i>Megacarpaea polyandra</i>		+	*				
<i>Sisymbrium tanacetifolium</i>		+	*				
<i>Vella pseudocytisus</i>	+						
Cucurbitaceae							
<i>Momordica cochinchinensis</i>		+	*				
<i>Neoalsomitra pubigera</i>		+	*				
Cunoniaceae							
<i>Caldcluvia paniculata</i>			+				
<i>Cunonia capensis</i>					+	*	
<i>Weinmannia silvicola</i>		+					
<i>W. trichosperma</i>		+	**				
Cyanastraceae							
<i>Cyanastrum cordifolium</i>					+		
Cyperaceae							
<i>Cyperus javanicus</i>		+					
<i>Dichromena ciliata</i>		+					
Daphniphyllaceae							
<i>Daphniphyllum macropodum</i>	+						
Desfontainiaceae							
<i>Desfontainia spinosa</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Diapensiaceae							
Galax urceolata		+					
Dilleniaceae							
Candollea tetrandia		+					
Dillenia indica		+					
Hibbertia scandens		+					
H. volubilis		+					
Tetracera scandens		+					
Dioscoreaceae							
Dioscorea bulbifera	+						
D. caucasica		+					
D. macroura		+					
D. reticulata		+					
Dipsacaceae							
Morina longifolia				+			
Pteroccephalus virens		+					
Scabiosa africana		+					
S. graminifolia		+					
S. japonica		+					
Dipterocarpaceae							
Dipterocarpus alatus			+				
Shorea curtisii†		+					
S. macrophylla		+					
S. leprosula		+					
S. resinosa		+					
Stemonoporus reticulatus		+					
Vateria copalifera		+					
Droseraceae							
Drosera capensis							Ci
D. cuneifolia							Ci
D. intermedia							Ci
Drosophyllum lusitanicum							Ci
Ebenaceae							
Diospyros ferrea		+					
D. hawaiiensis		+					
D. wilsonii					+		
Elaeagnaceae							
Elaeagnus angustifolius		+					
E. multiflora	+						
E. umbellatus				+			
Hippophae rhamnoides				+			
Shepherdia argentea		+					

† The species of *Shorea*, *Stemonoporus* and *Vateria* were very kindly observed for me by Dr Kwitong Jong of the University of Aberdeen.

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Elaeocarpaceae							
<i>Aristotelia chilensis</i>		+					
<i>A. fruticosa</i>	+						
<i>Crinodendron hookerianum</i>				+	+		
<i>Elaeocarpus reticulatus</i>		+					
<i>Vallea stipularis</i>		+					
Epacridaceae							
<i>Dracophyllum secundum</i>	+						
<i>Epacris impressa</i>	+						
<i>Monotoca elliptica</i>	+						
<i>Styphelia triflora</i>	+	+					
Ericaceae							
<i>Agapetes hosseana</i>		+					
<i>A. incurva</i>		+					
<i>A. stenantha</i>					+		
<i>A. variegata</i>	+	+					
<i>Agauria salicifolia</i>						+	
<i>Arbutus menziesii</i>					+		
<i>Arctostaphylos andersonii</i>					+		
<i>A. pumila</i>					+		
<i>Cavendishia acuminata</i>		+					
<i>C. complexens</i>		+					
<i>Dimorphanthera collinsii</i>	+						
<i>Diplycosia heterophylla</i>		+					
<i>Elliottia racemosa</i>					+		
<i>Enkianthus campanulatus</i>					+		
<i>Gaultheria leucocarpa</i>		+					
<i>G. pullei</i>		+					
<i>Leucothoe grayana</i>					+		
<i>Macleania glabra</i>		+					
<i>Menziesia pilosa</i>						+	
<i>Pernettya pumila</i>	+						
<i>P. rupicola</i>	+						
<i>Pieris formosa</i>	+						
<i>Rhododendron</i> :							
<i>Lepidotes</i> : all							
except <i>R. pendulum</i>	+				+		
<i>Elepidotes</i>						+	
<i>R. pendulum</i>						+	
<i>Sphyrospermum buxifolium</i>	+						
<i>Vaccinium amplifolium</i>	+						
<i>V. angustifolium</i>					+		
<i>V. ovatum</i>		+					
<i>Wittsteinia coriacea</i>		+					
Erythroxylaceae							
<i>Erythroxylum coca</i>						+	
Eucommiaceae							
<i>Eucommia ulmoides</i>					+		
Eucryphiaceae							
<i>Eucryphia glutinosa</i>						+	

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Euphorbiaceae							
<i>Acalypha brownii</i>		+					
<i>A. sidifolia</i>		+					
<i>A. wilkesiana</i>		+					
<i>Alchornea ilicifolia</i>				+			
<i>Aleurites remyi</i>		+					
<i>Antidesma bunius</i>		+					
<i>Breynia nivosa</i>				+			
<i>Codiaeum interruptum</i>	+						
<i>Euphorbia amygdaloides</i>					+		
<i>E. characias</i>					+		
<i>E. fourieri</i>		+					
<i>E. fulgens</i>					+		
<i>E. lophogona</i>					+		
<i>E. mellifera</i>					+		
<i>E. myrsinites</i>					+		
<i>E. obtusifolia</i>					+		
<i>E. sikkimensis</i>					+		
<i>E. wulfenii</i>					+		
<i>Excoecaria bicolor</i>		+					
<i>Hieronima oblonga</i>		+					
<i>Jatropha curcas</i>		+					
<i>J. gossypifolia</i>		+					
<i>Joannesia princeps</i>		+	*				
<i>Manihot usitatissima</i>		+	*				
<i>Mercurialis perennis</i>				+			
<i>Monadenium lugardae</i>					+		
<i>M. yatteeum</i>					+		
<i>Pedilanthus tithymaloides</i>		+					
<i>Phyllanthus grandifolius</i>				+			
<i>Ricinus communis</i>			+				
<i>Synadenium grantii</i>					+		
Eupomatiaceae							
<i>Eupomatia laurina</i>		+					
Fagaceae							
<i>Castanea sativa</i>			+				
<i>Cyclobalanopsis clausa</i>		+					
<i>Fagus sieboldii</i>			+				
<i>F. sylvatica</i>			+				
<i>Nothofagus obliqua</i>			+				
<i>Quercus cerris</i>			+				
<i>Q. coccinea</i>			+				
<i>Q. garryana</i>			+				
<i>Q. glandulifera</i>			+				
<i>Q. kelloggii</i>			+				
<i>Q. macranthera</i>			+				
<i>Q. nigra</i>			+				
<i>Q. pontica</i>			+				
<i>Q. robur</i>			+				

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Flacourtiaceae							
<i>Aberia caffra</i>		+			+		
<i>Azara dentata</i>					+		
<i>Dovyalis hebecarpa</i>					+		
<i>Flacourtia jangomas</i>		+					
<i>Oncoba routledgei</i>							
<i>O. spinosa</i>		+		+			
<i>Poliothysis chinensis</i>					+		
Flagellariaceae							
<i>Flagellaria guineensis</i>					+		
<i>F. indica</i>					+		
Garryaceae							
<i>Garrya elliptica</i>		+					
Gentianaceae							
<i>Gentiana acaulis</i>		+					
<i>G. crassicaulis</i>					+		
<i>G. dinarica</i>	+						
<i>G. gracilipes</i>					+		
<i>G. purpurea</i>			+				
<i>G. septemfida</i>					+		
<i>G. tibetica</i>					+		
<i>Menyanthes trifoliata</i>					+		
<i>Nymphoides indica</i>				+			
<i>N. peltata</i>				+			
<i>Swertia speciosa</i>					+		
Geraniaceae							
<i>Erodium cheilanthifolium</i>			+				
<i>E. leucanthum</i>			+				
<i>Geranium cinereum</i>			+				
<i>G. endressii</i>			+				
<i>G. maderensis</i>			+				
<i>G. malviflorum</i>			+				
<i>G. renardii</i>			+				
<i>G. yunnanensis</i>			+				
<i>Pelargonium australe</i>			+				
<i>P. bowkeri</i>			+				
<i>P. carnosum</i>			+				
<i>P. crassicaule</i>			+				
<i>P. crithmifolium</i>			+				
<i>P. echinatum</i>			+				
<i>P. papilionaceum</i>			+				
<i>P. quercetorum</i>			+				
<i>P. saxifragoides</i>		+					
Gesneriaceae							
<i>Aeschynanthus ellipticus</i>	+						
<i>A. horsfieldii</i>	+						
<i>A. hosseusii</i>	+	+					
<i>A. longiflorus</i>	+	+					
<i>A. parvifolius</i>	+						
<i>Agalmyla microtrichum</i>				+			
<i>Alloplectus capitatus</i>				+			
<i>A. schlimii</i>				+			
<i>Chirita asperifolia</i>				+			

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>C. sinensis</i>				+			
<i>C. urticifolia</i>				+			
<i>C. walkeri</i>				+			
<i>Codonanthe carnosa</i>	+						
<i>Columnea argentea</i>				+			
<i>C. crassifolia</i>	+	+					
<i>C. hispida</i>				+			
<i>C. microphylla</i>	+						
<i>C. pilosissima</i>				+			
<i>C. rutilans</i>				+			
<i>Cyrtandra cupulata</i>				+			
<i>C. fusco-vellea</i>				+			
<i>C. gibbsii</i>				+			
<i>C. oblongifolia</i>				+			
<i>C. trispala</i>		+					
<i>Didymocarpus bombycinus</i>				+			
<i>D. flavescens</i>				+			
<i>D. malayanus</i>				+			
<i>Drymonia mollis</i>				+			
<i>Episcia ciliosa</i>				+			
<i>Fieldia australis</i>				+			
<i>Gesneria cuneifolia</i>		+					
<i>G. pedunculosa</i>		+					
<i>G. pedicellaris</i>		+					
<i>G. viridiflora</i>		+					
<i>Haberlea ferdinandi-coburgii</i>				+			
<i>H. rhodensis</i>				+			
<i>Hexatheca fulva</i>				+			
<i>Hypocyrtia glabra</i>	+						
<i>Kohleria eriantha</i>	+						
<i>Nautilocalyx lynchii</i>				+			
<i>Nematanthus longipes</i>				+			
<i>Ramonda nathaliae</i>				+			
<i>Rechsteineria sellowii</i>				+			
<i>Rhabdothamnus solandri</i>				+			
<i>Rhytidophyllum auriculatum</i>				+			
<i>R. berteronianum</i>				+			
<i>Saintpaulia ionantha</i>				+			
<i>S. magungensis</i>				+			
<i>S. orbicularis</i>				+			
<i>Sarmienta repens</i>	+						
<i>Seemannia latifolia</i>	+						
<i>Sinningia barbata</i>				+			
<i>Streptocarpus kirkii</i>				+			
<i>S. saxorum</i>	+						
Globulariaceae							
<i>Globularia trichosantha</i>	+	+					
<i>G. vulgaris</i>		+					
Gramineae							
<i>Alopecurus pratensis</i>				+			
<i>Arundinaria falconeri</i>				+			
<i>A. viridistriata</i>				+			
<i>Bambusa multiplex</i>				+			
<i>Brachypodium sylvaticum</i>				+			
<i>Bromus ciliatus</i>				+			
<i>B. racemosus</i>				+			

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>Cenchrus echinatus</i>					+		
<i>Dendrocalamus sikkimensis</i>					+		
<i>Glyceria maxima</i>		+					
<i>Melica picta</i>					+		
<i>Milium effusum</i>					+		
<i>Olyra floribunda</i>					+		
<i>Oplismenus imbecilis</i>					+		
<i>Oryza sativa</i>					+		
<i>Paspalum conjugatum</i>		+					
<i>Phalaris arundinacea</i>					+		
<i>Phleum nodosum</i>					+		
<i>Phyllostachys fulva</i>					+		
<i>P. henonis</i>					+		
<i>Poa annua</i>		+					
<i>P. chaixii</i>		+					
<i>P. crassicaulis</i>		+					
<i>P. palustris</i>		+					
<i>Puccinellia rupestris</i>		+					
<i>Saccharum officinarum</i>					+		
<i>Sasa veitchii</i>					+		
<i>Sitanion hansenii</i>					+		
<i>Stenotaphrium secundum</i>		+					
<i>Zea mays</i>					+		
Guttiferae							
<i>Clusia grandiflora</i>	+						
<i>Garcinia livingstonii</i>		+					
<i>Hypericum calycinum</i>	+	+					
<i>H. chinense</i>	+						
<i>H. ruwenzoriensis</i>	+						
<i>H. uralum</i>	+						
<i>Kielmeyera coriacea</i>					+		
<i>Ochrocarpus siamensis</i>		+					
<i>Rheedia brasiliensis</i>		+					
Haloragaceae							
<i>Gunnera chilensis</i>		+					
<i>Haloragis erecta</i>	+						
Hamamelidaceae							
<i>Altingia excelsa</i>		+					
<i>Corylopsis platypetala</i>			+				
<i>C. spicata</i>			+				
<i>C. wilmottiae</i>			+				
<i>Fothergilla monticola</i>			+				
<i>Hamamelis japonica</i>			+				
<i>Liquidambar styraciflua</i>			+				
<i>Loropetalum chinense</i>	+	+					
<i>Parottia persica</i>		+			+		
<i>Parrotiopsis jacquemontiana</i>			+				
<i>Sycopsis sinensis</i>		+					
<i>Symingtonia populnea</i>		+					
<i>Trichocladus crinitus</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Hippocrateaceae							
<i>Hippocratea guineensis</i>				+			
<i>H. obtusifolia</i>				+			
Hippocastanaceae							
<i>Aesculus californica</i>		+	*				
<i>A. flava</i>		+	*				
<i>A. hippocastanum</i>		+	*				
<i>A. parviflora</i>		+	*				
Hydrophyllaceae							
<i>Hydrolea spinosa</i>		+					
<i>Romanzoffia traceyi</i>	+						
Hypoxidaceae							
<i>Curculigo latiflora</i>							PI
<i>Hypoxis villosa</i>		+					
<i>Rhodohypoxis baurii</i>		+					
Icacinaeae							
<i>Villaresia mucronata</i>		+					
Illiciaceae							
<i>Illicium parviflorum</i>					+		
<i>I. verum</i>					+		
Iridaceae							
<i>Acidantha candida</i>		+					
<i>Chasmanthe aethiopica</i>		+					
<i>Crocasmia masonorum</i>							PI
<i>Dietes prolongata</i>		+					
<i>D. vegeta</i>		+					
<i>Iris bucharica</i>					+		
<i>I. graminea</i>		+					
<i>I. japonica</i>		+					
<i>I. lazica</i>		+					
<i>I. pseudopumila</i>		+					
<i>I. pumila</i>		+					
<i>I. wattii</i>		+					
<i>Lapeyrousia laxa</i>		+					
<i>Libertia grandiflora</i>		+					
<i>L. ixioides</i>		+					
<i>Neomarica vittata</i>		+					
<i>Nivenia stokoei</i>		+					
<i>Romulea clusiana</i>	+						
<i>Schizostylis coccinea</i>		+					
<i>Sisyrinchium idahoense</i>		+					
<i>S. striatum</i>		+					
<i>Watsonia bulbiflora</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Juglandaceae							
<i>Carya alba</i>		++					
<i>Juglans cordiformis</i>		+					
<i>J. mandshurica</i>		++					
<i>Pterocarya forrestii</i>		+					
<i>P. fraxinifolia</i>		++					
<i>P. rhoifolia</i>		++					
<i>P. stenoptera</i>		++					
Juncaceae							
<i>Luzula nivea</i>					+		
<i>L. sylvatica</i>					+		
Labiatae							
<i>Aeollanthus njassae</i>				+			
<i>Coleus barbatus</i>				+			
<i>C. comosus</i>		+					
<i>Gomphostemma javanica</i>				+			
<i>Lamiastrum galeobdolon</i>		+					
<i>Lepechinia salviae</i>						+	
<i>Marrubium peregrinum</i>					+		
<i>Nepeta teydae</i>						+	
<i>Perrieriastrum oreophyllum</i>		+					
<i>Phlomis alpina</i>		+					
<i>P. cashmiriana</i>		+					
<i>P. chrysophylla</i>		+					
<i>Physostegia virginiana</i>					+		
<i>Leonotis leonurus</i>		+					
<i>Plectranthus ciliatus</i>		+					
<i>P. ambiguus</i>				+			
<i>P. hilliardii</i>				+			
<i>P. oertendahlia</i>		+					
<i>P. purpuratus</i>		+					
<i>P. verticillatus</i>		+					
<i>Rosmarinus officinalis</i>						+	
<i>Salvia bolleana</i>		+		+			
<i>S. cardinalis</i>		+					
<i>S. carduacea</i>		+					
<i>S. concolor</i>	+						
<i>S. elegans</i>		+					
<i>S. leucophylla</i>		+					
<i>S. mellifera</i>		+					
<i>S. sessei</i>		+					
<i>Sideritis dasycephala</i>		+					
<i>Stachys citrina</i>		+					
<i>S. longifolia</i>						+	
<i>S. officinalis</i>						+	
<i>S. pumila</i>		+					
<i>Teucrium fruticans</i>	+						
Lardizabalaceae							
<i>Akebia quinata</i>		+					
<i>A. trifoliata</i>		+					
<i>Decaisnea fargesii</i>		++					
<i>Holboellia latifolia</i>		+					
<i>Lardizabala biternata</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Lauraceae							
<i>Cinnamomum camphora</i>					+		
<i>Cryptocarya peumus</i>		+					
<i>Endiandra sieberi</i>		+					
<i>Nothaphoebe lingue</i>		+			+		
<i>Ocotea foetens</i>					+		
<i>Persea indica</i>					+		
Lecythidaceae							
<i>Napoleona vogelii</i>					+		
Leguminosae							
<i>Acacia baileyana</i>		+					
<i>A. dealbata</i>		++					
<i>A. drummondii</i>		+					
<i>A. gummifera</i>		++					
<i>A. koa</i>		+					
<i>A. pulchella</i>		+					
<i>A. sphaerocephala</i>		+					
<i>Adenanthra pavonina</i>		++					
<i>Albizzia lophantha</i>		++					
<i>Anthyllis vulneraria</i>		+					
<i>Astragalus angustifolius</i>		++					
<i>A. poterium</i>		++					
<i>Bauhinia forficata</i>		+					
<i>B. grandidieri</i>		+					
<i>B. natalensis</i>		+					
<i>B. taitensis</i>		+					
<i>B. tomentosa</i>		+					
<i>B. variegata</i>		+					
<i>Brachysema lanceolata</i>		+					
<i>Caesalpinia galpinii</i>		+					
<i>C. sappan</i>		+					
<i>Calliandra goldringii</i>		+					
<i>C. myriophylla</i>		++					
<i>Calycotome spinosa</i>		+					
<i>Caragana aurantiaca</i>		++					
<i>Cassia laevigata</i>		+					
<i>C. suratensis</i>		+					
<i>Ceratonlia siliqua</i>		+					
<i>Cercis griffithiana</i>		+					
<i>Chorizema cordata</i>		+					
<i>Clanthus puniceus</i>		+					
<i>Colutea afghanica</i>		+					
<i>Coronilla glauca</i>		+					
<i>Cytisus battandieri</i>		+					
<i>C. canariensis</i>		+					
<i>Desmodium gyrans</i>		+					
<i>Erythrina corallodendron</i>		+					
<i>E. falcata</i>		+					
<i>E. indica</i>		+					
<i>E. variegata</i>		+					
<i>Flemingia strobilifera</i>		+		+			
<i>Genista sericea</i>		+					
<i>Indigofera balfouriana</i>		+					
<i>Kennedyia prostrata</i>		+					
<i>Lathyrus aureus</i>					+		
<i>L. pratensis</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>L. variegatus</i>					+		
<i>L. vernus</i>					+		
<i>Lotononis wylei</i>		+	+				
<i>Lupinus arboreus</i>		+	+				
<i>Medicago arborea</i>		+	+				
<i>Mimosa spegazzinii</i>		+					
<i>Mucuna gigantea</i>		+	+				
<i>Myroxylon pereirae</i>		+	+				
<i>Pithecolobium longiflorum</i>	+						
<i>P. prinus</i>		+	+				
<i>Prosopis jacari</i>		+	+				
<i>Psoralea pinnata</i>		+	+				
<i>Rhynchosia calycina</i>		+					
<i>Schotia brachypetala</i>		+	+				
<i>Sophora jaubertii</i>		+	+				
<i>Strongylodon macrobotrys</i>		+	+				
<i>Sutherlandia frutescens</i>		+	+				
<i>Templetonia retusa</i>		+					
<i>Tephrosia grandiflora</i>		+	+				
<i>T. vogelii</i>		+	+				
<i>Vicia persica</i>		+	+				
<i>V. sepium</i>		+	+				
<i>Wisteria floribunda</i>		+	+				
Lentibulariaceae							
<i>Pinguicula grandiflora</i>					+		
<i>Utricularia reniformis</i>		+					
Liliaceae							
<i>Albuca nelsoni</i>					+		
<i>Allium moly</i>					+		
<i>A. neapolitanus</i>					+		
<i>A. sativum</i>					+		
<i>A. ursinum</i>					+		
<i>Aloe africana</i>	+						
<i>A. arborescens</i>	+				+		
<i>A. aristata</i>	+						
<i>A. bainesii</i>	+				+		
<i>A. cryptopoda</i>	+				+		
<i>A. plicatilis</i>	+						
<i>A. striata</i>	+				+		
<i>Arthropodium cirrhatum</i>					+		
<i>Asphodelus cerasiferus</i>	+						
<i>Aspidistra lurida</i>					+		
<i>Astelia cockaynei</i>		+					
<i>A. petriei</i>		+					
<i>Bellevia paradoxa</i>					+		
<i>Camassia quamash</i>					+		
<i>Chionodoxa luciliae</i>					+		
<i>Chlorophytum orchidastrum</i>					+		
<i>C. sparsifolium</i>					+		
<i>Colchicum autumnale</i>					+		
<i>C. byzantinum</i>					+		
<i>C. cilicicum</i>					+		
<i>C. giganteum</i>					+		
<i>C. laetum</i>					+		
<i>C. tenorii</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>Convallaria majalis</i>					+		
<i>Dianella aspera</i>		+					
<i>D. caerulea</i>		+					
<i>D. intermedia</i>		+					
<i>Disporum cantoniensis</i>		+					
<i>Drimyopsis maculata</i>					+		
<i>Erythronium americanum</i>					+		
<i>E. californicum</i>					+		
<i>Eucomis comosa</i>					+		
<i>Fritillaria gracilis</i>					+		
<i>F. imperialis</i>					+		
<i>F. paludiflora</i>					+		
<i>Gloriosa rothschildiana</i>					+		
<i>Heloniopsis orientalis</i>					+		
<i>Hemerocallis citrina</i>		+					
<i>Hosta maculata</i>					+		
<i>Lilium candidum</i>	+						
<i>Ornithogalum arabicum</i>					+		
<i>Polygonatum latifolium</i>					+		
<i>Scilla peruviana</i>	+						
<i>S. socialis</i>					+		
<i>Scoliopus bigelovii</i>					+		
<i>Tofieldia calyculata</i>		+					
<i>Tricyrtis macropoda</i>					+		
<i>Trillium chloropetalum</i>					+		
<i>T. grandiflorum</i>					+		
<i>T. ovatum</i>					+		
<i>Tulipa celsiana</i>					+		
<i>T. violacea</i>					+		
<i>Urginea maritima</i>					+		
<i>Veltheimia deasii</i>					+		
Limnanthaceae							
<i>Limnanthes douglasii</i>		+	*				
Linaceae							
<i>Linum narbonense</i>	+						
Loganiaceae							
<i>Fagraea grandis</i>	+						
<i>F. obovata</i>	+						
<i>Gelsemium elegans</i>	+						
<i>Geniostoma ligustrifolia</i>	+						
<i>Nicodemia diversifolia</i>	+	+					
Lythraceae							
<i>Cuphea hyssopifolia</i>	+	+					
<i>C. micropetala</i>	+						
<i>Lafoensia vandelliana</i>		+					
<i>Lagerstroemia indica</i>	+	+					
Magnoliaceae							
<i>Liriodendron tulipifera</i>		+					
<i>Manglieta hookeri</i>		+					
<i>Magnolia campbellii</i>		+					
<i>M. grandiflora</i>		+					
<i>M. kobus</i>		+					
<i>M. sprengeri</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>M. tripetala</i>		+					
<i>M. wilsonii</i>		+					
<i>Michelia champaca</i>		+					
<i>M. figo</i>		+					
Malpighiaceae							
<i>Malpighia glabra</i>		+					
<i>Stigmaphyllon ciliatum</i>	+						
Malvaceae							
<i>Abutilon striatum</i>			+				
<i>A. vitifolium</i>			+				
<i>Goethea mackoyana</i>		+					
<i>Hibiscus clayii</i>		+					
<i>H. kokio</i>		+					
<i>H. schizopetalus</i>		+					
<i>H. youngianus</i>		+					
<i>Hoheria glabrata</i>				+			
<i>H. sexstylosa</i>				+			
<i>Lagunaria patersonii</i>		+					
<i>Lavatera cachemirica</i>			+				
<i>L. olbia</i>			+				
<i>Malva alcea</i>			+				
<i>Pavonia spinifex</i>			+				
<i>Sphaeralcea umbellata</i>			+				
Marantaceae							
<i>Calathea lietzei</i>					+		
<i>C. makoyana</i>					+		
<i>C. rufibarba</i>					+		
<i>Ctenanthe lubbersiana</i>					+		
<i>C. oppenheimiana</i>					+		
<i>Maranta bicolor</i>					+		
<i>M. leuconeura</i>					+		
<i>Stromanthe sanguinea</i>					+		
<i>Thalia dealbata</i>					+		
Marcgraviaceae							
<i>Marcgravia umbellata</i>					+		
<i>Norantea guineensis</i>					+		
Melastomaceae							
<i>Bredia hirsuta</i>		+					
<i>Calvoa orientalis</i>					+		
<i>Clidemia hirta</i>					+		
<i>Medinilla magnifica</i>		+			+		
<i>M. venosa</i>		+					
<i>Melastoma sanguinea</i>					+		
<i>Miconia magnifica</i>		+					
<i>M. saldanhaei</i>		+					
<i>Monochaetum humboldtianum</i>							
<i>Schizocentron elegans</i>	+						
<i>Tibouchina organensis</i>					+		
<i>T. urvilleana</i>					+		

PI

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Meliaceae							
<i>Aglaia odorata</i>		+	*				
<i>Cedrela lilloi</i>		+	*				
<i>C. sinensis</i>		+	*				
<i>Trichilia dregei</i>		+	*				
<i>T. odorata</i>		+	*				
<i>Turraea floribunda</i>		+					
Melanthaceae							
<i>Greyia sutherlandii</i>			+				
<i>Melanthus major</i>		+					
Menispermaceae							
<i>Cocculus carolinus</i>		+					
<i>C. laurifolius</i>	+	+					
<i>Sinomenium acutum</i>	+						
Monimiaceae							
<i>Atherosperma moschatum</i>		+					
<i>Doryophora sassafras</i>		+					
<i>Peumus boldus</i>		+					
Moraceae							
<i>Artocarpus integrifolius</i>		+					
<i>Ficus benjamina</i>		+			+		
<i>F. carica</i>		+					
<i>F. elastica</i>					+		
<i>F. eugenioides</i>					+		
<i>F. ferruginea</i>		+					
<i>F. glaberrima</i>					+		
<i>F. indica</i>					+		
<i>F. lucida</i>					+		
<i>F. macrophylla</i>					+		
<i>F. montana</i>		+					
<i>F. pretoriae</i>					+		
<i>F. rubiginosa</i>					+		
<i>F. sycomorus</i>		+					
<i>F. terminalis</i>					+		
<i>F. villosa</i>					+		
<i>F. vogelii</i>					+		
Musaceae							
<i>Ensete glauca</i>					+		
<i>Lowia longiflora</i>					+		
<i>Musa acuminata</i>					+		
<i>M. assamica</i>					+		
<i>M. basjoo</i>					+		
<i>M. beccarii</i>					+		
<i>Orchidanthera maxillarioides</i>					+		
Myricaceae							
<i>Myrica californica</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Myrsinaceae							
<i>Ardisia crenata</i>					+		
<i>A. elliptica</i>					+		
<i>A. mitchellae</i>				+			
<i>A. opegrapha</i>				+			
<i>A. sieboldii</i>					+		
<i>Embelia floribunda</i>					+		
<i>Elingamita johnsonii</i>					+		
<i>Maesa henryi</i>	+	+					
<i>M. japonica</i>	+	+					
<i>Myrsine africana</i>					+		
<i>M. australis</i>					+		
<i>M. coxii</i>					+		
<i>M. salicina</i>					+		
Myrtaceae							
<i>Backhousia myrtifolia</i>	+	+					
<i>Beaufortia decussata</i>					+		
<i>Callistemon citrinus</i>	+				+		
<i>C. pityoides</i>	+						
<i>Decaspermum tomentosum</i>	+	+					
<i>Eucalyptus calophylla</i>					+		
<i>E. ficifolia</i>	+						
<i>Eugenia glaziovii</i>	+	+					
<i>E. longipes</i>	+						
<i>E. myrtifolia</i>		+					
<i>E. seloi</i>		+					
<i>Hypocalymma angustifolia</i>					+		
<i>Melaleuca elliptica</i>		+					
<i>Metrosideros excelsa</i>		+					
<i>M. villosa</i>		+					
<i>Myrtus bullata</i>	+						
<i>M. ugni</i>	+						
<i>Psidium cattleianum</i>	+						
<i>P. guajava</i>		+					
<i>Rhodomyrtus tomentosa</i>		+					
<i>Tristania laurina</i>					+		
<i>Xanthostemon balansae</i>		+					
Nepenthaceae							
<i>Nepenthes ampullaria</i>				+	+		
<i>N. mirabilis</i>				+			
<i>N. ratcliffiana</i>				+			
<i>N. sanderana</i>				+			
<i>N. ventricosa</i>				+	+		
Nyctaginaceae							
<i>Bougainvillea spectabilis</i>		+					
<i>Heimerliodendron brunonianum</i>		+					
<i>Pisonia grandis</i>		+					
Nymphaeaceae							
<i>Nymphaea flava</i>				+			
<i>N. lotus</i>				+			
<i>N. micrantha</i>				+			
Nyssaceae							
<i>Camptotheca acuminata</i>		+					

TABLE 2 (cont.)

	F/C	C-P	C	I	S	R	Other
Ochnaceae							
<i>Ochna mossambicensis</i>		+					
<i>Planchonella novo-zelandica</i>					+		
Oleaceae							
<i>Forsythia giraldiana</i>					+		
<i>Fraxinus chinensis</i>		++					
<i>F. ornus</i>		++					
<i>F. velutina</i>		++					
<i>Jasminum auriculatum</i>		+					
<i>J. heterophyllum</i>		++					
<i>J. multiflorum</i>		++					
<i>J. polyanthum</i>		++					
<i>J. simplicifolium</i>		+					
<i>J. subhumile</i>		+					
<i>Ligustrum ibota</i>					+		
<i>Olea capensis</i>	+	+					
<i>O. europaea</i>	+	+					
<i>Osmanthus serrulatus</i>					+		
<i>O. yunnanensis</i>					+		
<i>Syringa pinnatifolia</i>		++					
<i>S. tomentella</i>					+		
<i>S. vulgaris</i>					+		
<i>S. yunnanensis</i>					+		
Onagraceae							
<i>Epilobium crassum</i>	+						
<i>Fuchsia arborescens</i>	+						
<i>F. denticulata</i>	+						
<i>F. procumbens</i>	+						
<i>F. regia</i>	+						
<i>F. simplicicaulis</i>	+						
<i>F. thymifolia</i>	+						
<i>Jussieua suffruticosa</i>				+			
<i>Ludwigia peruviana</i>				+			
<i>Oenothera acaulis</i>				+			
<i>O. missouriensis</i>				+			
<i>Zauschneria californica</i>	+						
Orchidaceae							
<i>Appendicula calcicola</i>		+					
<i>Cochlioda rosea</i>		+					
<i>Coelogyne carinata</i>					+		PI
<i>C. dayana</i>					+		PI
<i>C. longebracteata</i>					+		
<i>Dactylorrhiza elata</i>					+		
<i>D. maderensis</i>					+		
<i>Dendrobium chrysocrepis</i>		+					
<i>D. flammea</i>		+					
<i>D. gibsonii</i>		+					
<i>D. kingianum</i>		+					
<i>D. macfarlanei</i>		+					
<i>D. nuttallii</i>		+					
<i>Dendrochilum filiforme</i>					+		
<i>Dichaea muricata</i>		+					
<i>Dilochia cantleyi</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>Disa uniflora</i>					+		
<i>Doritis pulcherrima</i>		+					
<i>Encyclia virgata</i>		+					
<i>Ephemerantha forcipata</i>		+					
<i>Epidendrum difforme</i>		+					
<i>E. subpurum</i>		+					
<i>Goodyera oblongifolia</i>					+		
<i>G. rubicunda</i>					+		
<i>Huntleya burtii</i>		+					
<i>Lycaste macrophylla</i>					+		Pl
<i>L. schilleriana</i>					+		Pl
<i>Masdevallia tovarensis</i>		+					
<i>Maxillaria elegantula</i>		+					
<i>Odontoglossum bictonense</i>		+					
<i>O. caudatum</i>		+					
<i>O. costatum</i>		+					
<i>O. hallii</i>		+					
<i>Oncidium excavatum</i>		+					
<i>Paphiopedilum barbatum</i>		+					
<i>P. haynaldianum</i>		+					
<i>P. lawrencianum</i>		+					
<i>P. philippinense</i>		+					
<i>P. sublaeve</i>		+					
<i>P. venustum</i>		+					
<i>P. villosum</i>		+					
<i>Pterostylis pedunculata</i>					+		
<i>Sobralia holfordii</i>					+		Pl
<i>Stenoglottis woodii</i>					+		
<i>Vanda tricolor</i>		+					
<i>Vanilla imperialis</i>					+		
Paoniaceae							
<i>Paeonia delavayi</i>						+	
<i>P. emodi</i>					+		
<i>P. lutea</i>		+	*				
<i>P. mlokosewitschii</i>					+		
<i>P. officinalis</i>					+		
<i>P. rhodia</i>					+		
Palmae							
All spp., as far as known							Pl
Pandanaceae							
<i>Pandanus tectorius</i>		+					
<i>P. vandermeschii</i>		+					
Papaveraceae							
<i>Adlumia fungosa</i>		+	*				
<i>Corydalis cheilanthifolia</i>		+	**				
<i>C. wilsonii</i>		+					
<i>Dendromecon rigidum</i>					+		
<i>Dicentra formosa</i>		+	**				
<i>Meconopsis betonicifolia</i>				+			
<i>M. napaulensis</i>				+			
<i>M. paniculata</i>				+			
<i>M. quintuplinervia</i>				+			
<i>M. regia</i>	+						
<i>Papaver atlanticum</i>						+	

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>P. aculeatum</i>		+					
<i>P. lateritium</i>						+	
<i>P. rupifragum</i>						+	
<i>Sanguinaria canadensis</i>					+		
Passifloraceae							
<i>Adenia glauca</i>		++					
<i>Passiflora antioquiensis</i>		+					
<i>P. coccinea</i>		+					
<i>P. foetida</i>		+					
<i>P. incarnata</i>		+					
<i>P. laurifolia</i>		+					
<i>P. lutea</i>		+					
<i>P. manicata</i>		+					
<i>P. membranacea</i>		+		+			
<i>P. mixta</i>		+					
<i>P. organensis</i>		+					
<i>P. quadrangularis</i>		+					
<i>P. truxillensis</i>		+					
Pentaphragmaceae							
<i>Pentaphragma euryoides</i>					+		
Philesiaceae							
<i>Lapageria rosea</i>	+	+					
Philydraceae							
<i>Philydrium lanuginosum</i>		+					
Phytolaccaceae							
<i>Ercilla spicata</i>		+					
<i>Phytolacca dioica</i>		+					
<i>Trichostigma peruviana</i>		+					
Piperaceae							
<i>Peperomia acronarcana</i>	+						
<i>P. camptotricha</i>		+					
<i>P. incana</i>		+					
<i>P. macrostachya</i>		+					
<i>P. nivalis</i>		+					
<i>P. maculosa</i>		+					
<i>P. pereskifolia</i>				+			
<i>P. sandersii</i>		+					
<i>P. velutina</i>					+		
<i>Piper angustifolium</i>				+			
<i>P. chaba</i>					+		
<i>P. excelsum</i>				+			
<i>P. nigrum</i>					+		
<i>P. obliquum</i>				+			
<i>P. unguiculatum</i>				+			
Pittosporaceae							
<i>Pittosporum bicolor</i>	+	+					
<i>P. colensoi</i>	+	+					
<i>P. erioloma</i>	+	+					
<i>P. ramiflorum</i>				+			
<i>P. tobira</i>					+		
<i>P. undulatum</i>		+					
<i>Sollya heterophylla</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Platanaceae							
<i>Platanus occidentalis</i>		+					
<i>P. orientalis</i>		+					
Plumbaginaceae							
<i>Limonium binervosum</i>				+			
<i>Plumbago auriculata</i>				+			
<i>P. capensis</i>				+			
<i>P. zeylanica</i>				+			
Polemoniaceae							
<i>Cobaea scandens</i>		+	*				
<i>Phlox stolonifera</i>	+						
<i>Polemonium caeruleum</i>		+	*				
<i>P. foliosissimum</i>		+	*				
<i>P. mexicanum</i>		+	*				
<i>P. reptans</i>		+	*				
Polygalaceae							
<i>Polygala calcarea</i>					+		
<i>P. chamaebuxus</i>	+						
Polygonaceae							
<i>Antigonon lancasteri</i>						+	
<i>A. leptopus</i>						+	
<i>Atraphaxis virgata</i>						+	
<i>Coccoloba uvifera</i>						+	
<i>Eriogonum jamesii</i>						+	
<i>E. subalpinum</i>						+	
<i>E. umbellatum</i>						+	
<i>Muehlenbeckia complexa</i>						+	
<i>M. platyclados</i>						+	
<i>M. polygonoides</i>						+	
<i>Oxyria digyna</i>						+	
<i>Polygonum affine</i>						+	
<i>P. amplexicaule</i>						+	
<i>P. baldschuanicum</i>						+	
<i>P. bistorta</i>						+	
<i>P. campanulatum</i>						+	
<i>P. emodi</i>						+	
<i>P. polystachyum</i>						+	
<i>P. regelianum</i>						+	
<i>P. reynoutria</i>						+	
<i>P. sachalinense</i>						+	
<i>P. vacciniifolium</i>						+	
<i>Rheum forrestii</i>						+	
<i>R. palmatum</i>						+	
<i>Rumex conglomeratus</i>						+	
<i>R. crispus</i>						+	
<i>R. sanguineus</i>						+	
<i>R. scutatus</i>						+	
Portulacaceae							
<i>Claytonia australasica</i>	+						
<i>C. perfoliata</i>		+					
<i>C. sibirica</i>		+					
<i>Lewisia cotyledon</i>					+		
<i>L. fuchsii</i>					+		
<i>Talinum patens</i>						+	

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Primulaceae							
<i>Androsace ciliata</i>					+		
<i>A. lactea</i>					+		
<i>Ardisiandra wettsteinii</i>						+	
<i>Dionysia aretioides</i>						+	
<i>D. curviflora</i>					+		
<i>D. mira</i>						+	
<i>D. revoluta</i>						+	
<i>Dodecatheon hendersonii</i>					+		
<i>D. jeffreyi</i>					+		
<i>D. meadca</i>					+		
<i>Douglasia nivalis</i>					+		
<i>Lysimachia glutinosa</i>					+		
<i>Primula auricula</i>					+		
<i>P. beesiana</i>						+	
<i>P. capitata</i>						+	
<i>P. chungensis</i>						+	
<i>P. clusiana</i>					+		
<i>P. darialica</i>						+	
<i>P. denticulata</i>						+	
<i>P. forrestii</i>						+	
<i>P. fortunei</i>						+	
<i>P. frondosa</i>						+	
<i>P. gaubeana</i>				+			
<i>P. glaucescens</i>					+		
<i>P. gracilipes</i>						+	
<i>P. helodoxa</i>						+	
<i>P. ianthina</i>						+	
<i>P. juliae</i>						+	
<i>P. malacoides</i>						+	
<i>P. melanops</i>						+	
<i>P. modesta</i>						+	
<i>P. marginata</i>				+			
<i>P. palinuri</i>					+		
<i>P. pubescens</i>					+		
<i>P. pulverulenta</i>						+	
<i>P. rosea</i>						+	
<i>P. saxatilis</i>						+	
<i>P. verticillata</i>				+			
<i>P. villosa</i>					+		
<i>P. viscosa</i>					+		
<i>P. vulgaris</i>						+	
<i>P. whitei</i>						+	
Proteaceae							
<i>Dryandra formosa</i>				+			
<i>Embothrium grandiflorum</i>			+				
<i>Gevuina avellana</i>			+				
<i>Grevillea hilliana</i>			+				
<i>G. robusta</i>			+				
<i>Hakea crassifolia</i>	+						
<i>H. franciscana</i>	+						
<i>H. suaveolens</i>			+				
<i>Knightia excelsa</i>			+				
<i>Lomatia ferruginea</i>			+				
<i>L. ilicifolia</i>			+				
<i>Macadamia ternata</i>			+				
<i>Stenocarpus sinuatus</i>			+				

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Punicaceae							
<i>Punica granatum</i>	+						
Ranunculaceae							
<i>Actaea rubra</i>		+					
<i>Adonis amurensis</i>			+				
<i>A. brevistyla</i>		+					
<i>Anemone caffra</i>			+				
<i>A. tomentosa</i>			+				
<i>A. virginiana</i>		+					
<i>Aquilegia chrysantha</i>		+					
<i>Caltha palustris</i>					+		
<i>Callianthemum rutifolium</i>		+					
<i>Clematis alpina</i>		+					
<i>C. chrysocoma</i>		+					
<i>C. cruttwellii</i>		+					
<i>C. grata</i>		+					
<i>C. heracleifolia</i>		+					
<i>C. macropetala</i>		+					
<i>C. spooneri</i>		+					
<i>Eranthis hyemalis</i>			+				
<i>Glaucidium palmatum</i>					+		
<i>Helleborus cyclophyllus</i>					+		
<i>H. odoratus</i>					+		
<i>H. purpurascens</i>					+		
<i>Hepatica nobilis</i>					+		
<i>H. transsilvanica</i>				+	+		
<i>H. triloba</i>				+	+		
<i>Knowltonia bracteata</i>		+					
<i>Pulsatilla halleri</i>		+					
<i>P. vulgaris</i>		+					
<i>Ranunculus alpestris</i>					+		
<i>R. amplexicaulis</i>					+		
<i>R. bilobus</i>		+					
<i>R. gramineus</i>					+		
<i>R. lyallii</i>					+		
<i>R. sceleratus</i>					+		
<i>Trollius chinensis</i>					+		
<i>Xanthorrhiza apiifolia</i>		+					
Restionaceae							
<i>Restio subverticillatus</i>					+		
Rhamnaceae							
<i>Berchemia lineata</i>		+					
<i>B. racemosa</i>		+					
<i>Ceanothus griseus</i>				+			
<i>C. integrifolia</i>				+			
<i>Noltaea africana</i>		+					
<i>Pomaderris apetala</i>		+					
<i>P. rugosa</i>		+					
<i>Rhamnus dumetorum</i>				+			
<i>R. imeretinus</i>			+				
Rhizophoraceae							
<i>Crossostylis grandiflora</i>				+			

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Rosaceae							
<i>Acaena laevigata</i>		++					
<i>A. ovina</i>		++					
<i>Alchemilla alpina</i>			+				
<i>A. mollis</i>			+				
<i>A. persica</i>			+				
<i>Amelanchier alnifolia</i>		+					
<i>A. amabilis</i>		+					
<i>A. asiatica</i>		+					
<i>A. oblongifolia</i>		+					
<i>A. spicata</i>		+					
<i>Bencomia sphaerocephala</i>		+					
<i>Cercocarpus betuloides</i>			+				
<i>Chamaebatiaria millefolium</i>						+	
<i>Chaenomeles japonica</i>						+	
<i>C. speciosa</i>						+	
<i>Cotoneaster acutifolia</i>		+					
<i>C. affinis</i>		+					
<i>C. bullatus</i>		+					
<i>C. congestus</i>		+					
<i>C. divaricatus</i>		+					
<i>C. foveolatus</i>		+					
<i>C. frigidus</i>		+					
<i>C. froebelii</i>		+					
<i>C. glaucophyllus</i>		+					
<i>C. lucidus</i>		+					
<i>C. melanocarpus</i>		+					
<i>C. obscurus</i>		+					
<i>C. rubens</i>		+					
<i>C. salicifolius</i>		+					
<i>C. wardii</i>		+					
<i>Crataegus maximowiczii</i>		+					
<i>Cydonia oblonga</i>					+		
<i>Dendropterium menendezii</i>		+					
<i>Dryas octopetala</i>						+	
<i>Eriobotrya japonica</i>		+					
<i>Exochorda giraldii</i>		+					
<i>E. korolkowii</i>		+					
<i>Filipendula purpurea</i>			+				
<i>F. rubra</i>		+					
<i>Fragaria vesca</i>			+				
<i>Geum coccineum</i>			+				
<i>G. montanum</i>			+				
<i>G. reptans</i>			+				
<i>Holodiscus dumosus</i>		+					
<i>Kerria japonica</i>		+					
<i>Lyonothamnus floribundus</i>		+					
<i>Maddenia wilsonii</i>			+				
<i>Malus baccata</i>				+	+		
<i>M. floribunda</i>				+	+		
<i>M. halliana</i>				+			
<i>M. hupehensis</i>				+			
<i>M. kansuensis</i>				+			
<i>M. orthocarpa</i>				+			
<i>M. prunifolia</i>				+			
<i>M. pumila</i>				+			
<i>M. sieboldii</i>				+			
<i>M. toringoides</i>				+			

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>M. zumii</i>				+			
<i>Mespilus germanica</i>					+		
<i>Neillia sinensis</i>			+				
<i>N. thibetica</i>			+				
<i>N. uekii</i>			+				
<i>Neviusia alabamensis</i>			+				
<i>Osmaronia cerasiforme</i>		+					
<i>Osteomeles schwerinii</i>		+					
<i>O. subrotunda</i>		+					
<i>Pentactina rupicola</i>					+		
<i>Photinia beauverdiana</i>		+					
<i>Physocarpus opulifolius</i>			+				
<i>Potentilla anserina</i>		+					
<i>P. argyrophylla</i>		+					
<i>P. candicans</i>		+					
<i>P. forrestii</i>						+	
<i>P. fruticosa</i>						+	
<i>P. leuconota</i>		+					
<i>P. megalantha</i>		+					
<i>P. nitida</i>		+					
<i>P. opaca</i>		+					
<i>Prinsepia sinensis</i>		+					
<i>P. utilis</i>		+					
<i>Prunus acuminata</i>		+					
<i>P. americana</i>		+					
<i>P. armeniaca</i>					+		
<i>P. avium</i>		+					
<i>P. bokhariensis</i>					+		
<i>P. brachypoda</i>		+					
<i>P. cerasifera</i>					+		
<i>P. conradinae</i>		+					
<i>P. laurocerasus</i>		+					
<i>P. maackii</i>		+					
<i>P. nipponica</i>		+					
<i>P. padus</i>		+					
<i>P. pleuroptera</i>		+					
<i>P. polytricha</i>		+					
<i>P. rufa</i>		+					
<i>P. serrula</i>		+					
<i>P. sieboldii</i>		+					
<i>P. spinosa</i>					+		
<i>P. tenella</i>		+					
<i>P. tomentosa</i>					+		
<i>P. vaniotii</i>		+					
<i>P. virginiana</i>		+					
<i>Pyrus calleyrana</i>				+			
<i>P. pashia</i>				+			
<i>P. salicifolia</i>				+			
<i>P. ussuriensis</i>				+			
<i>Quillaja saponaria</i>		+					
<i>Rosa carolina</i>		+					
<i>R. clinophylla</i>		+					
<i>R. corymbifera</i>		+					
<i>R. omeiensis</i>		+					
<i>R. sherardii</i>		+					
<i>R. sinowilsonii</i>		+					
<i>Rubus calycinoides</i>			+				
<i>R. moluccanus</i>			+				

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>R. coreanus</i>		+	**				
<i>R. nepalensis</i>			+				
<i>Sanguisorba dodecandra</i>		+	*				
<i>Sorbaria sorbifolia</i>		+	**				
<i>Sorbus americana</i>		+	*				
<i>S. cashmiriana</i>		+	*				
<i>S. hupehensis</i>		+	*				
<i>S. maderensis</i>		+	*				
<i>S. pohuashanensis</i>		+	*				
<i>S. rehderiana</i>		+	*				
<i>Spiraea amoena</i>					+		
<i>S. chamaedrifolia</i>					+		
<i>S. miyabei</i>					+		
<i>S. nipponica</i>					+		
<i>Stranvaesia davidiana</i>		+					
<i>S. nussia</i>		+					
<i>Waldsteinia ternata</i>			+				
Rubiaceae							
<i>Alberta magna</i>	+						
<i>Burchellia capensis</i>		+					
<i>Coprosma avicenniifolia</i>	+						
<i>C. repens</i>	+	**					
<i>Cephaelis beerii</i>	+	*					
<i>Emmenopterys henryi</i>	+						
<i>Gardenia bonfigliori</i>						+	
<i>G. tahitiensis</i>						+	
<i>G. urcelliformis</i>						+	
<i>Hoffmannia ghiesbreghtii</i>	+	*					
<i>Ixora findlayana</i>	+	*					
<i>Luculia intermedia</i>	+	*					
<i>L. grandiflora</i>					+		
<i>Manettia indica</i>	+	*					
<i>Pinckneya pubens</i>	+	*					
<i>Rondeletia odorata</i>	+	*					
<i>R. roezlii</i>	+	*					
<i>Rubia sikkimensis</i>	+	*					
Rutaceae							
<i>Barosma lanceolata</i>	+						
<i>Boronia microphylla</i>		+					
<i>Casimiroa tetramera</i>		+	*				
<i>Citrus limonia</i>		+					
<i>C. paradisi</i>		+					
<i>Clausena lansium</i>		+	*				
<i>Correa decumbens</i>		+					
<i>C. speciosa</i>		+					
<i>Euodia anisodora</i>		+	*				
<i>E. henryi</i>		+	**				
<i>Melicope nantellii</i>		+	*				
<i>Ravenia spectabilis</i>	+	+					
<i>Toddalia aculeata</i>			+				
<i>Zanthoxylum oxyphyllum</i>		+	**				
<i>Z. stenophyllum</i>		+	*				

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Sabiaceae							
<i>Meliosma beaniana</i>		+					
<i>M. cuneifolia</i>		+					
<i>M. tenuis</i>		+					
Salicaceae							
<i>Populus candicans</i>				+			
<i>P. maximowiczii</i>				+			
<i>P. trichocarpa</i>				+			
<i>Salix alba</i>					+		
<i>S. cascadenis</i>					+		
<i>S. herbacea</i>					+		
<i>S. irrorata</i>					+		
<i>S. matsudana</i>					+		
<i>S. melanostachys</i>					+		
<i>S. sachalinensis</i>					+		
<i>S. viminalis</i>					+		
Salvadoraceae							
<i>Salvadora persica</i>	+						
Sapindaceae							
<i>Alectryon coriaceus</i>		+					
<i>Cardiospermum halicacabum</i>		+					
<i>Cupania grandidens</i>		++					
<i>C. grandiflora</i>		+					
<i>Dodonaea viscosa</i>		+					
<i>Euphoria longana</i>		++					
<i>Filicium decipiens</i>		++					
<i>Hippobromus alatus</i>		++					
<i>Koelreuteria elegans</i>		+					
<i>K. paniculata</i>		++					
<i>Paullinia rufescens</i>		+					
<i>P. thalictrifolia</i>		+					
<i>Serjania reticulata</i>		+					
<i>Xanthoceras sorbifolium</i>		+					
Sapotaceae							
<i>Achras sapota</i>		+					
<i>Chrysophyllum cainito</i>		+					
<i>Lucuma sellowii</i>		+					
<i>L. valparasidea</i>		+					
<i>Mimusops elengi</i>		+					
<i>Pouteria suaveis</i>		+					
<i>Sideroxylon inerme</i>		+					
Saururaceae							
<i>Saururus cernuus</i>				+			
Saxifragaceae							
<i>Anopterus glandulosus</i>					+		
<i>Astilbe thunbergii</i>		+					
<i>Bergenia cordifolia</i>					+		
<i>B. purpurascens</i>					+		
<i>B. stracheyi</i>					+		
<i>Brexia madagascariensis</i>		+					
<i>B. spinosa</i>		+					
<i>Carpenteria californica</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>Deutzia ongifolia</i>		+					
<i>D. pulchra</i>	+	+					
<i>Dichroa febrifuga</i>				+			
<i>Escallonia punctata</i>					+		
<i>E. rubra</i>					+		
<i>Francoa sonchifolia</i>			+				
<i>Heuchera curtisii</i>			+				
<i>H. cylindrica</i>			+				
<i>H. micrantha</i>			+				
<i>Hydrangea bretschneideri</i>		+					
<i>H. macrophylla</i>					+		
<i>H. petiolaris</i>					+		
<i>H. villosa</i>		+					
<i>Itea yunnanensis</i>		+					
<i>Jamesia americana</i>			+				
<i>Mitella ovalis</i>			+				
<i>Penthorum sedoides</i>					+		
<i>Philadelphus henryi</i>		+					
<i>P. magdalenae</i>	+	+					
<i>Pileostegia viburnoides</i>		+					
<i>Ribes giraldii</i>			+				
<i>R. grossularioides</i>			+				
<i>R. inebrians</i>			+				
<i>R. laurifolium</i>			+				
<i>R. mandshuricum</i>			+				
<i>R. refractum</i>			+				
<i>R. speciosum</i>			+				
<i>R. viburnifolium</i>			+				
<i>Rodgersia podophylla</i>		+					
<i>Saxifraga callosa</i>		+					
<i>S. granulata</i>					+		
<i>S. hirsuta</i>		+					
<i>S. hostii</i>		+					
<i>S. laestadii</i>	+						
<i>S. longifolia</i>	+						
<i>S. trifurcata</i>	+						
<i>S. umbrosa</i>	+	+					
Schizandraceae							
<i>Kadsura scandens</i>				+			
<i>Schizandra rubriflora</i>					+		
<i>S. sphenanthera</i>					+		
Scrophulariaceae							
<i>Bacopa amplexicaulis</i>	+						
<i>Calceolaria pavonii</i>						+	
<i>Digitalis grandiflora</i>					+		
<i>Freylinia cestroides</i>		+					
<i>Halleria elliptica</i>	+						
<i>Hebe canterburyensis</i>	+						
<i>H. chathamica</i>		+					
<i>H. hulkeana</i>		+					
<i>Hemichaena fruticosa</i>		+					
<i>Isoplexis canariensis</i>					+		
<i>I. sceptrum</i>					+		
<i>Lindernia reptans</i>				+			
<i>Ourisia crosbyi</i>					+		
<i>O. macrocarpa</i>					+		

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
<i>Parahebe cataractae</i>	+						
<i>P. lyallii</i>		+					
<i>P. perfoliata</i>		+					
<i>Penstemon alpicola</i>	+						
<i>P. barretiae</i>	+						
<i>P. deustus</i>	+						
<i>P. fruticosa</i>	+						
<i>P. gormannii</i>	+						
<i>Phygellus aequalis</i>	+						
<i>Sibthorpia europaea</i>	+						
<i>Synthyris stellata</i>				+			
<i>Verbascum dumulosum</i>		+					
<i>V. pestalozzae</i>		+					
<i>Veronica incana</i>						+	
<i>V. multifida</i>						+	
<i>V. prostrata</i>						+	
<i>Wulfenia baldaccii</i>						+	
Simaroubaceae							
<i>Ailanthus giraldii</i>		+	*				
<i>Picraena excelsa</i>		+					
<i>Picramnia ciliata</i>		+	**				
<i>Picrasma ailanthoides</i>		+	**				
Smilacaceae							
<i>Smilax aspera</i>		+					
<i>S. mauritanica</i>		+					
Solanaceae							
<i>Brunfelsia macrophylla</i>		+					
<i>Cestrum elegans</i>		+					
<i>C. nocturnum</i>		+					
<i>C. psittacinum</i>		+					
<i>Cyphomandra betacea</i>		+					
<i>Datura aurea</i>		+					
<i>Solanum ochraceum</i>		+					
<i>Streptosolen jamesonii</i>		+					
<i>Vestia lycioides</i>		+					
Stachyuraceae							
<i>Stachyurus chinensis</i>				+			
<i>S. praecox</i>				+			
Staphylaeaceae							
<i>Staphylaea colchica</i>				+	*		
<i>S. pinnata</i>				+	*		
Sterculiaceae							
<i>Abroma angusta</i>			+				
<i>Firmiana malayana</i>			+				
<i>Fremontodendron mexicanum</i>			+				
<i>Hermannia angularis</i>		+					
<i>Hildegardia barteri</i>	+						
<i>Sterculia foetida</i>		+	*				
<i>Theobroma cacao</i>		+					
<i>Thomasia solanacea</i>			+				

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Styracaceae							
<i>Halesia carolina</i>			+				
<i>H. monticola</i>					+		
<i>Pterostyrax corymbosa</i>					+		
<i>Styrax japonica</i>	+	+					
<i>S. obassia</i>					+		
Theaceae							
<i>Camellia hongkongense</i>		+					
<i>C. miyagii</i>					+		
<i>C. sasanqua</i>					+		
<i>C. tsaii</i>					+		
<i>Cleyera japonica</i>					+		
<i>Gordonia axillaris</i>					+		
<i>G. chrysantra</i>					+		
<i>G. dalglieshiana</i>					+		
<i>Schima superba</i>					+		
<i>Stewartia ovata</i>		+					
<i>S. pseudocamellia</i>		+					
<i>S. serrata</i>		+					
<i>S. sinensis</i>		+					
<i>Ternstroemia japonica</i>					+		
Theophrastaceae							
<i>Clavija longifolia</i>		+					
<i>Theophrasta minor</i>		+					
Thymelaeaceae							
<i>Daphne genkwa</i>					+		
<i>D. giraldii</i>					+		
<i>D. odora</i>					+		
<i>D. oleoides</i>					+		
<i>Passerina filiformis</i>		+					
<i>Phaleria disperma</i>		+					
<i>Peddiea dregei</i>					+		
Tiliaceae							
<i>Entelia arborescens</i>		+					
<i>Grewia nitida</i>		+					
<i>Tilia americana</i>					+		
<i>T. europaea</i>					+		
<i>T. mongolica</i>					+		
<i>T. platyphyllos</i>					+		
Trochodendraceae							
<i>Euptelea polyandra</i>		+					
<i>Tetracentron sinense</i>					+		
Tropaeolaceae							
<i>Tropaeolum polyphyllum</i>		+	*				
Ulmaceae							
<i>Celtis bungeana</i>					+		
<i>Ulmus americana</i>		+					
<i>U. fulva</i>		+					
<i>U. glabra</i>		+					
<i>Zelkova carpinifolia</i>		+					
<i>Z. sinensis</i>		+					

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Umbelliferae							
<i>Aciphylla dissectum</i>		+					
<i>A. munroi</i>		+					
<i>Angelica archangelica</i>		++					
<i>Astrantia maxima</i>					+		
<i>A. major</i>					+		
<i>Bupleurum fruticosum</i>					+		
<i>Carum carvi</i>		++					
<i>Eryngium campestre</i>					+		
<i>Hacquetia epipactis</i>					+		
<i>Levisticum officinale</i>		+					
<i>Myrrhis odorata</i>		++					
<i>Oenanthe crocata</i>		+					
<i>Petagnia saniculifolia</i>					+		
<i>Petroselinum crispum</i>		++					
<i>Smyrniolum perfoliatum</i>					+		
Urticaceae							
<i>Boehmeria macrophylla</i>				+			
<i>B. nivea</i>	+	+					
<i>Debregeasia longifolia</i>		+					
<i>Dorstenia contrajerva</i>			+				
<i>D. kyimbilaensis</i>		+					
<i>D. massonii</i>		+					
<i>D. psilurus</i>		+					
<i>Laportea moroides</i>		+					
<i>Myriocarpa longipes</i>		+					
<i>M. stipitata</i>		+					
<i>Pilea cadierei</i>				+			
<i>P. pubescens</i>				+			
<i>P. grandis</i>				+			
<i>Villebrunea eburnea</i>				+			
Valerianaceae							
<i>Valeriana arizonica</i>		+					
Velloziaceae							
<i>Vellozia splendens</i>		+					
<i>V. villosa</i>		+					
Verbenaceae							
<i>Baillonia juncea</i>		+					
<i>Callicarpa dichotoma</i>		+					
<i>Caryopteris incana</i>		+					
<i>Citharexylum spicatum</i>		+					
<i>Clerodendrum bakeri</i>			+				
<i>C. petasites</i>	+	+					
<i>C. thomsonae</i>		+					
<i>Lantana camara</i>		+					
<i>Petreaa volubilis</i>		+					
<i>Tectona grandis</i>			+				

TABLE 2 (cont.)

	F/C	C	C-P	I	S	R	Other
Violaceae							
<i>Corynostylis hybanthus</i>				+			
<i>Melicytus lanceolatus</i>				+			
<i>M. macrophyllus</i>				+			
<i>Viola arborea</i>				+			
<i>V. cornuta</i>				+			
<i>V. hallii</i>				+			
<i>V. labradorica</i>				+			
<i>V. lactiflora</i>				+			
<i>V. odorata</i>				+			
<i>V. pumila</i>				+			
<i>V. zoyisii</i>				+			
Vitaceae							
<i>Cissus amazonica</i>		+					
<i>C. oblonga</i>		+					
<i>C. striata</i>		+	*				
<i>Leea guineensis</i>		+	*				
<i>L. horrida</i>		+	*				
<i>L. macropus</i>		+	*				
<i>Tetrastigma harmandsii</i>		+					
<i>Vitis acuminata</i>		+	*				
<i>V. lanigera</i>		+	*				
<i>V. nitens</i>		+	*				
<i>V. rumicisperma</i>		+	*				
<i>V. tiliifolia</i>		+	*				
<i>V. voineriana</i>		+	*				
Winteraceae							
<i>Drimys winteri</i>					+		
Zingiberaceae							
<i>Aframomum melegueta</i>					+		
<i>Alpinia arctiflora</i>					+		
<i>A. caerulea</i>					+		
<i>A. officinarum</i>					+		
<i>A. racemifera</i>					+		
<i>Burbridgea schizocheila</i>					+		
<i>B. stenantha</i>					+		
<i>Costus afer</i>					+		
<i>C. claviger</i>					+		
<i>C. glaucus</i>					+		
<i>C. laevis</i>					+		
<i>C. leucanthus</i>					+		
<i>C. malorteanus</i>					+		
<i>C. speciosus</i>					+		
<i>C. tappenbeckianus</i>					+		
<i>Dimerocostus argenteus</i>					+		
<i>Hedychium coccineum</i>					+		
<i>Renealmia battenbergiana</i>					+		
<i>R. nicolaioides</i>					+		
<i>Zingiber cylindricum</i>					+		
<i>Z. officinale</i>					+		
Zygophyllaceae							
<i>Bulnesia arborea</i>		+					
<i>Porlieria hygrometrica</i>		+					
<i>Viscainoa geniculata</i>					+		

TAXONOMIC IMPLICATIONS

To assess the taxonomic implications of the survey requires a very wide knowledge of the whole of the Angiosperms, and the matter will require considerable time for thought and comparison. The following section comments briefly on some of the more obvious results.

In order to make comparisons easier, two simplifications are necessary: (a) flat or curved leaves occur apparently randomly throughout the whole of the survey, and are often associated with succulence; and (b) the conduplicate form of ptyxis is merely a variant of the conduplicate form, as can be seen in plants with palmately veined leaves (e.g. *Acer*, *Lavatera*, *Alchemilla*), in which there is a conduplicate fold along each of several main veins, and the two can be considered together. If flat or curved leaves are thus ignored as having possibly evolved from any of the other types, and conduplicate-plicate is regarded as a sub-type of conduplicate, then on the basis of the present evidence the following 104 families (55% of those studied) show only one kind of ptyxis:

Conduplicate (plus *conduplicate-plicate*): Aceraceae, Amaranthaceae (1 sp. only examined), Anacardiaceae, Annonaceae, Aristolochiaceae, Bignoniaceae, Bixaceae (1 only examined), Bombacaceae, Cappariaceae, Chloranthaceae (1 only examined), Cistaceae, Cneoraceae (1 only examined), Convolvulaceae, Corynocarpaceae (1 only examined), Cucurbitaceae, Cyperaceae, Desfontainiaceae (1 only examined), Diapensiaceae (1 only examined), Dilleniaceae, Dioscoreaceae, Dipterocarpaceae, Eupomatiaceae (1 only examined), Fagaceae, Garryaceae (1 only examined), Geraniaceae, Globulariaceae, Hamamelidaceae, Hippocastanaceae, Icacinaceae (1 only examined), Juglandaceae, Lardizabalaceae, Limnanthaceae (1 only examined), Magnoliaceae, Meliaceae, Melianthaceae, Monimiaceae, Myricaceae (1 only examined), Nyctaginaceae, Nyssaceae (1 only examined), Pandanaceae, Passifloraceae, Phylodraceae (1 only examined), Phytolaccaceae, Platanaceae, Polemoniaceae, Proteaceae, Rutaceae, Sabiaceae, Sapindaceae, Sapotaceae, Simaroubaceae, Smilacaceae, Solanaceae, Sterculiaceae, Theophrastaceae, Tropaeolaceae (1 only examined), Valerianaceae (1 only examined), Velloziaceae, Verbenaceae, Vitaceae.

Supervolute: Agavaceae, Alismataceae (1 only examined), Alstroemeriaceae, Aquifoliaceae, Araceae, Bromeliaceae, Butomaceae (1 only examined), Cactaceae (*Pereskia* only), Cannaceae (1 only examined), Cyanastraceae, Eucommiaceae (1 only examined), Flagellariaceae, Illiciaceae, Juncaceae, Lecythidaceae (1 only examined), Marantaceae, Marcgraviaceae, Musaceae, Pentaphylacaceae (1 only examined), Restionaceae (1 only examined), Winteraceae (1 only examined), Zingiberaceae.

Involute: Balsaminaceae, Cercidiphyllaceae (1 only examined), Hippocrateaceae, Nymphaeaceae, Plumbaginaceae, Rhizophoraceae (1 only examined), Saururaceae (1 only examined), Stachyuraceae, Staphyleaceae, Violaceae.

Revolute: Erythroxylaceae (1 only examined), Eucryphiaceae (1 only examined), Polygonaceae.

Other:—*Circinate*: Droseraceae; *Plicate*: Palmae; *Flat*: Asclepiadaceae, Calycanthaceae, Coriariaceae (1 only examined), Daphniphyllaceae (1 only

examined), Linaceae (1 only examined), Punicaceae (1 only examined), Salvadoraceae (1 only examined).

Among the uniform families, the Polygonaceae stands out as being the only large family to have consistently revolute leaves. Such leaves also occur in the small families Erythroxylaceae and Eucryphiaceae and in some Ericaceae, Labiatae, Compositae, Portulacaceae, Rosaceae, Rubiaceae, and Scrophulariaceae. The combination of an ochrea and revolute young leaves renders even very young plants of the Polygonaceae easily recognisable.

In the 83 families which show variability in ptyxis, some exhibit a correlation between the different states and infra-familial classification (whether at generic or higher level), while others, apparently, do not. Notes on some of these families are given below.

Actinidiaceae. *Saurauja* is conduplicate, *Actinidia* and *Clematoclethra* supervolute. This, perhaps, gives added weight to the recognition of the Sauraujiaceae as a separate family.

Amaryllidaceae. The occurrence of explicative leaves appears to be restricted to this family, occurring in some species of *Galanthus* and in *Phaedranassa chloracra*. The character has been used taxonomically for the division of the genus *Galanthus*. In Stern's monograph (*Snowdrops and Snowflakes*, 1956) three series are recognised: ser. *Nivales* (leaves flat, 6 spp.), ser. *Plicati* (leaves 'plicate', i.e. explicative, following the terminology employed here, 3 spp.) and ser. *Latifolii* (leaves 'convolute', i.e. supervolute, 6 spp.). It is unfortunate that the term 'plicate' has been used for this group: there is no doubt that the situation in *Galanthus* ser. *Plicati* is quite different from that occurring in palms or in *Curculigo*, to mention only other Monocotyledons which can be described as genuinely plicate.

Betulaceae. In this family *Ostrya virginiana* has supervolute leaves, whereas all the other species examined (belonging to *Alnus*, *Betula* and *Corylus*) have conduplicate-plicate leaves. The ptyxis is quite difficult to determine in the Betulaceae, so this difference may be more apparent than real.

Campanulaceae. This is a highly variable family as far as ptyxis is concerned, but the taxonomic distribution of the various patterns is not clear.

Caprifoliaceae. Another family showing great variability in ptyxis. The character has been used taxonomically in the large genus *Lonicera*. Rehder (*Manual of Cultivated Trees & Shrubs*, ed. 2, 1947) divides it into 2 subgenera, one of which, subgen. *Chamaecerasus* (i.e. subgen. *Lonicera*) is divided into several sections, on the basis of a number of characters including ptyxis—'leaves plane or carinate in veneration [i.e. ptyxis flat or conduplicate-flat]: sect. *Isoxylostium*; leaves convolute [i.e. supervolute] or involute: other sections (*Isika*, *Coeloxyllostium*, *Nintooa*). I have not been able to examine sufficient species of subgen. *Lonicera*, in particular of sect. *Isoxylostium*, to test the value of the character.

Celastraceae. In this family most species are involute, but a few species of *Euonymus* are supervolute. The variation within *Euonymus* appears to cut across the supraspecific classification of the genus as presented by Blakelock (*Kew Bull.* 2:210-290, 1951).

Combretaceae. Only a very small sample of this largely tropical family has been examined. Variation appears to correspond to the genera, *Combretum* having conduplicate, *Quisqualis* and *Terminalia* supervolute, leaves.

Commelinaceae. Both involute and supervolute leaves are found in this family, whose suprageneric classification is in a state of flux. However, the involute condition is very uncommon in Monocotyledons, so its occurrence here may be taxonomically significant.

Compositae. As might be expected, this family is highly variable as to ptyxis. The occurrence of many species with revolute leaves is notable, as this is the least frequent condition in the Dicotyledons. The genus *Celmisia* has species with either conduplicate or revolute leaves, but this variation does not appear to match up with the supraspecific classification (Allan, *Flora of New Zealand* 1:610-656, 1961); the possibility that some of the cultivated material is incorrectly named cannot be ruled out.

Cornaceae. The genus *Cornus* is variable, some species having conduplicate, others involute, leaves. The variation agrees reasonably well with Wangerin's classification [*Pflanzenreich* 41 (IV. 229), 1910], all the species of subgen. *Thelycrania* having the conduplicate condition, those of the other subgenera (*Benthamia*, *Microcarpia*) being involute. The one exception appears to be *C. walteri* (subgen. *Thelycrania* but leaves involute); again, the possibility of misidentification must not be overlooked.

Ericaceae. In the main, this family has supervolute leaves. The most important exception is the large genus *Rhododendron*, in which variation in the character is taxonomically significant, as was first pointed out by Bayley Balfour (*Notes R.B.G. Edinb.* 12:49, 1919) and then in much greater detail by Sinclair (*loc. cit.*, 19:267-271, 1937). Subgen. *Rhododendron* (consisting of the lepidote or scaly species) has leaves which are flat, curved or supervolute; the other subgenera (cf. Chamberlain & Cullen, *Notes R.B.G. Edinb.* 36: 105-126, 1977) have leaves which are revolute (it must be pointed out here that quite a number of lepidote *Rhododendrons* have leaves which are revolute when mature). The only exceptional species known is *R. pendulum*, in which the young leaves are clearly lepidote and revolute.

Gentianaceae. It is interesting that the two aquatic species of *Nymphoides*, which have leaves like those of *Nymphaea* spp., should also, like them, be involute—a type of ptyxis otherwise unknown in the Gentianaceae.

Gramineae. The grasses are divided between supervolute and conduplicate types; the conduplicate condition correlates with the keeling of the mature leaves, a character widely used as a diagnostic in grass classification.

Iridaceae. This family is almost entirely composed of species with conduplicate leaves which overlap each other at their bases in a characteristic way (equitant vernation). One species of *Iris* however, (and perhaps more), has supervolute leaves—the most frequently occurring condition in the Monocotyledons.

Leguminosae. This very large family appears to be uniformly conduplicate, except for a small group of genera and species in the Viciae. The supervolute ptyxis of *Lathyrus* has been noted by a number of workers (e.g. Kupicha, *Notes R.B.G. Edinb.* 32:249, 1973), and is confirmed by the present small sample. Kupicha (pers. comm.) tells me that the small genus *Vavilovia* also has supervolute leaflets, as do *Vicia biennis* and at least some variants of *V. faba*.

Malvaceae. The genus *Hoheria* with involute leaves is notable in this family, which usually has conduplicate or conduplicate-plicate leaves. Further observations on genera related to *Hoheria* are desirable.

Moraceae. The main interest in this family is the large genus *Ficus*: many species have supervolute leaves (exemplified by the familiar india-rubber plant), whereas some others are conduplicate. Examination of many more species is necessary before taxonomic conclusions can be drawn.

Myrsinaceae. *Maesa*, comprising subfam. *Maesoideae* has conduplicate leaves, whereas genera from other subfamilies have supervolute or involute leaves. The occurrence of both these types in the genus *Ardisia* perhaps warrants further investigation.

Paeoniaceae. The genus *Paeonia* is remarkably variable in its ptyxis; this apparent variability may in some cases be due to the complex nature of the division of the leaves, which renders observation difficult. All the herbaceous species examined, however, have supervolute leaves, the woody species accounting for all the rest of the variability.

Primulaceae. Ptyxis has long been known as an important character in this family, particularly in the large genus *Primula* (Wright Smith & Forrest, *Notes R.B.G. Edinb.* 16:1-50, 1928), in which two large groups, *Involutae* and *Revolutae* have been traditionally recognised. A more recent classification, (Wendelbo, *Arb. Univ. Bergen* No. 11, 1961) groups the species into 7 subgenera, of which two (*Sphondylia* and *Auriculastrum*) comprise the *Involutae*, the other five the *Revolutae*. In general terms, the character holds good, but I have not examined any material of subgen. *Auriculastrum* (sect. *Verticillatae* of Wright Smith & Forrest). R. B. Cain (*Bull. Alp. Gard. Soc.* 35:146, 1970), says that subgen. *Sphondylia* shows both involute and supervolute ptyxis, which is confirmed by the present survey, but that subgen. *Auriculastrum* is purely involute. The genus *Dionysia* (Wendelbo, *Arb. Univ. Bergen* No. 3, 1961) is also divided into sections using this feature, sect. *Dionysia* having flat or involute leaves and sect. *Anacamptophyllum* revolute leaves; this, too, is borne out by the present survey. The *Primulaceae* appears to be the only large, variable Dicotyledonous family in which conduplicate leaves are not found.

Ranunculaceae. A highly variable family, in which some genera are purely conduplicate, others purely supervolute. Both types are found in the large genus *Ranunculus*, and further observations may yield information of taxonomic value.

Rhamnaceae. Variability here seems to correspond largely with the genera, except in the case of the genus *Rhamnus*. Went (*Feddes Rep.* 65: 3-132, 1962) has split this genus into two, using ptyxis as one of the diagnostic characters, *Oreohertzogia* (including *Rhamnus imeretinus*) consisting of species with conduplicate-plicate leaves, *Rhamnus s.s.* of species with supervolute leaves.

Rosaceae. This large family has mainly conduplicate leaves or leaflets, but shows significant variation in several groups. In subfam. *Spiraeoideae*, *Spiraea* is supervolute, whereas the other genera are conduplicate. In the large genus *Prunus* (subfam. *Prunoideae*), the character has been traditionally used for the recognition of subgenera, sections, or even segregate genera (see, for example, Rehder, *Manual of Cultivated Trees and Shrubs*, ed. 2, 1947, and Browicz in Davis, *Flora of Turkey* 4:3-46, 1972). The present survey confirms these results. In subfam. *Maloideae*, *Malus*, *Pyrus* and *Chaenomeles*

show involute or supervolute ptyxis, whereas other genera, such as *Cotoneaster*, *Crataegus*, *Sorbus*, etc., are conduplicate. The woody species of *Potentilla* are noteworthy in having revolute leaflets.

Salicaceae. In this family, the genera differ in ptyxis, *Populus* having involute, *Salix* supervolute leaves.

Umbelliferae. In this large family, a number of genera have supervolute leaves, while the rest are conduplicate. This division conforms with no obvious taxonomic grouping, but the character may prove to be of some diagnostic value.

ACKNOWLEDGMENT

I would like to thank Miss R. M. Smith for drawing the figures.