

SMITHSONIAN INSTITUTION

Contributions from the United States National Herbarium
Volume 57: 1-172

Systematics and Biogeography of *Aralia* L. (Araliaceae):
Revision of *Aralia* Sects. *Aralia*, *Humiles*, *Nanae*, and
Sciadodendron

by

Jun Wen

Department of Botany
National Museum of Natural History
Washington, DC
2011

ABSTRACT

Wen, Jun. Systematics and Biogeography of *Aralia* L. (Araliaceae): Revision of *Aralia* Sects. *Aralia*, *Humiles*, *Nanae*, and *Sciadodendron*. *Contributions from the United States National Herbarium*, volume 57, 172 pages. This treatment provides a revision of four sections of *Aralia* L. (Araliaceae). It is the third and last of the *Aralia* monographic series by the author. The first was on *Aralia* sect. *Pentapanax* (Seem.) Wen (19 species, Wen 2002); and the second was on *Aralia* sect. *Dimorphanthus* (Miq.) Miq. (29 spp., Wen 2004). This revision treats *Aralia* sects. *Aralia* (14 spp.), *Humiles* (3 spp.), *Nanae* (1 sp.), and *Sciadodendron* (5 spp.). A taxonomic key to all sections of *Aralia* is provided. Species keys are provided for each of the three sections with multiple species. As typified by *Aralia fargesii* Franch., *Aralia* sect. *Anomalae* Harms is now placed in synonymy of *Aralia* sect. *Aralia*. *Aralia* sect. *Nanae* is the only monotypic section of the genus, consisting of *Aralia nudicaulis* L. Marchal's genus *Coudenbergia* is merged with *Aralia* sect. *Sciadodendron* in this study. Detailed descriptions on the morphology and ecology, illustrations, and distribution maps are provided for each taxon of the four sections (23 species). The phylogeny of *Aralia* based on sequences of the internal transcribed spacer (ITS) regions of nuclear ribosomal DNA and three chloroplast markers, including the *ndhF* gene, the *trnL-F* region, and the *atpB-rbcL* spacer, is presented. An early biogeographic radiation of *Aralia* is hypothesized. Taxa of *Aralia* sect. *Humiles* do not form a clade with those of the Asian *Aralia* sect. *Pentapanax*. These two sections were once treated as constituting the genus "*Pentapanax*," and they are shown here to be non-monophyletic and best treated as belonging to two different sections. *Aralia bahiana* J. Wen is herein described as a new species from Bahia, Brazil. *Aralia* sect. *Sciadodendron* is a new nomenclatural combination with the genus *Sciadodendron* as its basionym. The newly lectotypified names include (accepted names in boldface): *Aralia cachemirica* Decne., *A. californica* S. Watson, *A. californica* var. *acuminata* S. Watson ex Howell, *A. chilapensis* Sessé & Moc., *A. continentalis* Kitagawa, *A. cordata* Thunb., *A. edulis* Sieb. & Zucc., *A. fluminensis* Glaz., *A. henryi* Harms, *A. humilis* Cav., *A. pilosa* Franch., *A. pubescens* DC., *A. racemosa* L. var. *sachalinensis* Regel, *Megalopanax rex* Ekman ex Harms, *Pentapanax ulei* Harms, and *Sciadodendron excelsum* Griseb.

Key words: *Aralia*, *Aralia* sect. *Aralia*, *Aralia* sect. *Dimorphanthus*, *Aralia* sect. *Humiles*, *Aralia* sect. *Nanae*, *Aralia* sect. *Pentapanax*, *Aralia* sect. *Sciadodendron*, Araliaceae, biogeography, systematics.

DATE OF PUBLICATION: March 2011

Cover Design by Alice R. Tangerini: front *Aralia tibetana* G. Hoo illustrated by ART; back *Aralia bahiana* J. Wen illustrated by ART.

Contributions from the United States National Herbarium (ISSN 0097-1618) Department of Botany, National Museum of Natural History, MRC-166, Smithsonian Institution, Washington, DC, 20013-7012, USA.

POSTMASTER: Send address changes to Contributions from the U.S. National Herbarium, Department of Botany, National Museum of Natural History, MRC-166, P.O. Box 37012, Smithsonian Institution, Washington, DC, 20013-7012, USA.

The paper used in this publication meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials Z39.48—1984.

The periodical, Contributions from the United States National Herbarium, was first published in 1890 by The United States Department of Agriculture. From 1 July 1902 forward it was published as a Bulletin of the United States National Museum. The series was discontinued after volume 38 (1974), and has been revived with volume 39 (2000) as a venue for publishing longer taxonomic papers, checklists, floras, and monographs, produced by the staff and associates at the U.S. National Herbarium. It is externally peer reviewed, and published at irregular intervals. Subscription and other correspondence should be addressed to CUSNH, Department of Botany, National Museum of Natural History, MRC-166, Smithsonian Institution, Washington, DC, 20013-7012, USA e-mail: CUSNH@si.edu. The present issue is available for free while supplies last and PDF files of the most recent issues (vol. 49-present) of the *Contr. U.S. Natl. Herb.* are available at: <http://www.nmnh.si.edu/botany/pubs/CUSNH/> If you have any questions about manuscript submission or comments on previous volumes, please contact the editor, Paul M. Peterson (peterson@si.edu).

CONTENTS

INTRODUCTION	5
TAXONOMIC HISTORY	7
Generic concept and historical infrageneric classifications	7
<i>Aralia</i> from the New World	8
<i>Aralia</i> from the Old World	9
PHYLOGENETIC RELATIONSHIPS	10
MORPHOLOGICAL CHARACTERS	13
Habit	13
Underground systems	13
Prickles	13
Leaf architecture and morphology	13
Trichomes and vesture	13
Cuticles	13
Pedicel articulation	14
Inflorescence	15
Bracts and bracteoles	22
Flowers	22
Fruits	22
POLLEN MORPHOLOGY	22
CHROMOSOME NUMBERS	26
INFRAGENERIC CLASSIFICATION	28
I. <i>Aralia</i> sect. <i>Aralia</i>	28
II. <i>Aralia</i> sect. <i>Humiles</i>	28
III. <i>Aralia</i> sect. <i>Nanae</i>	28
IV. <i>Aralia</i> sect. <i>Pentapanax</i>	29
V. <i>Aralia</i> sect. <i>Sciadodendron</i>	29
VI. <i>Aralia</i> sect. <i>Dimorphanthus</i>	30
KEY TO SECTIONS OF ARALIA	31
REPRODUCTIVE BIOLOGY	31
SPECIES CONCEPTS	32
DISTRIBUTION AND BIOGEOGRAPHY	32
Early evolutionary radiation in <i>Aralia</i>	32
<i>Aralia</i> sect. <i>Aralia</i>	33
<i>Aralia</i> sect. <i>Humiles</i>	33
<i>Aralia</i> sect. <i>Sciadodendron</i>	33
TAXONOMY	34
ARALIA L. SECT. ARALIA	34
Key to species of <i>Aralia</i> sect. <i>Aralia</i>	35
1. <i>Aralia californica</i>	36
2. <i>Aralia racemosa</i>	42

3. <i>Aralia bicrenata</i>	68
4. <i>Aralia cordata</i>	73
5. <i>Aralia schmidtii</i>	77
6. <i>Aralia taiwaniana</i>	80
7. <i>Aralia continentalis</i>	83
8. <i>Aralia cachemirica</i>	87
9. <i>Aralia tibetana</i>	90
10. <i>Aralia fargesii</i>	94
11. <i>Aralia atropurpurea</i>	96
12. <i>Aralia apioides</i>	100
13. <i>Aralia glabra</i>	103
14. <i>Aralia henryi</i>	106
ARALIA SECT. NANAE	109
15. <i>Aralia nudicaulis</i>	109
ARALIA SECT. HUMILES	118
Key to species of <i>Aralia</i> sect. <i>Humiles</i>	118
16. <i>Aralia humilis</i>	118
17. <i>Aralia regeliana</i>	127
18. <i>Aralia scopulorum</i>	131
ARALIA SECT. SCIADODENDRON	133
Key to species of <i>Aralia</i> sect. <i>Sciadodendron</i>	134
19. <i>Aralia soratensis</i>	134
20. <i>Aralia warmingiana</i>	138
21. <i>Aralia rex</i>	142
22. <i>Aralia excelsa</i>	142
23. <i>Aralia bahiana</i>	149
EXCLUDED NAMES	151
ACKNOWLEDGEMENTS	151
LITERATURE CITED	152
ALPHABETICAL INDEX TO COLLECTORS	158
INDEX TO SCIENTIFIC NAMES	170
COLOR PLATES 1-16	49

Systematics and Biogeography of *Aralia* L. (Araliaceae): Revision of *Aralia* Sects. *Aralia*, *Humiles*, *Nanae*, and *Sciadodendron*

by

J. Wen¹

INTRODUCTION

Aralia L. is one of the approximately 50 genera of the predominantly tropical Araliaceae (or the ginseng plant family). The genus consists of 71 species and is the fifth largest in the Araliaceae (following *Schefflera* J. R. Forst. & G. Forst., *Polyscias* J. R. Forst. & G. Forst., *Oreopanax* Decne. & Planch., and *Dendropanax* Decne. & Planch.). *Aralia* plays an important role in understanding the diversification of Araliaceae because it represents most north temperate species of the family. Harms (1898) considered *Aralia* as one of the centers of diversity within Araliaceae and suggested that it played a critical role in leading to other lineages in Araliaceae and Apiaceae. Recent phylogenetic analyses of the core Araliaceae suggest that *Aralia* is closely related to *Panax* L. The *Aralia* – *Panax* clade constitutes one of the three major clades in the core Araliaceae (Wen et al. 2001; Plunkett et al. 2004). Within Araliaceae, *Aralia* and *Panax* are perhaps most closely related to *Polyscias*, *Pseudopanax* K. Koch, and their close relatives (Wen et al. 2001; Plunkett et al. 2004).

The phylogenetic position of *Aralia* in the Araliaceae and its relationship to *Panax* were variously hypothesized prior to modern phylogenetic analyses. Seemann (1868) treated *Aralia* and *Panax* in different tribes. Harms (1898) suggested a close relationship between *Aralia* and *Panax*. Emphasizing a single-character taxonomy, Hutchinson (1967) placed *Aralia* and *Panax* once again in different tribes. But this treatment has been criticized as “unnatural” (Hoo and Tseng

1978, p.178). On the other hand, some workers (e.g., Decaisne and Planchon 1854; Clarke 1879; Burkill 1902) treated *Panax* as a synonym of *Aralia*. Based on the 5-merous flowers and articulated pedicels, Harms (1898) and Eyde and Tseng (1971) suggested that *Stilbocarpa* (Hook. f.) Decne. & Planch. from New Zealand and adjacent islands may be closely related to *Aralia* and *Panax*. Vegetatively *Stilbocarpa* shares many similarities with some early-diverging lineages of Apiaceae. Mitchell et al. (1999) have shown that *Stilbocarpa* is nested in a clade of Apiaceae with *Azorella* and *Schizeilema* from the Southern Hemisphere, very distinct from any araliaceous genera.

As slightly modified from Wen (1993), *Aralia* is here defined by the following characters: 1-4-pinnately compound leaves, articulated pedicels, 5-12-merous flowers, imbricate aestivation, smooth seed surface, and smooth endosperm. Recent phylogenetic analyses have tested the *Aralia* generic concept, and major lineages or clades within *Aralia* have been delimited (Wen 2001a, also see Wen 2002, 2004). Species of *Aralia* are now classified into six sections (see Wen 2002, 2004) primarily based on characters including habit, presence/absence of prickles, leaf architecture, trichome types, and presence/absence of bracts at the base of the inflorescence. These sections are: *Aralia* sect. *Aralia* (14 spp.), sect. *Dimorphanthus* (29 spp.), sect. *Humiles* Harms (3 spp.), sect. *Nanae* Harms (1 sp.), sect. *Pentapanax* (Seem.) J. Wen (19 spp.), and sect. *Sciadodendron*

¹ Department of Botany, National Museum of Natural History, MRC-166, Smithsonian Institution, P.O. Box 37012, Washington, D.C. 20013-7012, U.S.A., wenj@si.edu

(Griseb.) J. Wen (5 spp.). Because of the large number of species involved, revisions of these sections have been published in three treatments. The present monograph of *Aralia* is the third and the last of the series (see Wen 2002 for the revision of *Aralia* sect. *Pentapanax*; and Wen 2004 for the treatment of *Aralia* sect. *Dimorphanthus*).

Aralia is widely distributed in different areas of Asia and the New World. Asia has relatively high species diversity for *Aralia* (57 of the 71 species), whereas only 14 species occur in the New World. The 57 Asian species belong to three sections (sect. *Aralia*, sect. *Dimorphanthus*, and sect. *Pentapanax*) with only sect. *Pentapanax* endemic to Asia; the other two sections are disjunct between Asia and North America. Despite the relatively low species diversity, the New World species of *Aralia* belong to five sections with three endemic to the New World (sect. *Humiles*, sect. *Nanae*, and sect. *Sciadodendron*) and two sections disjunct with Asia (sect. *Aralia* and sect. *Dimorphanthus*). The high species richness of *Aralia* in Asia is largely due to the greater number of species in two sections: sects. *Aralia* (11 out of 14 in Asia) and *Dimorphanthus* (27 out of 29 in Asia).

Aralia has a long taxonomic history (Wen and Reveal 1992). It was first reported from the New World by Cornut in 1635. Several species were introduced into cultivation in Europe in the 1600's and 1700's. Tournefort (1700) coined the name for the genus from the old French-Canadian name "aralie" (Fernald 1950). Several species of *Aralia* have been cultivated in various countries in Europe and Asia. Commonly cultivated *Aralia* species include: *A. cordata* Thunb., *A. elata* (Miq.) Seem., *A. cachemirica* Decne., *A. stipulata* Franch., and sometimes *A. spinosa* L., *A. racemosa* L., and *A. californica* S. Watson (also see Harms 1897; Rehder 1900; Wen 2002, 2004).

Systematic studies of *Aralia* provide a much-needed framework for further biogeographic studies, especially on the origin and development of the eastern Asian and eastern North American disjunct distribution, and the diversification of taxa within each of the two continents. Two sections of *Aralia* (sects. *Aralia* and *Dimorphanthus*) and their close relative *Panax* (Wen et al. 2001) are disjunctly distributed in eastern Asia and eastern

North America (Wen 1991; Wen and Zimmer 1996; Wen et al. 1998; Wen 1999, 2000a, 2001a). The disjunct distributions of congeneric plants between eastern Asia and eastern North America have fascinated botanists since the Linnaean period (e.g., Halenius 1750; Gray 1840, 1846, 1859, 1878; Hu 1935, 1936; Hara 1952, 1956, 1972; Li 1952, 1972; Graham 1972; Boufford and Spongberg 1983; Wu 1983; Tiffney 1985a, 1985b; Parks and Wendel 1990; Wen 1998, 1999, 2001b). Many studies have documented the disjunct distributional patterns in various taxa. Phylogenetic analyses have now been conducted for many plant genera or sections (see review in Wen 1999, 2001b; Manos and Donoghue 2001). Both molecular and fossil data suggest multiple origins of the disjunct pattern in the Tertiary (Tiffney 1985a, 1985b; Wen et al. 1996; Wen 1999; Xiang et al. 2000). Few studies, however, provide taxonomic treatments or monographs of genera that show this disjunct pattern.

With the completion of the revision of *Aralia* sect. *Pentapanax* (Wen 2002) and sect. *Dimorphanthus* (Wen 2004), the largest and most challenging yet-to-be monographed section is *Aralia* sect. *Aralia*. It consists of 14 species with three species in North America and eleven species in Asia, primarily in the Sino-Himalayan floristic region extending from eastern Russia southward to Taiwan, and from Japan westward to Kashmir, India and western Pakistan. Mainland China has relatively high species diversity, harboring six of the eleven Asian species (with *A. cachemirica*, *A. taiwaniana*, *A. cordata*, *A. glabra* and *A. schmidtii* excepted). *Aralia cordata* occurs throughout Japan, and *A. taiwaniana* is restricted to the mountains of central Taiwan. Species of the section form a monophyletic group with synapomorphies including ternately compound leaves.

This treatment includes a comprehensive revision of four sections of *Aralia* (sects. *Aralia*, *Humiles*, *Nanae* and *Sciadodendron*), with detailed documentation of the morphology, ecology, distribution, and uses of the 23 species belonging to these sections, presentation of a multigene phylogeny of *Aralia*, a synopsis of the classification of the genus, and discussions of the group's biogeographic diversification.

TAXONOMIC HISTORY

Generic concept and historical infrageneric classifications

Aralia (Araliaceae) consists of 71 species distributed in eastern and southeastern Asia and the Americas. *Aralia* is defined as those species of Araliaceae with pinnately to quadri-pinnately compound leaves, articulated petioles, 5-12-merous flowers, imbricate petals, and articulated pedicels (as modified from Wen 1991, 1993). Previous workers provided various infrageneric classifications of *Aralia* (e.g., Persoon 1805; Sprengel 1825; Blume 1826; de Candolle 1830; Decaisne and Planchon 1854; Miquel 1863; Harms 1896; Nakai 1927; Hoo and Tseng 1965). However, their systems are of limited value because of the problematic generic limits of *Aralia*, and the utilization of only one or two characters for infrageneric classification (see Wen 1993 for more detailed discussions). This current definition of *Aralia* recognizes the following synapomorphies: pinnately compound leaf architecture, presence of stipules, 5-12-locular ovaries, smooth seed surface, and flattened seeds. Its closest relative, the genus *Panax* possesses palmately compound leaves, absence of stipules, 2-4-locular ovary, rough seed surfaces, and non-flattened seeds.

Most early workers (e.g., Persoon 1805; Sprengel 1825; Blume 1826; de Candolle 1830) followed the broad Linnaean concept of *Aralia*, which stressed reproductive characters in defining the genus. It is now realized that floral characters are relatively conserved in Araliaceae (Philipson 1979; Wen et al. 2001) and the sole use of these characters is not effective in delimiting genera in the family. The Linnaean concept of *Aralia* had thus been abandoned by later workers (e.g., Miquel 1863; Seemann 1868; Li 1942; Hoo and Tseng 1978; Philipson 1979; Shang 1985b; Wen 1993).

Most previous systems of *Aralia* emphasized only one or two characters (e.g., Persoon 1805; Sprengel 1825; Blume 1826; de Candolle 1830; Decaisne and Planchon 1854; Nakai 1927; Hoo and Tseng 1965). Because different workers stressed different characters, their systems are very different. These systems resulting from the overemphasis on one or two characters are

apparently artificial and of limited predictive value.

Harms (1896) constructed his classification of *Aralia* based on several characters, but with an emphasis on inflorescence structure. The sections in Harms' system appear more natural than those in previous systems. Harms followed Miquel's (1863) generic concept of *Aralia*. Furthermore, Harms' sect. *Capituligerae* was established based only on its capitate inflorescences. This character appears to have evolved at least twice in *Aralia*: once in the *A. dasyphylla* and *A. urticifolia* complex, and a second time in *A. dasyphyloides*. *Aralia* sect. *Capituligerae* is thus not monophyletic, and Harms' system of the genus stands in need of revision.

Li and Xiang (1992) proposed a new classification of *Aralia*, in which two subgenera and eight sections were recognized. These workers circumscribed all herbaceous taxa in *Aralia* as constituting their new subgenus *Paralia* Shang & X. P. Li, and placed all woody, prickly members in subgenus *Aralia*. However, the treatment of the herbaceous members in a new subgenus is illegitimate because the type species of *Aralia*, *A. racemosa*, belongs to this group (cf. Wen et al. 1998). Subgenus "*Aralia*" sensu Li and Xiang (1992) is equivalent to Miquel's sect. *Dimorphanthus*. Li and Xiang (1992) proposed four new sections for *Aralia*: sects. *Undulatae* C. B. Shang & X. P. Li, *Glaucae* C. B. Shang & X. P. Li, *Echinatae* C. B. Shang & X. P. Li, and *Tomentosae* C. B. Shang & X. P. Li. These new sections were largely based on presence or absence of leaflet pubescence, leaflet margin, presence or absence of prickles on petioles and inflorescence, and presence or absence of tomentose or strigose pubescence. Our phylogenetic analysis suggests that none of the sections recognized by Li and Xiang is monophyletic (Wen 2004).

Wang and Hu (2001) proposed another classification of *Aralia*, in which two subgenera and six sections were recognized. Four of the sections are herein treated as synonyms of sect. *Dimorphanthus*. Two new sections described in Wang and Hu (2001) are illegitimate because they were based on type species of previously described sections. The type of sect. *Laxipaniculae* Z. Z. Wang was designated to be *A. spinifolia*, which is

also the type of sect. *Echinatae* C. B. Shang & X. P. Li (Li and Xiang 1992). *Aralia undulata* is the type for sect. *Undulatae* C. B. Shang & X. P. Li as well as for sect. *Glabrae* Z. Z. Wang.

Harms' (1896) classification of *Aralia* has been most influential. Hoo and Tseng (1965, 1978) basically followed Harms (1896), but split Harms' sect. *Arborescentes* into two sections based on slight differences in inflorescence structure.

Species of Harms' sects. *Anomalae* and *Genuinae* are similar: herbaceous, unarmed, branched, leaves tripinnate (on lower portion of stem) to pinnate (on upper portion of stem), flowers small, and inflorescence terminal and axillary. Harms established these two sections based on slight differences in inflorescence pattern, i.e., sect. *Anomalae* with umbellate overall inflorescence structure and sect. *Genuinae* with paniculate overall structure. It is now realized that intermediates exist between Harms' two "sections". *Aralia cordata* (sect. *Genuinae*) sometimes has an umbellate structure, and *A. fargesii* (sect. *Anomalae*) sometimes demonstrates a paniculate pattern of inflorescence. Our phylogenetic analysis suggests that species of *Anomalae* and *Genuinae* constitute a monophyletic group. Harms' sects. *Anomalae* and *Genuinae* are, therefore, combined here into one section, *Aralia*.

Marchal (1879a) regarded his *Coudenbergia* (monotypic then) as a close relative of *Aralia*, but differing from the latter by the former's 8-merous flowers (vs. 5-merous), the recurved oblong to linear anthers (vs. straight anthers), and concave floral disc with adnated edges (vs. conical to flat floral disc with free edges). These differences indeed hold true if *Coudenbergia warmingiana* is the sole member of the genus. However, there is little doubt that *Coudenbergia angelicifolium* and *C. ulei* (now as the synonym of *Aralia warmingiana*, which is the accepted name for *Coudenbergia warmingiana*) are very closely related and they should be treated as congeners. With the expanded concept of the *Coudenbergia* group, *Coudenbergia* and *Aralia* become hardly distinguishable. In terms of the number of floral parts, *Coudenbergia angelicifolium*, *C. ulei* and *C. warmingiana* are 5, 6, and 8-merous, respectively. Flowers of *Aralia* s. str. are 5-(6)-merous. Thus, based on floral parts, *Aralia* and *Coudenbergia* can not be well separated. The discovery of *Aralia weberbaueri* Harms made the limits between

Aralia and *Coudenbergia* even more indistinct. The floral structure of Harms' *Aralia weberbaueri* is very similar to that of the other *Aralia* species, with more or less distinct styles and 5-merous floral parts. But it has a conical to flat floral disc and is vegetatively very similar to the South American *Coudenbergia* species. Even Harms himself (1917) was not certain about his placement of this species in *Aralia* or in *Pentapanax* (Harms merged *Coudenbergia* with *Pentapanax* in his worldwide monograph of Araliaceae in 1898). He, thus, described it as *Aralia? weberbaueri*. In his original description, he presented the hypothesis that *Aralia weberbaueri* was an intermediate between *Aralia* and *Pentapanax* sensu Harms (as he treated *Coudenbergia* under the synonymy with *Pentapanax*). Because the difference between *Coudenbergia* and *Aralia* is minor and the intermediate forms are distinguishable, I treated *Coudenbergia* under synonymy with the Linnaean *Aralia* (Wen 1993). This treatment is now supported by phylogenetic data (Wen 2001a, 2002, 2004, this study).

Sciadodendron, a monotypic genus consisting of *S. excelsum* from Central America, the Caribbean to northern South America, was described as closely related to *Aralia*, but differing in its more numerous floral parts, more enlarged anthers, straight (vs. recurved) filaments, and non-articulated pedicels (Grisebach 1858; Gentry 1993; Wen 1993). Recent phylogenetic analysis using the ITS sequences of the nuclear ribosomal DNA (Wen 2001a) suggested that *Sciadodendron* is nested within *Aralia*. Wen (2002) formally merged it with *Aralia*.

***Aralia* from the New World**

Linnaeus (1753) accounted for three *Aralia* species from eastern North America: *A. nudicaulis*, *A. racemosa* and *A. spinosa*. The early history of these species was discussed in detail by Wen and Reveal (1992). Subsequently it was shown that they belong to three different sections. *Aralia nudicaulis* and *A. racemosa* are treated in this monograph, and *A. spinosa* was treated in Wen (2004). *Aralia californica* and *A. bicrenata* were later reported from the western part of North America and both species are members of sect. *Aralia* commonly compared with the eastern North American *A. racemosa* (Smith 1944).

The Sessé and Mociño expedition in 1787-1803 to Mexico and nearby regions resulted in the publication of eight species of *Aralia*: *A. chilapensis* and *A. pinnata* published in Sessé and Mociño (1888), and *A. fruticosa*, *A. lobata*, *A. longifolia*, *A. ovata*, *A. tuxtensis* and *A. sp.* in their *Flora Mexicana* (Sessé and Mociño 1894). Only their *A. chilapensis* and *A. pinnata* truly belong to the genus *Aralia* with both herein treated as the synonyms of *A. humilis*. The other six species belong to *Oreopanax* and *Dendropanax* (see McVaugh 2000).

Cavanilles (1797) described his *Aralia humilis* based on cultivated material from the Madrid Botanical Garden. In the original description, it was noted that it flowered every year in October and had fruits in 1792. McVaugh (2000) found no type material in the Sessé and Mociño Herbarium nor in the general Madrid herbarium. Most likely, the plant was grown from seeds collected in Mexico during the Sessé and Mociño Expedition. The other major expedition to Mexico at the time was the Malaspina Expedition, during which botanists Née and Haenke collected in western and central Mexico in 1791. Apparently Cavanilles' *Aralia humilis* was planted in the Madrid Botanical Garden earlier than 1791.

De Candolle's *Aralia pubescens* was described based on material growing in the Botanical Garden in Montpellier, France (De Candolle 1813). Later in his *Prodromus*, De Candolle (1830) also included *Aralia scabra* Presl ex DC. as a synonym of *A. pubescens*. Standley (1924) expressed uncertainty whether *A. pubescens* should be treated as a synonym of *A. humilis*. Smith (1944) defined *A. humilis* broadly and treated *A. chilapensis*, *A. pinnata*, *A. brevifolia*, *A. pubescens* and *A. scabra* as its synonyms.

Grisebach (1858) described *Sciadodendron* as a new monotypic genus from Panama, consisting of *S. excelsum*. It was regarded as a close relative of *Aralia*, but was differentiated from the latter by *Sciadodendron*'s 10-12-locular ovaries. Donnell Smith (1910) reported *Reynoldsia americana* from Peninsula Nicoya of Costa Rica. *Sciadodendron excelsum* and *Reynoldsia americana* were shown to be identical along with Rusby's (1920) *Pentapanax granatensis* (Harms 1928; Smith 1936). Wen (2002) merged *Sciadodendron* with *Aralia* and made the nomenclatural combination.

Marchal (1879a) described three species of

Aralia: *A. regeliana* and *A. brevifolia* from Mexico and *A. soratensis* from Bolivia. He also reported *Coemansia warmingiana* (= *Aralia warmingiana*) as a new species from Minas Gerais of Brazil.

Harms (1908) described *Pentapanax ulei* from Bahia, Brazil. This name was placed as a synonym of *Aralia warmingiana* by Wen (1993). Harms (1918) described *Aralia? weberbaueri* from Peru as a species very similar to *Aralia soratensis*. He also compared his new species with *Pentapanax angelicifolius* Griseb. from Argentina. He suggested that *A. soratensis* and *A. weberbaueri* were intermediates between *Aralia* and *Pentapanax*. Wen (1993) placed *A. weberbaueri* and *Pentapanax angelicifolius* as synonyms of *A. soratensis*, which has nomenclatural priority. Harms (1924) also reported Ekman's *Megalopanax rex* Ekman ex Harms, which was recently merged with *Aralia* (Wen 1993).

Standley (1924) recognized five species of *Aralia* from Mexico: *A. scopulorum*, *A. regeliana*, *A. humilis*, *A. pubescens*, and *A. racemosa*. His *A. racemosa* clearly represented *A. bicrenata*. He differentiated *A. pubescens* from *A. humilis* by the pubescence on the pedicels. He defined *A. humilis* as possessing glabrous pedicels.

Smith (1944) enumerated the North American species of Araliaceae and recognized the following eight species of *Aralia* from North America: *A. racemosa*, *A. californica*, *A. nudicaulis*, *A. spinosa*, *A. hispida*, *A. humilis*, *A. regeliana* and *A. scopulorum*. He also treated *Sciadodendron* and *Megalopanax* as distinct genera from *Aralia* because they have more numerous floral parts (7-12 vs 4-6). He distinguished *Sciadodendron* from *Megalopanax* by the former's nonarticulated pedicels and slightly divided styles (vs. articulated pedicels and firmly connate styles). *Aralia bicrenata* was placed as a synonym of *A. racemosa*.

***Aralia* from the Old World**

Species of *Aralia* from the Old World belong to three sections: *Aralia*, *Dimorphanthus* and *Pentapanax*. The latter two sections have been recently monographed and the taxonomic history of the species has been reviewed by Wen (2002, 2004). For regional interests, the readers are referred to Miquel (1840, 1856a, 1856b, 1857, 1863), Ridley (1922), Blume (1826), Blanco (1877), van Steenis (1948), Backer and Bakhuizen

van den Brink (1965), and Philipson (1951, 1977, 1979) for southeast Asia; Li (1942), Ho (1952), Hoo and Tseng (1965, 1978), Ling (1977, 1987), Shang (1985a, 1985b, Li and Xiang (1992), Huang (1993), Wen (1994), and Wang and Hu (2001) for China; Nakai (1927) and Lee (1993) for Korea; Ohwi (1984) for Japan; Wallich (1831-32), Don (1834), Clarke (1879), Mizushima (1966), and Wen et al. (2002) for the Himalayan region; and Bui (1964) and Ha (1974) for Indochina. The first Asian *Aralia* species was described by Linnaeus (1753) based on collections made by P. Osbeck near Canton, China (Bretschneider 1898; Hansen and Moule 1973), which was *Aralia chinensis* of sect. *Dimorphanthus*. Below I provide only a brief history of the taxonomic work of *Aralia* sect. *Aralia* in the Old World.

Thunberg (1784) described *Aralia cordata* of Japan, the first Asian species of sect. *Aralia*. The same species was later described as *A. edulis* and *A. nutans* by Siebold and Zuccarini (1837) and Franchet and Savatier (1878), respectively. Although *Aralia cordata* was mostly regarded as an endemic species to Japan earlier in its history (Thunberg 1784; Persoon 1805; De Candolle 1830; Don 1834; Miquel 1863; Franchet and Savatier 1875), a few workers thought that it also occurred in continental eastern Asia (e.g., Harms 1896; Nakai 1909; Li 1942). Kitagawa (1935) published *Aralia continentalis* based on specimens from Manchuria of northeastern China as well as Korea.

He noted differences between *A. cordata* and *A. continentalis* in overall inflorescence architecture, pedicel length, thickness and pubescence, and the conation of styles. The separation of the two taxa was first proposed in Russian literature according to Pojarkova (1973) and was accepted by a few later workers (e.g., Pojarkova 1950, 1973; Kitagawa 1979; Lee 1993). Hoo and Tseng (1978) somehow recognized both *A. continentalis* and *A. cordata* from China.

Matsumura (1899) reported *Aralia glabra*, the second recognized species of sect. *Aralia* from Japan based on collections made near Nikko. Harms (1896) described *A. henryi* from Central China with the specimen *A. Henry 6655* as the type. Franchet (1896) reported his *A. pilosa* from Central China, also citing *A. Henry 6655* as one of the two syntypes. Franchet's name appeared one day later than Harms' (September 16 vs. 15, 1896) and the species is thus recognized as *A. henryi*. In the same paper, Franchet (1896) described two additional species of sect. *Aralia*: *A. atropurpurea* and *A. fargesii* from China.

Hoo and Tseng (1965) described *A. tibetana* from Tibet, China. The species was later recorded to occur also in India and Nepal (Wen et al. 2002). Liu and Lu (1976) described *A. taiwaniana* from Central Taiwan. Other Asian taxa of the section include *A. schmidtii* (Pojarkova 1950) and *A. cachemirica* from the Himalaya (Decaisne 1844).

PHYLOGENETIC RELATIONSHIPS

A phylogenetic analysis is herein presented to help identify and test main evolutionary lineages within *Aralia*. The sampling includes 48 species of Araliaceae, representing all previously recognized sections of *Aralia*, its close relative *Panax*, and representatives of the *Polyscias* clade. The *Polyscias* clade was hypothesized to be closely related to the *Aralia-Panax* clade. Five species of the Asian core Araliaceae clade (see Wen et al. 2001) were included as outgroups. A detailed phylogenetic analysis of the *Aralia-Panax* clade will be published in a separate paper (J. Wen, in prep.). Herein I outline only the main findings.

Phylogenetic analyses were based on four molecular markers: the internal transcribed spacer (ITS) regions of nuclear ribosomal DNA and three chloroplast markers including the *ndhF* gene, the *trnL-F* region, and the *atpB-rbcL* spacer. The analyses were performed with PAUP* (version 4.0, Swofford 2003) using heuristic searches with MULPARS and furthest addition sequence options. Clade support for monophyletic groups revealed in the maximally parsimonious tree(s) (MPTs) was examined with 500 bootstrap replicates (Felsenstein 1985) with the random addition and the heuristic search options using parsimony.

The parsimony analysis generated 816 MPTs with a total length of 1389 steps, a consistency index of 0.69 (0.54 excluding uninformative characters), and a retention index of 0.73. The strict consensus tree with bootstrap support and the 50% majority-rule consensus tree are presented in Figs. 1 and 2, respectively.

The phylogenetic analysis supports a close relationship between *Aralia* and *Panax* with 100% bootstrap support. Within *Aralia*, six major

lineages are recognizable, and these six groups corresponding to the currently recognized sections of the genus (Figs. 1 and 2). The monotypic sect. *Nanae* (*A. nudicaulis* of North America) is herein suggested to be most closely related to the New World endemic sect. *Humiles*. Xiang and Li (1990) merged *Aralia scopulorum* of New World sect. *Humiles* with the Asian sect. *Pentapanax*, and this analysis does not support the monophyly of the sect. *Pentapanax* – sect. *Humiles* group (Figs. 1-

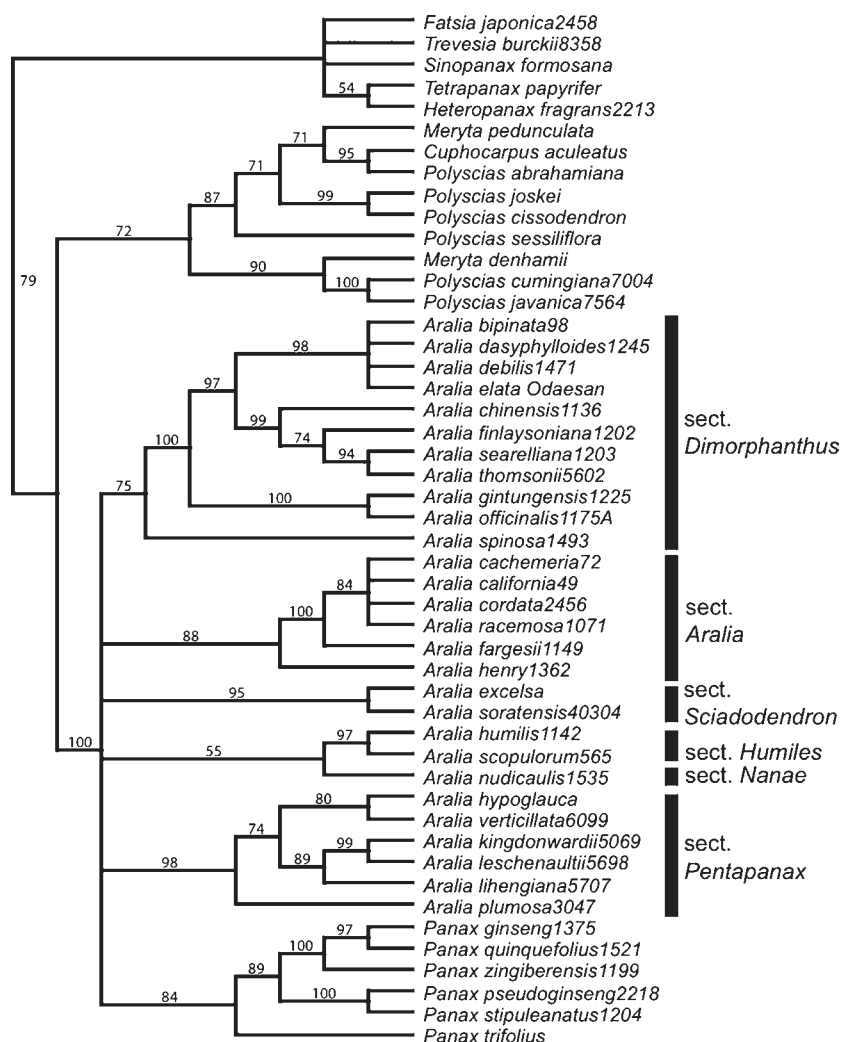


Fig. 1. Strict consensus tree of maximum parsimony analysis of *Aralia* and its close relatives based on sequences of the internal transcribed spacer (ITS) regions of nuclear ribosomal DNA and three chloroplast markers including the *ndhF* gene, the *trnL-F* region, and the *atpB-rbcL* spacer (816 maximally parsimonious trees, a total length of 1389 steps, a consistency index of 0.69, and a retention index of 0.73). The bootstrap support of 500 replicates is indicated above the clades.

2). Nevertheless the relationships among the six sections of the genus are still poorly resolved. Additional molecular markers will be employed

to resolve the relationships among the major lineages.

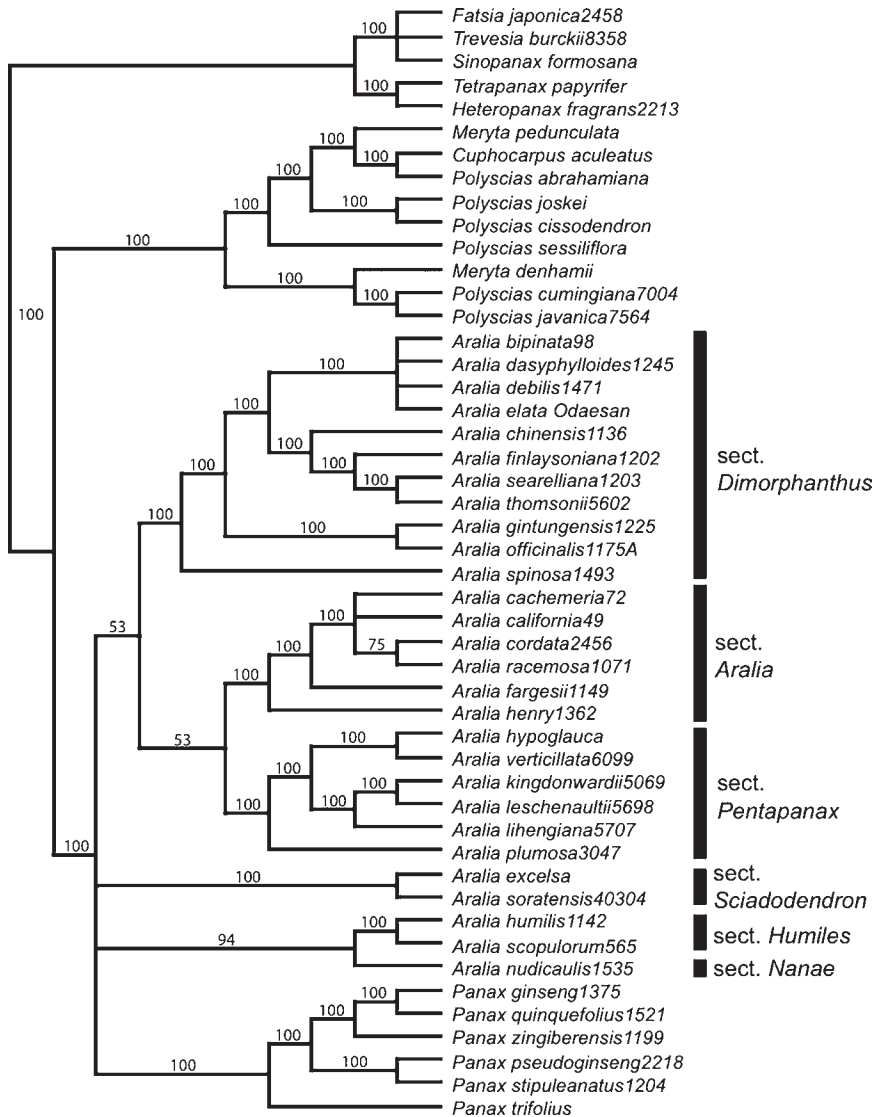


Fig. 2. The 50% majority-rule consensus tree of the parsimony analysis of *Aralia* and its close relatives based on sequences of the internal transcribed spacer (ITS) regions of nuclear ribosomal DNA and three chloroplast markers including the *ndhF* gene, the *trnL-F* region, and the *atpB-rbcL* spacer (816 maximally parsimonious trees, a total length of 1389 steps, a consistency index of 0.69, and a retention index of 0.73).

MORPHOLOGICAL CHARACTERS

This section is intended to discuss the variation of the characters used to delimit taxa; and to define the characters used in the descriptions and keys.

Habit

Aralia species are perennial herbs, shrubs or trees. Species of *Aralia* sect. *Aralia* are perennial herbs. *Aralia nudicaulis* of sect. *Nanae* has been described as being herbaceous, yet it has an extensive underground rhizome system and is thus essentially woody. Members of *Aralia* sect. *Dimorphanthus* consist of shrubs, treelets or trees, occasionally woody climbers, or semishrubs (i.e., herbaceous with a woody base). *Aralia* sect. *Pentapanax* often has epiphytic members. Species of sect. *Sciadodendron* are often trees or sometimes large shrubs, whereas members of sect. *Humiles* are often shrubs to sometimes small trees.

Underground systems

Aralia nudicaulis (sect. *Nanae*) is highly clonal with branched horizontal rhizomes. Most species of sect. *Aralia* have rhizomes and well-developed roots. Some species of *Aralia* sect. *Dimorphanthus* have been observed to form large clones (e.g., *Aralia elata*, *A. hispida*, *A. spinosa*, and *A. stipulata*), and it is presumed that they possess rhizomes. This character has not been used taxonomically, because most species have not been well documented for their underground features.

Prickles

All members of *Aralia* sect. *Dimorphanthus* bear prickles on their stems. The presence of prickles is herein regarded as a synapomorphy of the section (Wen 2004). Taxa of other sections are unarmed.

Leaf architecture and morphology

Leaf architecture is considered to be taxonomically useful in *Aralia*. *Aralia* sect. *Aralia* and sect. *Nanae* have ternately compound leaves. Leaves of sect. *Dimorphanthus* have mostly

bipinnate, but sometimes 3- or rarely 4-pinnate leaves. *Aralia* sect. *Sciadodendron* usually has 3- or 4-pinnate leaves. *Aralia* sect. *Humiles* and sect. *Pentapanax* usually have pinnate to bipinnate (rarely 3-pinnate) leaves. Taxa with 2-4-pinnate leaves usually have a pair of accessory leaflets or pinnae at each division of the rachis (see Fig. 1 in Wen 2004).

Trichomes and vesture

Vesture is taxonomically useful in *Aralia*. The terminology used in this revision follows Lawrence (1951), Harrington and Durrell (1957), and Stearn (1983), and is defined as below (examples refer to the abaxial leaflet surface if not specified otherwise): *ciliate*, margins with soft hairs; *pilose*, with sparse slender soft hairs; *pubescent*, with short soft straight hairs (e.g., in *A. thomsonii*); *scabrous*, with short, coarse, stiff white hairs, usually with a slightly swollen base, rough to touch (e.g., on the adaxial leaflet surface of *A. atropurpurea*); *tomentose*, with dense, more or less interwoven, short soft hairs (e.g., *A. dasyphyloides*). Vesture is usually regarded as useful in differentiating species, but less so phylogenetically because of uncertainty in establishing transformation series.

The trichome types in *Aralia* may be roughly grouped into four types: (1) branched (Fig. 3A, e.g., on lower leaf surface of *A. humilis*); (2) long and soft (Fig. 3B, e.g., in *A. nudicaulis*); (3) biseriate (Fig. 3C, e.g., in *A. racemosa*, and *A. cordata*); and (4) multiseriate (Fig. 3D, e.g., in *A. elata*). Also see Figs. 4-8 for detailed illustrations of trichome morphology of *Aralia apioides*, *A. atropurpurea*, *A. cordata*, *A. racemosa*, and *A. humilis*.

Cuticles

Two main cuticular patterns were reported on the abaxial leaflet surface in members of sect. *Dimorphanthus*: (1) striate, and (2) coronulate (see Wen 2004). This terminology follows Hardin and Beckmann (1982). The coronulate pattern is found only in *Aralia* sect. *Dimorphanthus*, including in the following species: *A. bipinnata*, *A. dasyphyloides*, *A. debilis*, *A. decaisneana*, *A. elata*,

A. gintangensis, *A. officinalis*, *A. spinosa*, *A. stipulata*, and *A. undulata*. The abaxial surface of all other *Aralia* species is striate, suggesting the coronulate pattern as the derived character state in the genus. The adaxial leaflet surface has the striate cuticle pattern throughout the genus *Aralia* (Figs. 9-10).

Pedicle articulation

Pedicle articulation has been regarded as an important taxonomic character in Araliaceae. In *Aralia*, there is a secondary loss of pedicle articulation in *A. excelsa* and its close relative, *A. bahiana*, a new taxon reported in this study.

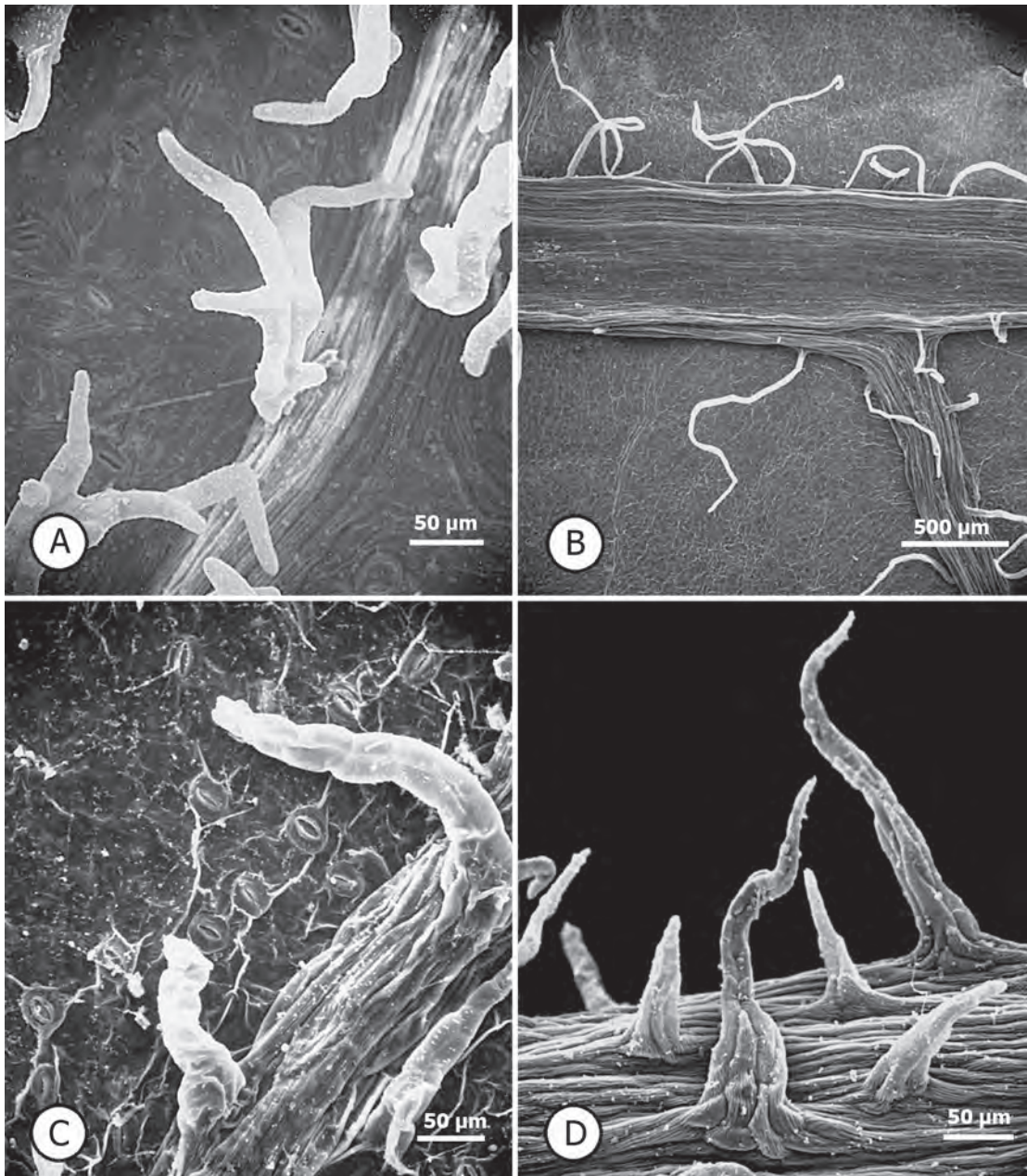


Fig. 3. Trichome types on lower leaflet surface in *Aralia*: A. Branched (*A. humilis*). B. Long and soft (*A. nudicaulis*). C. Biseriate (*A. racemosa*). D. Multiserial (*A. elata*).

Inflorescence

The presence or absence of a main inflorescence axis was in the past considered to be important taxonomically in *Aralia* (Harms 1896; Hoo and Tseng 1965). Harms (1896) used this character to distinguish two sections: sect. *Genuinae* (= sect. *Aralia*) with a well-developed main axis, and sect. *Anomalae* without a main axis. Hoo and Tseng (1965) employed this character to

differentiate sect. *Arborescentes* Harms (synonymous with sect. *Dimorphanthus*, characterized by having a main axis) from sect. *Digitatipanicula* Hoo (without a main axis). In contrast to Harms (1896) and Hoo and Tseng (1965), I regard the presence or absence of a main inflorescence axis as significant only at the species level, and so it is not used here to delimit sections (also see Wen 2004). Several species (e.g., *Aralia fargesii*) show an intermediate inflorescence

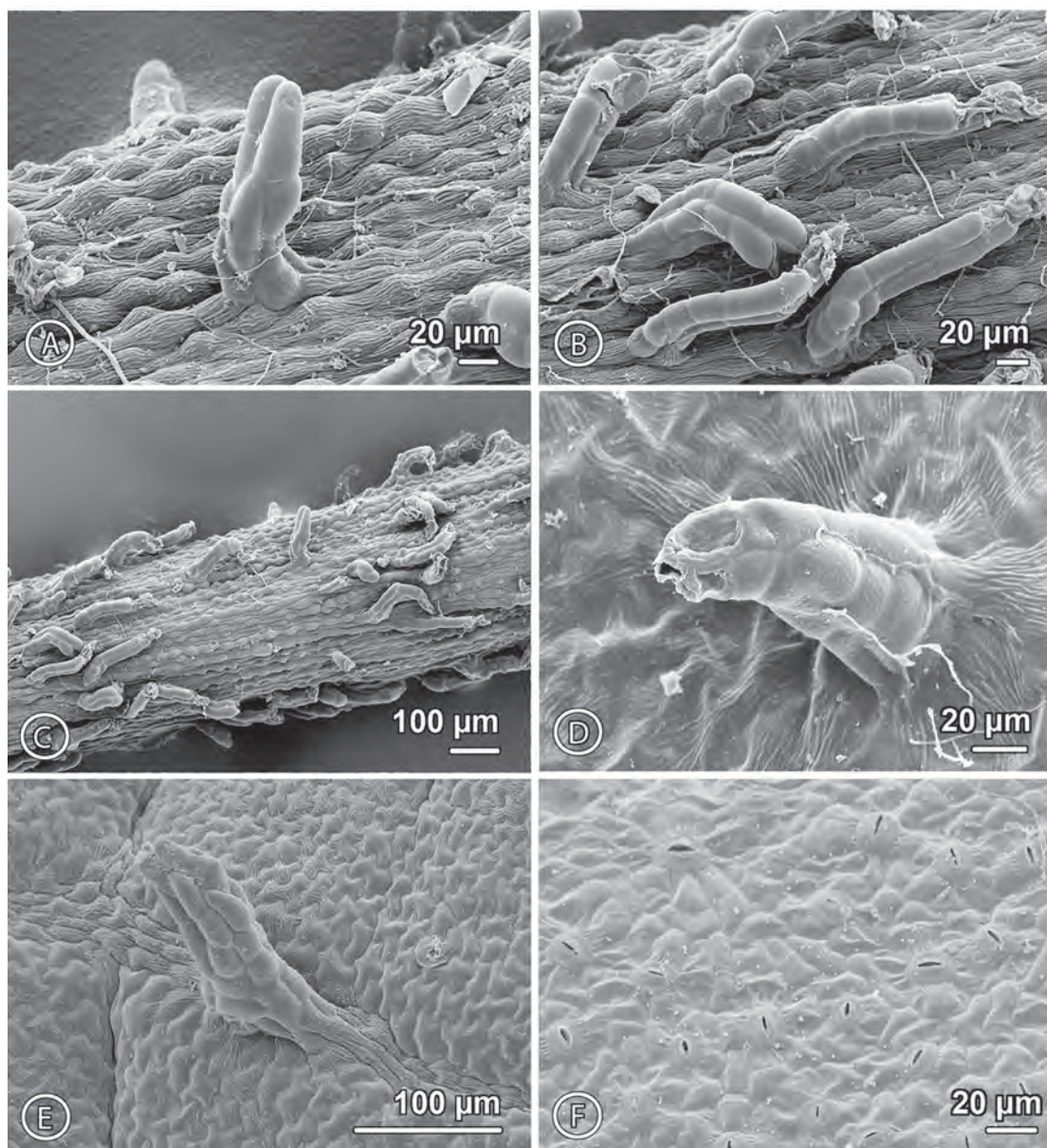


Fig. 4. Epidermal characters of *Aralia apioides*: A-C. Trichomes on pedicels. D. Trichome on lower leaflet surface. E. Trichome on upper leaflet surface. F. Stomates on lower leaflet surface (Wen *et al.* 1241, US).

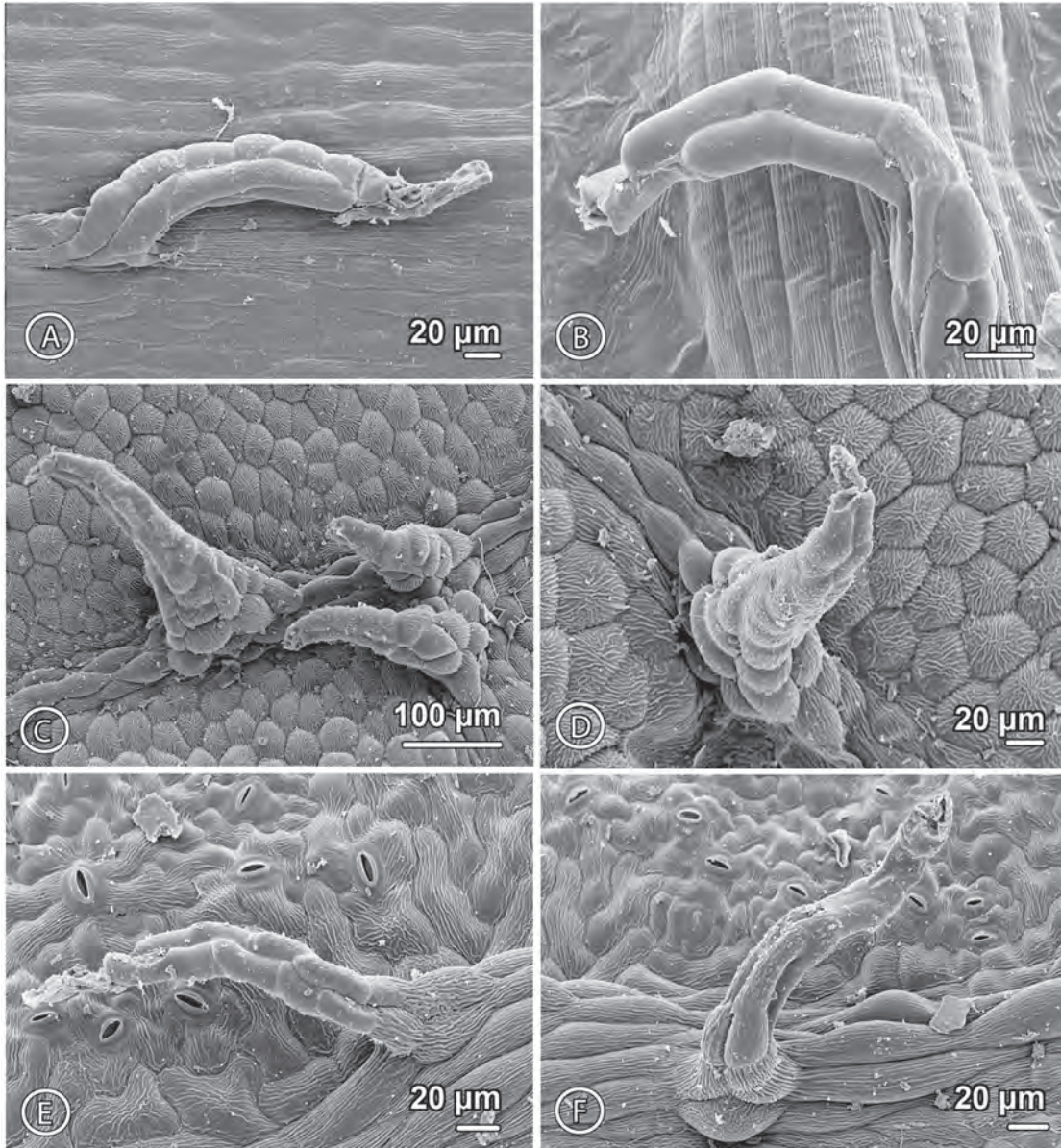


Fig. 5. Epidermal characters of *Aralia atropurpurea*: A&B. Trichome on pedicels. C&D. Trichomes on upper leaflet surface. E&F. Trichome on lower leaflet surface (Wen *et al.* 926, US).

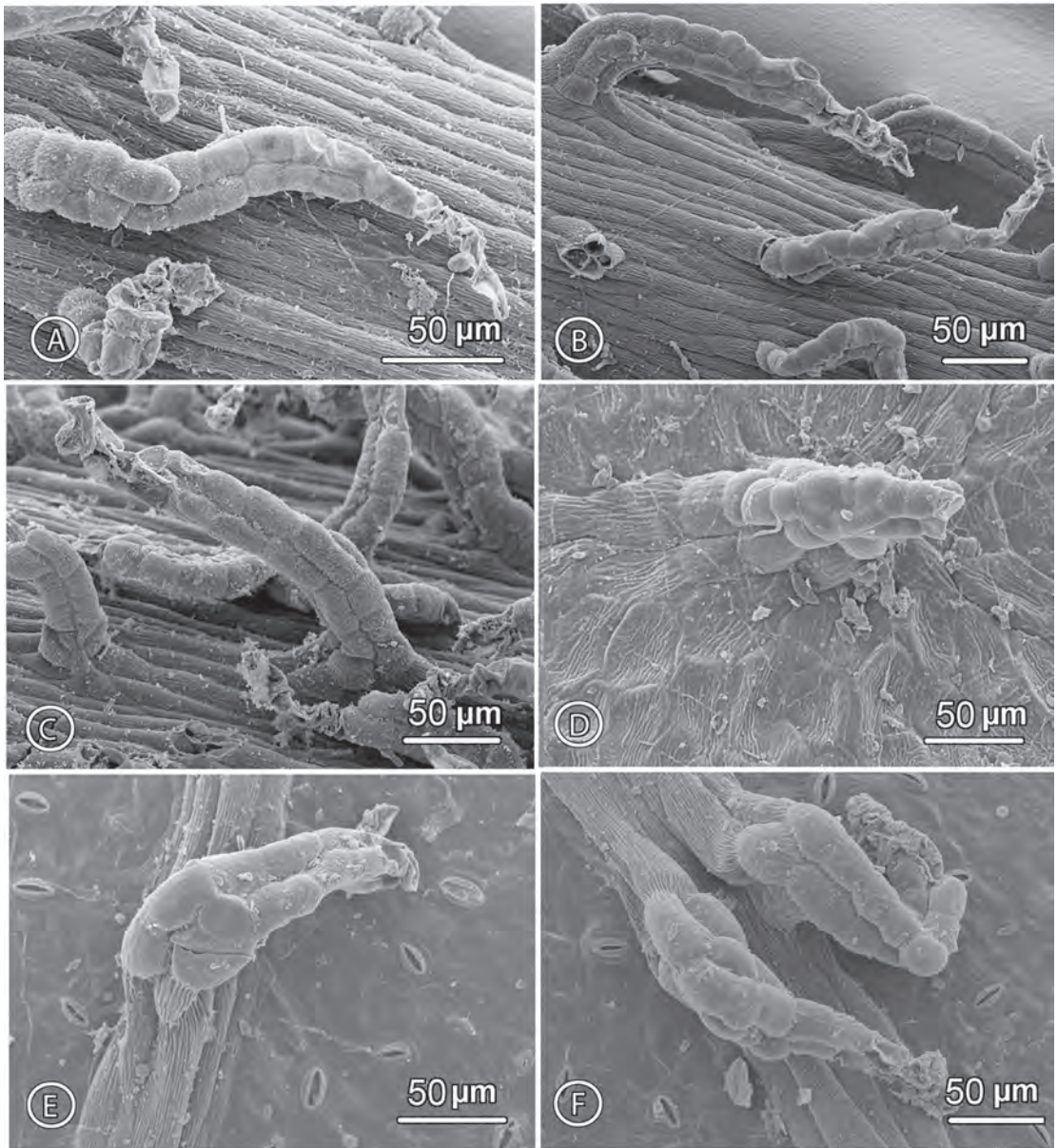


Fig. 6. Epidermal characters of *Aralia taiwaniana*: A&B. Trichomes on pedicels. C. Trichomes on lower leaflet vein. D. Trichome and cuticle on upper leaflet surface. E. Trichome on lower leaflet surface. F. Trichomes and stomates on lower leaflet surface (Wen 9424, US).

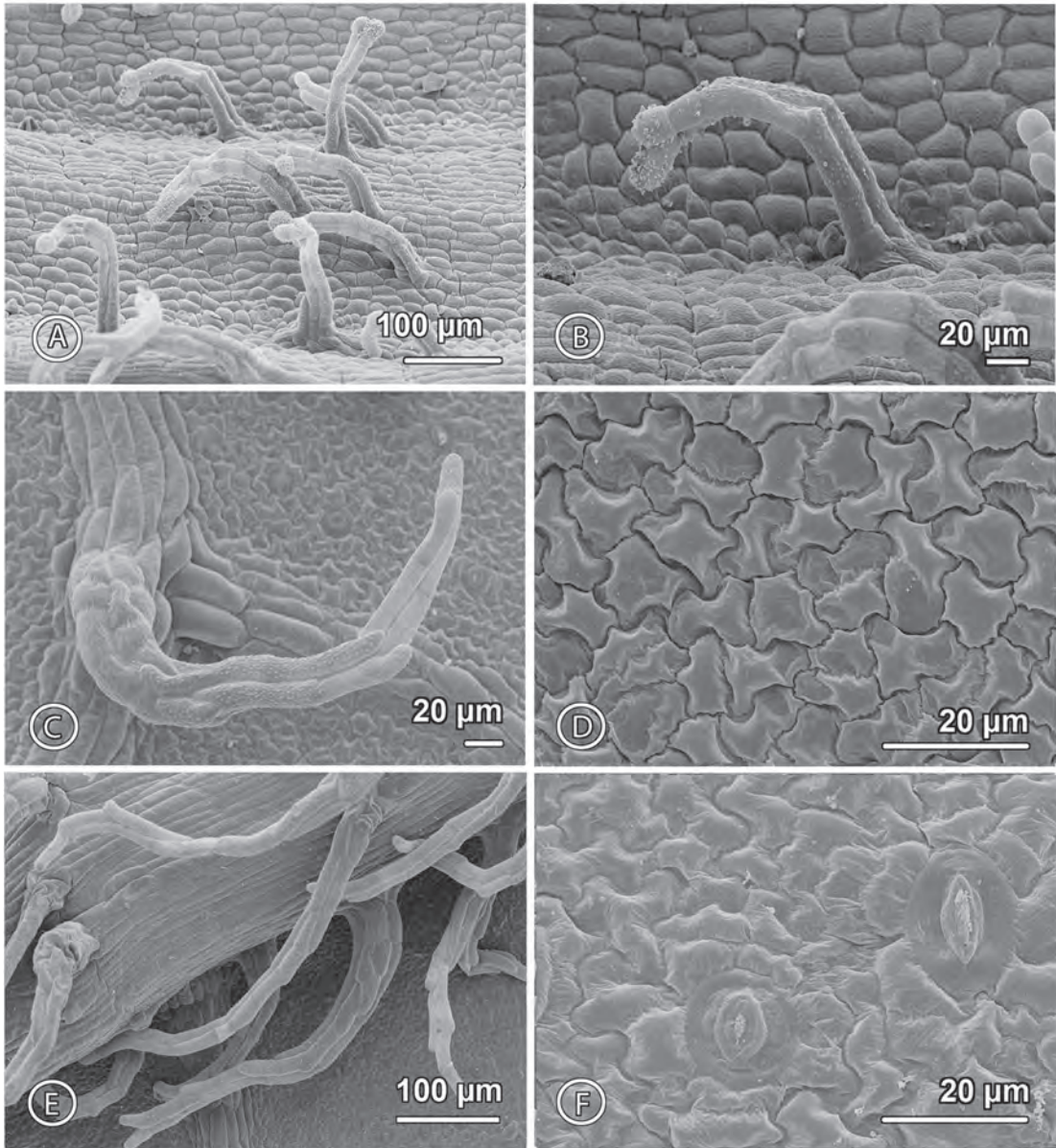


Fig. 7. Epidermal characters of *Aralia racemosa*: A&B. Trichomes on leaf petiole. C&D. Trichome on upper leaflet surface. E&F. Trichomes, cuticle and stomates on lower leaflet surface (Wen 9697, US).

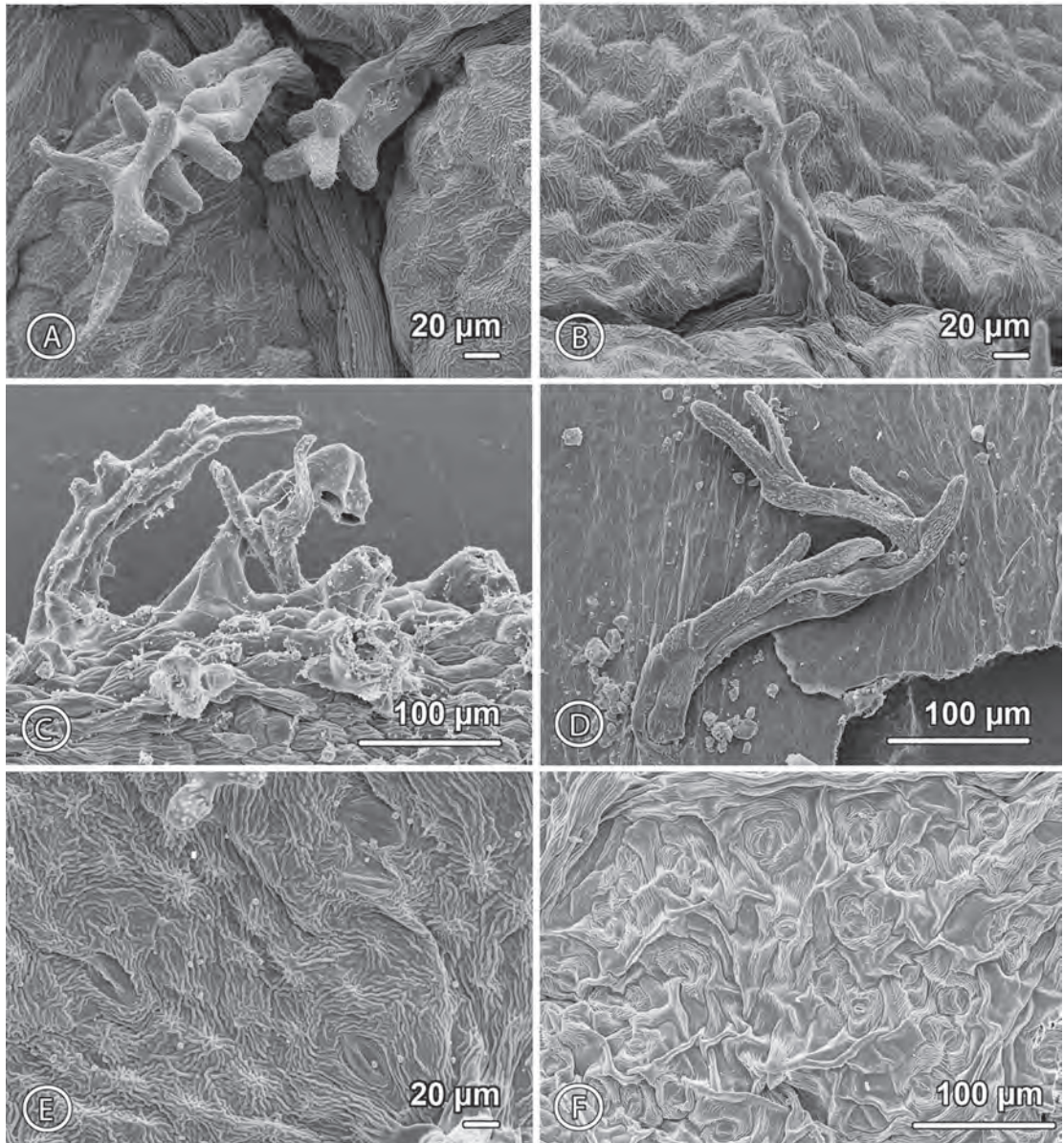


Fig. 8. Epidermal characters of *Aralia humilis*: A. Trichomes on lower leaflet surface. B-D. Trichomes on upper leaflet surface. E. Cuticle on upper leaflet surface, noting the presence of stomates. F. Cuticle and stomates on lower leaflet surface.

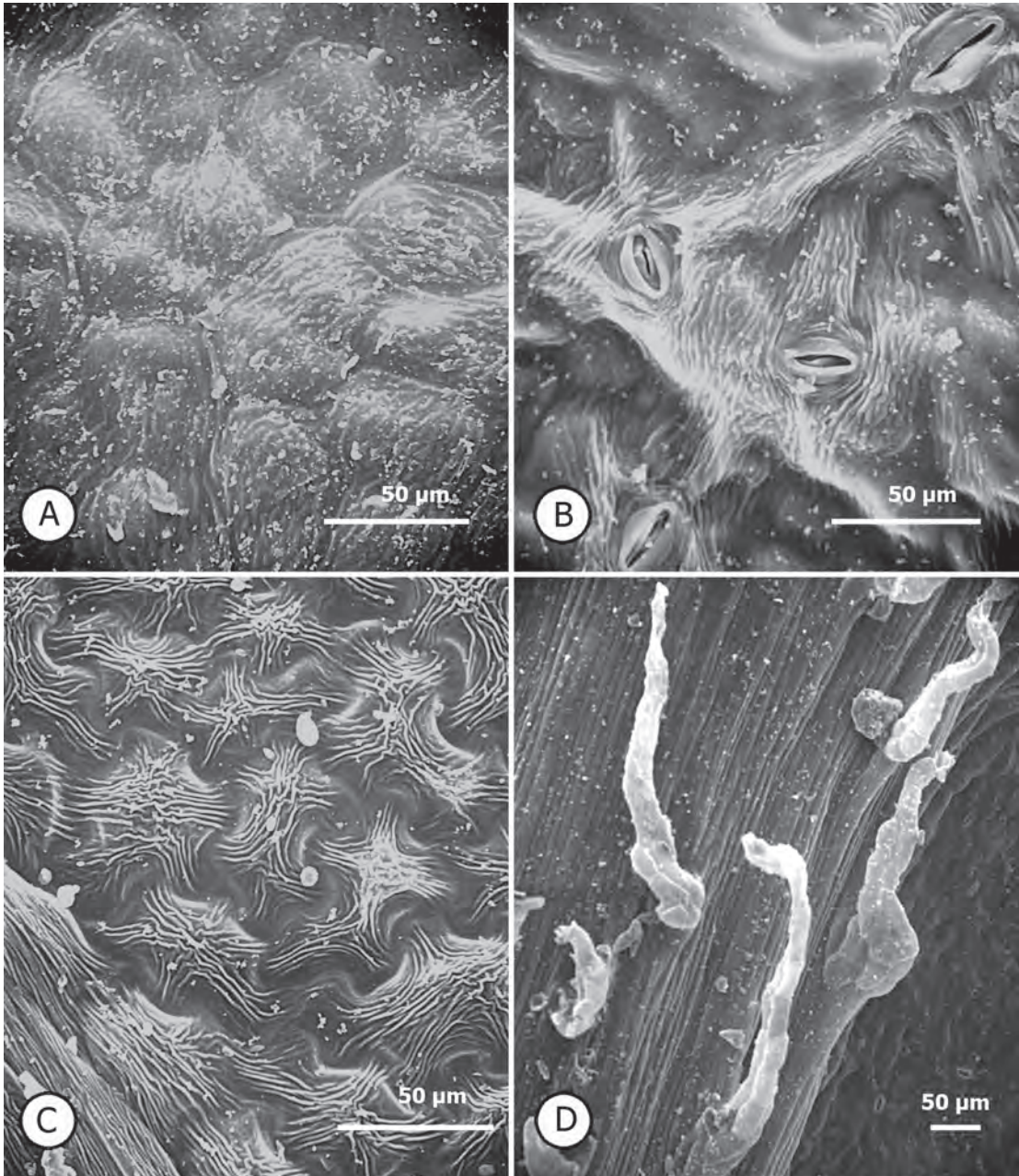


Fig. 9. Variation of striated type of leaf cuticles: A. *Aralia soratensis*, upper surface. B. *A. soratensis*, lower surface. C. *A. racemosa*, upper surface. D. *A. racemosa*, lower surface midvein with trichomes.

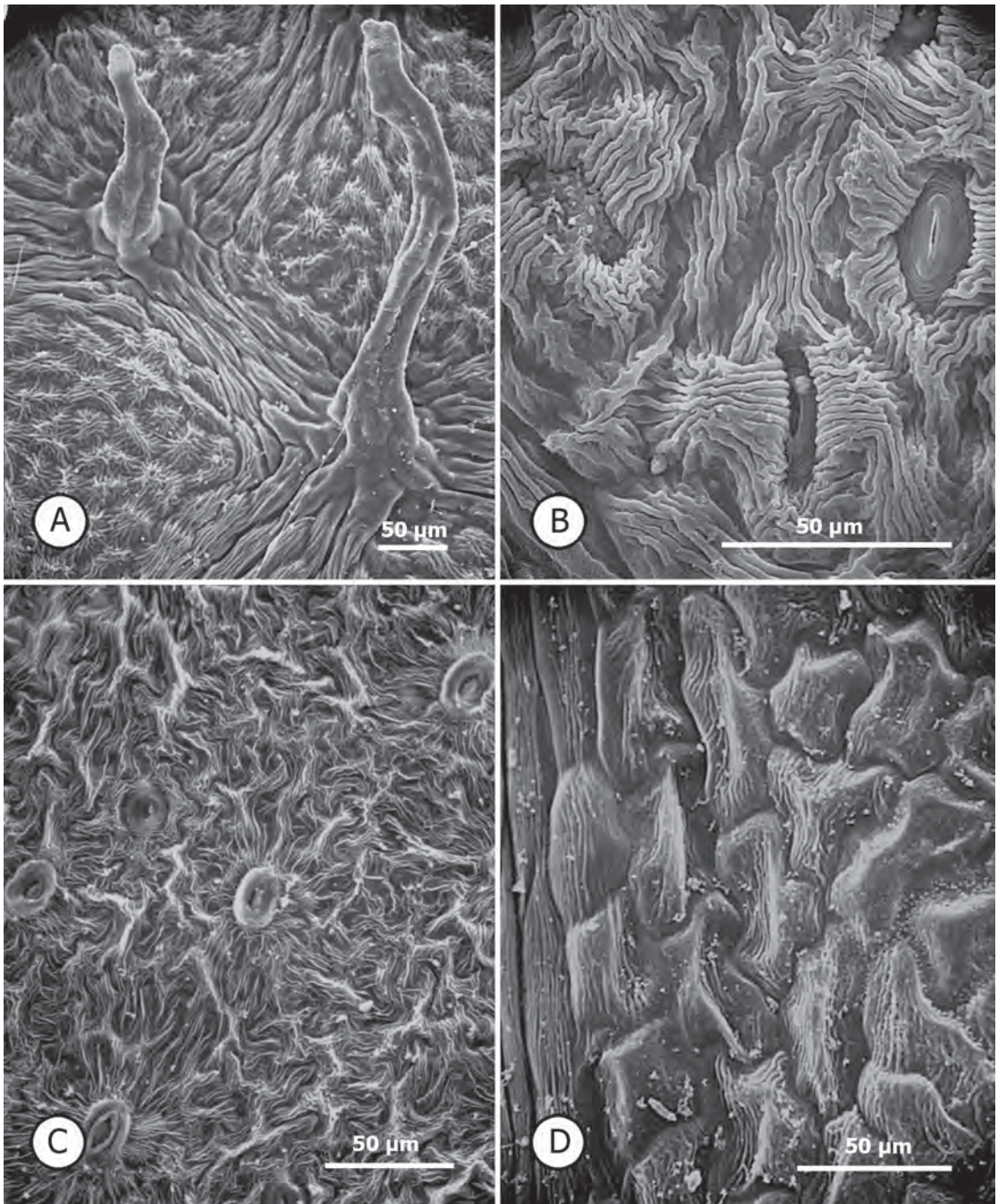


Fig. 10. Variation of striated type of leaf cuticles: A. *Aralia humilis*, upper surface. B. *A. humilis*, lower surface. C. *A. nudicaulis*, lower surface. D. *A. nudicaulis*, upper surface.

architecture between the two extreme conditions.

Bracts and bracteoles

The size, shape, pubescence and persistence of bracts and bracteoles in the inflorescence are useful for delimiting taxa in *Aralia*.

Flowers

Floral morphology is relatively constant in *Aralia* as well as it is throughout Araliaceae (Eyde and Tseng 1971; Wen 2004). Most species of *Aralia* possess 5 minute triangular to rounded sepals, 5 petals that are ovate or nearly so, 5 stamens, 5-locular ovaries, and styles that are distinct or connate at the base. *Aralia* sect. *Sciadodendron* shows more variation in floral parts, ranging from having 5-merous to 10- or even 12-merous flowers. *Aralia nudicaulis* and *A. scopulorum* occasionally have 6-merous flowers with the predominant condition of being 5-merous. The condition with more than five petals appears to represent secondary increase. In *Aralia excelsa* of sect. *Sciadodendron*, the author observed the later developmental split of 4-5 petals into 8-10 separate petal units.

Filament length shows interspecific variation in most cases. In the dioecious *Aralia nudicaulis*, the male flowers have significantly longer filaments than the female flowers.

The division of styles is useful to differentiate taxa. Species in *Aralia* have completely free or distinct styles (e.g., in *A. nudicaulis*) to nearly completely united styles (e.g., in *A. excelsa*).

Shape of the floral disc may prove to be taxonomically and/or phylogenetically significant. In sect. *Aralia*, *A. atropurpurea* has a projected floral disk, whereas *A. californica* has a flat floral disk. In sect. *Dimorphanthus*, some species such as *A. armata*, *A. bipinnata*, *A. chinensis*, *A. dasyphylloides*, *A. malabarica*, *A. searelliana* and *A. spinifolia* have projected floral discs, whereas in other species (such as *A. foliolosa*), they are flat. This character may be important for differentiating closely related species, but it clearly varies within sections.

Fruits

Fruit size and shape may be used to differentiate species. Most *Aralia* species have dark purple to blackish fruits. *Aralia henryi* is the only taxon of the genus possessing bright red fruits.

POLLEN MORPHOLOGY

Aralia L. — Pollen mostly subprolate in equatorial view, triangular to rounded triangular in polar view; 3-colporate, the colpal margins incurved, sometimes with a colpal ridge, costa ectocolpi variable, from poorly developed (*A. californica*, *A. humilis*) to more prominent (*A. leschenaultii*, *A. nudicaulis*); the endoaperture mostly lalongate, frequently with diffuse lateral margins (*A. hispida* excepted), costa endocolpi variable, small but sharply delimited (*A. californica*) to more prominent (*A. leschenaultii*); the tectum variable, complete, and punctate, incomplete, and finely reticulate with perforations larger at the poles (*A. spinosa* and other taxa in sect. *Dimorphanthus*), incomplete and perforate to irregularly perforate, or weakly striato-reticulate (most species in sects. *Aralia*, *Humiles* and *Pentapanax*). In TEM, the nonapertural endexine thin; the apertural endexine thickened at the colpi, sometimes (partially) filling the arch of the ectexine, sometimes with a gap or marked thinning

at the boundary of nonapertural and apertural endexines (*A. californica*; *A. hispida*, *A. leschenaultii*); the foot layer thin to thick; the columellae very short, sometimes elongated at the poles (conspicuously so in sect. *Dimorphanthus*); the tectum variable, continuous, or nearly so to more discontinuous. Many *Aralia* species examined have a weakly striato-reticulate tectum (sects. *Aralia*, *Humiles*, and *Pentapanax*). *Aralia nudicaulis* is a morphologically very distinct species within *Aralia* and is the sole member of sect. *Nanae* (Harms 1896; this study). Its very thin exine may represent an extreme reduction. On the other hand, pollen of *Aralia* sect. *Dimorphanthus* is thicker-walled and has elongated columellae at the poles (cf. Wen and Nowicke 1999). Taxa of sect. *Dimorphanthus* also have larger tectal perforations at the poles (see Wen and Nowicke 1999; Wen 2004). See Figs. 11-15 for pollen characteristics of *Aralia*.

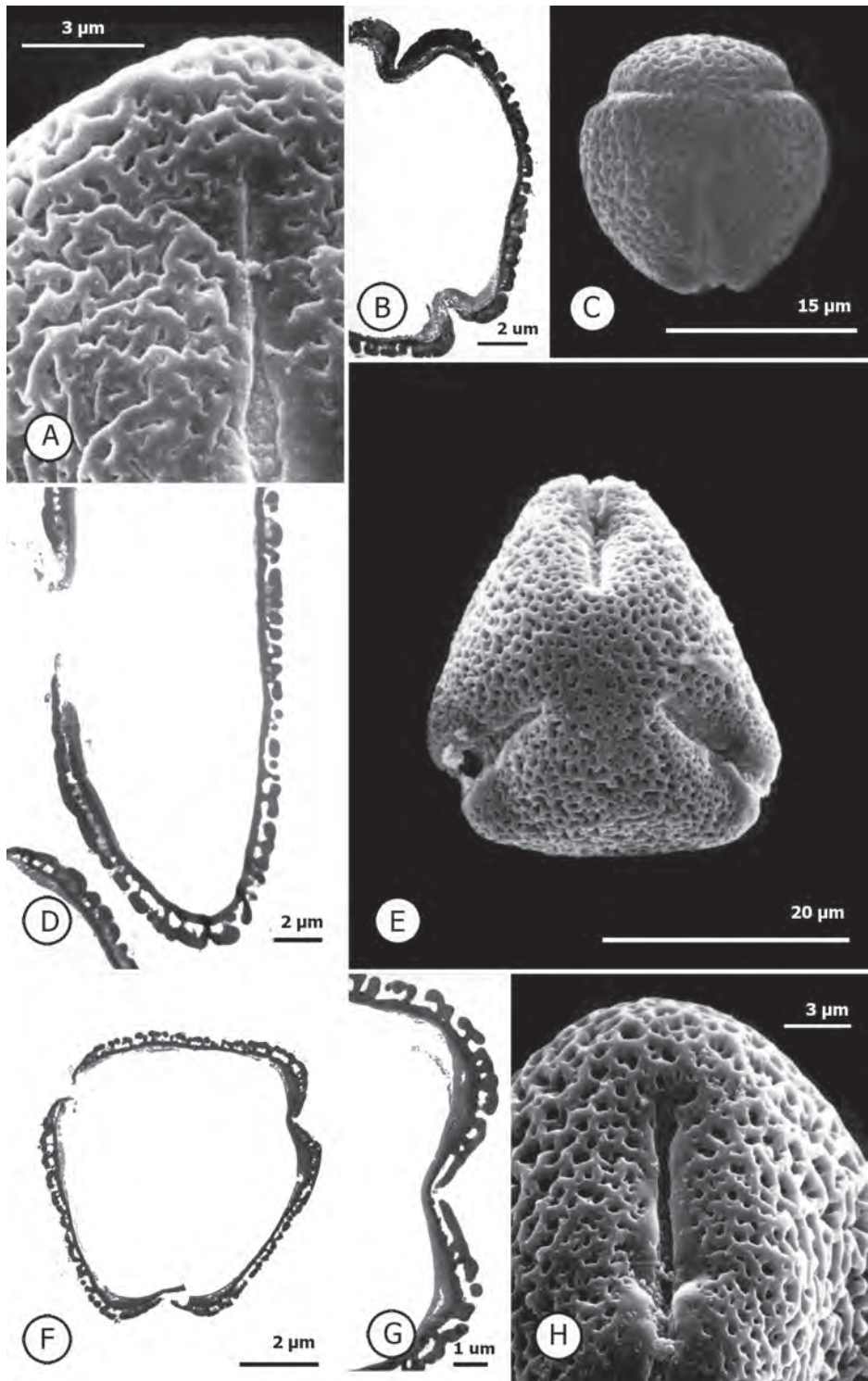


Fig. 11. Pollen morphology of *Aralia*. A-D. *A. nudicaulis* (Moyer s.n., Pennsylvania, US). E-H. *A. californica* (Robbins 2066, US)

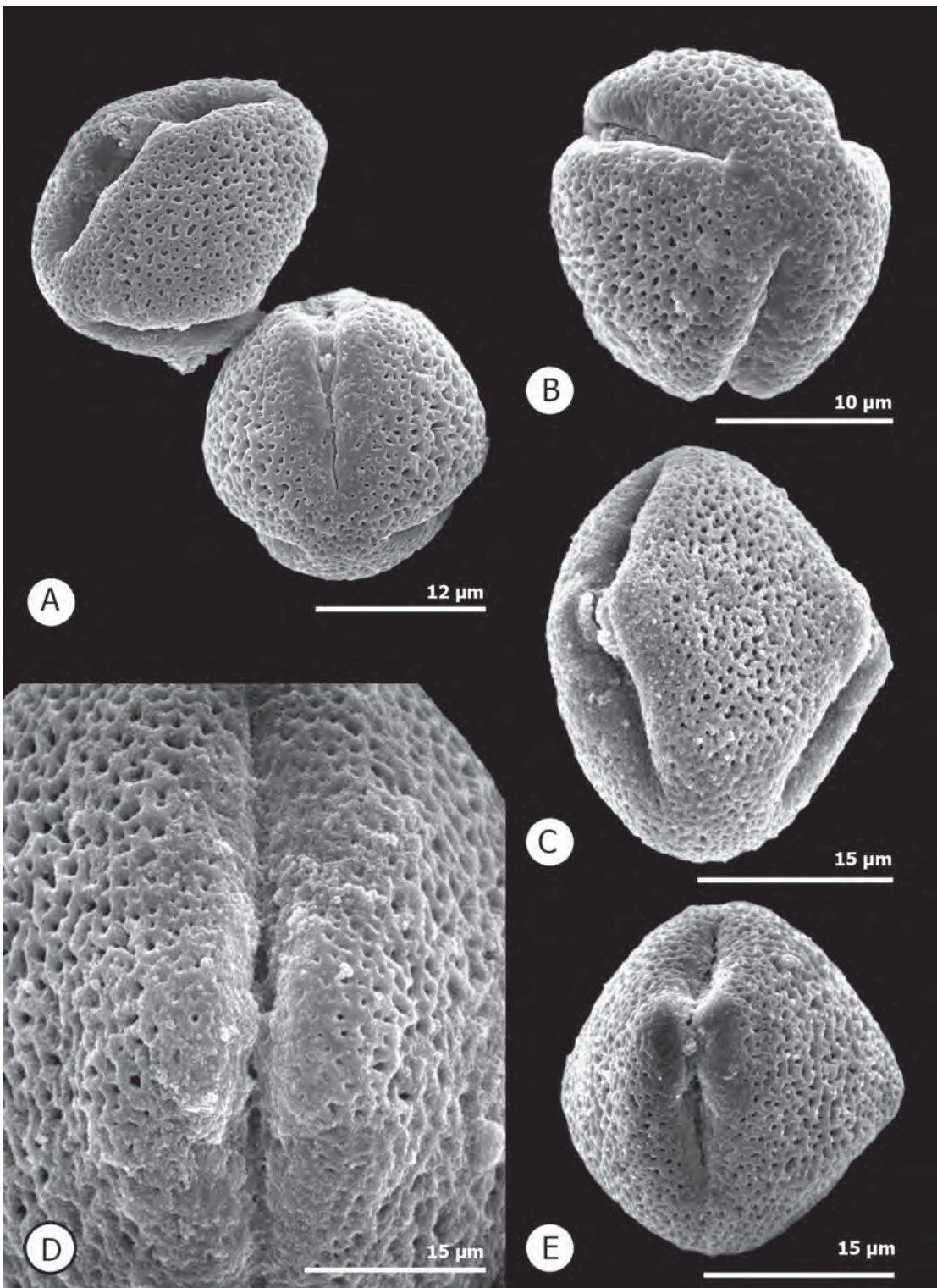


Fig. 12. Pollen morphology of *Aralia*. A&B. *A. soratensis* (Venturi 1081, US). C-E. *A. bicrenata* (Nelson 6141, US).

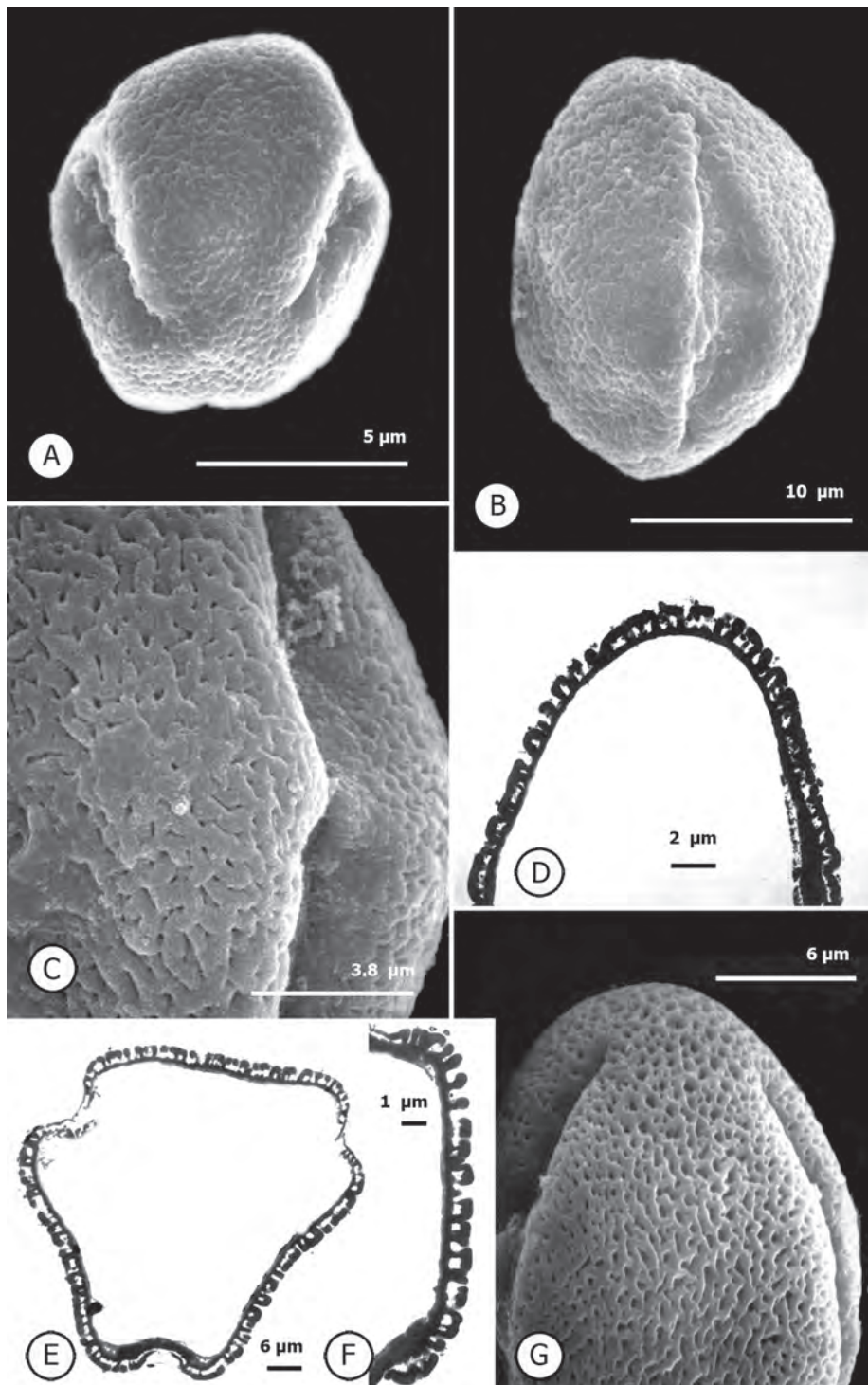


Fig. 13. Pollen morphology of *Aralia*. A-C. *A. warmingiana* (Smith & Klein 14120, US). D-G. *A. humilis* (McGill & Lehto L20373, US).

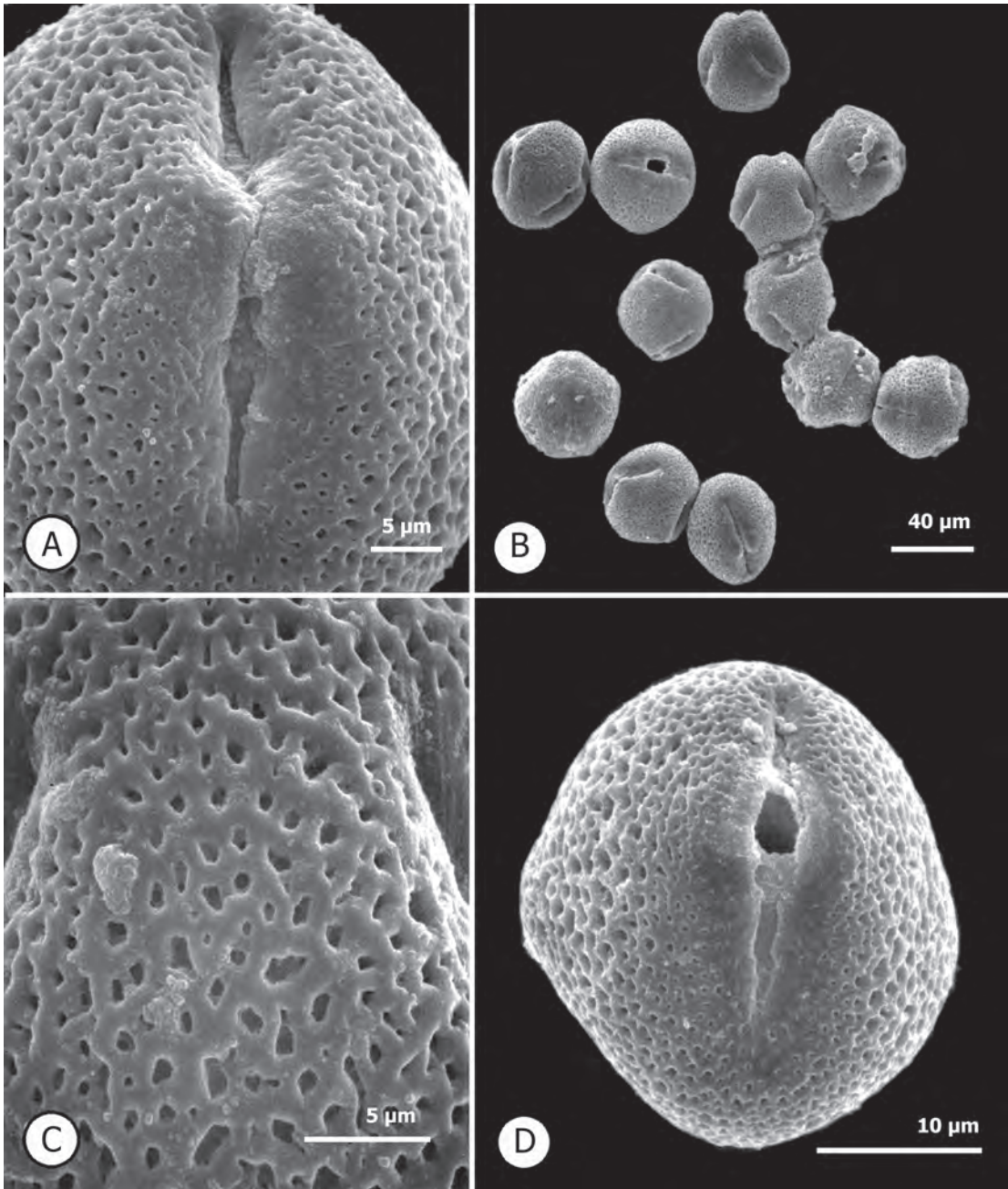


Fig. 14. Pollen morphology of *Aralia*. A-D. *A. regeliana* (McVaugh 10348, US).

CHROMOSOME NUMBERS

I herein provide an update on the chromosomal evolution in *Aralia* sect. *Aralia*, and sect. *Nanae*. The base chromosome number of *Aralia* has been suggested to be $x = 12$ (Wen 2002). The readers are also referred to Yi et al. (2004) for more information on chromosomal evolution in

Araliaceae, and to Wen (2004) for an overview of chromosome numbers in *Aralia*. Both diploids and tetraploids have been reported from sect. *Aralia* and sect. *Nanae* (see Table 1). To date all counts for members of sect. *Dimorphanthus* (*Aralia elata* var. *elata*, *A. elata* var. *mandshurica*, *A. hispida*,

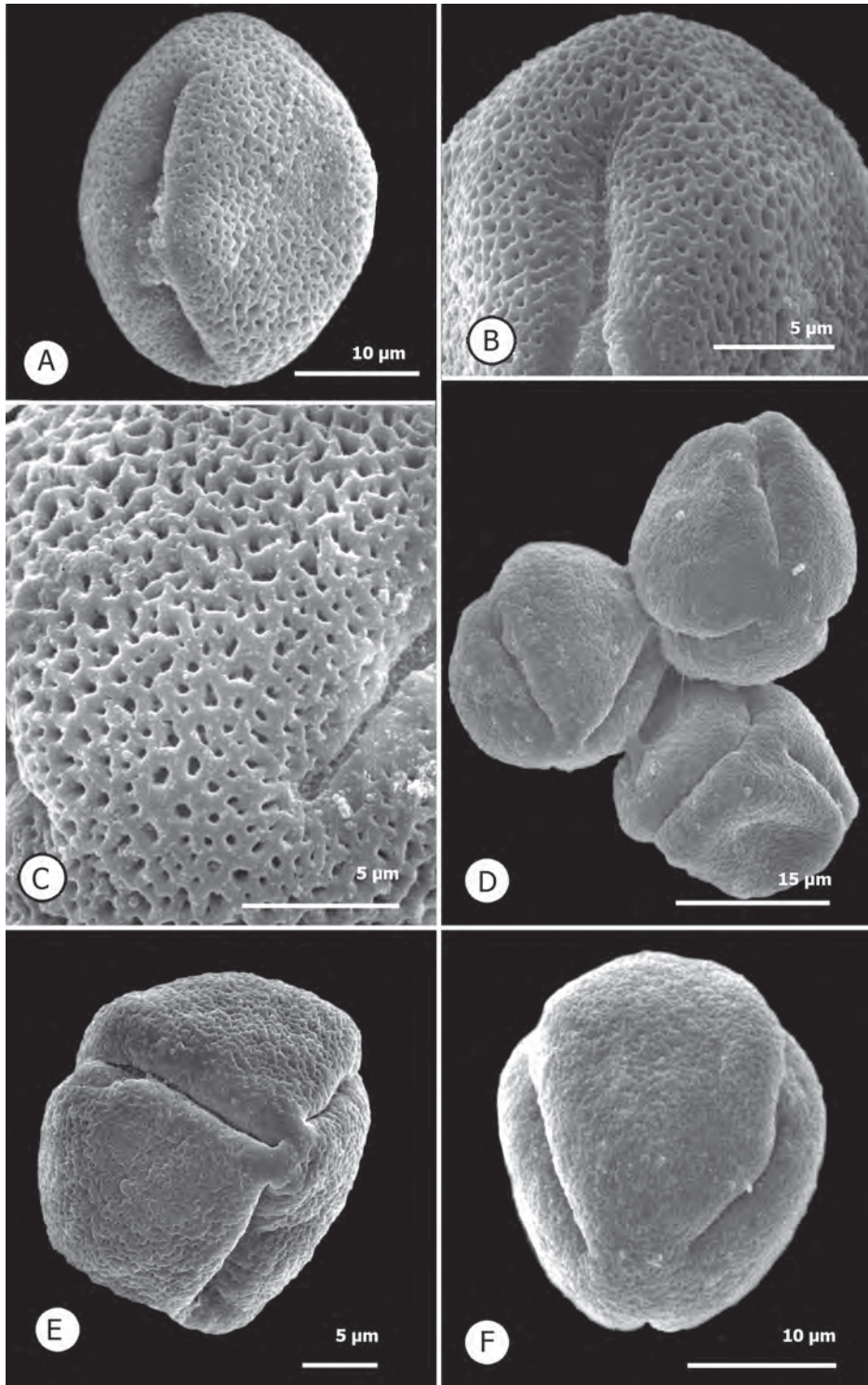


Fig. 15. Pollen morphology of *Aralia*. A-F. *A. scopulorum* (*Purpus s.n.*, Jan-Mar 1898, US).

and *A. spinosa*) and sect. *Pentapanax* (*A. franchetii*, *A. leschenaultii*, and *A. parasitica*) have been $2n = 24$. Chromosomal numbers of sect. *Humiles* and

sect. *Sciadodendron* have not been reported at present.

INFRAGENERIC CLASSIFICATION

Based primarily on the results from the phylogenetic analyses and our current understanding of the morphological variation in *Aralia*, a new classification of the genus is herein formally described with six sections recognized.

I. *Aralia* sect. *Aralia*

Aralia sect. *Anomalae* Harms, Bot. Jahrb. 23: 12, 1896.

Aralia sect. *Genuinae* Harms, Bot. Jahrb. 23: 15, 1896.

Branched herbs with rhizomes. Leaves stipulate, bi or tripinnate on lower portion of stem, pinnate to bipinnate on upper portion of stem, trichomes simple. Umbels aggregated into umbellate or paniculate structure, and inflorescence usually robust, terminal and axillary. Flowers small (1-2 mm in diameter), 5-merous. Fruits dark purple or occasionally red.

Number of species: 14.

Type species: *A. racemosa* L.

Distribution: eastern Asia, the Himalayas, eastern North America, and western North America.

List and distribution of species in *Aralia* sect. *Aralia*

1. *Aralia californica* S. Watson
California & Oregon
2. *Aralia bicrenata* Wooton & Standl.
SW US & N Mexico
3. *Aralia racemosa* L.
E N America
4. *Aralia cordata* Thunb.
Japan & Korea
5. *Aralia schmidtii* Pojark.
E Russia
6. *Aralia taiwaniana* Y. C. Liu & F. Y. Lu
Taiwan
7. *Aralia continentalis* Kitag.
China, Korea & E Russia
8. *Aralia cachemirica* Decne.
Himalaya
9. *Aralia tibetana* G. Hoo
E Himalaya

10. *Aralia fargesii* Franch.

China

11. *Aralia atropurpurea* Franch.

China

12. *Aralia apioides* Hand.-Mazz.

China

13. *Aralia glabra* Matsum.

Japan

14. *Aralia henryi* Harms

China.

II. *Aralia* sect. *Humiles* Harms

Aralia sect. *Humiles* Harms, Bot. Jahrb. 23: 13.

1896.

Unarmed branched shrubs. Leaves pinnate or bipinnate (*A. regeliana*), stipulate; trichomes on lower leaf surface branched, stomates on both abaxial and adaxial leaf surfaces. Umbels 5-15, loosely clustered into panicles, inflorescence terminal. Flowers 5 (-6)-merous. Fruits dark purple.

Number of species: 3.

Type species: *A. humilis* Cav.

Distribution: Central to North America.

List and distribution of species in *Aralia* sect. *Humiles*

1. *Aralia humilis* Cav.
C & N America
2. *Aralia regeliana* Marchal
Mexico
3. *Aralia scopulorum* Brandegee
Baja California

III. *Aralia* sect. *Nanae* Harms

Aralia sect. *Nanae* Harms, Bot. Jahrb. 23: 12, 1896.

Herbs with long horizontal rhizomes, acaulescent, dioecious. Leaves ternately compound, solitary, arising from the tip of the short rhizome, trichomes simple and slender, occasionally branching at the tip. Inflorescence solitary, arising from the base, umbels (2) 3 (7) in a cluster with a long scape. Flowers 5 or occasionally 6-merous, styles 5 (-6), free. Fruits

blackish purple.

Number of species: 1.

Type species: *Aralia nudicaulis* L.

Distribution: North America.

IV. *Aralia* sect. *Pentapanax* (Seem.) J. Wen

Aralia sect. *Pentapanax* (Seem.) J. Wen, *Cathaya* 11-12: 31. 2002.

Pentapanax Seem., *J. Bot.* 2: 294. 1864. Type species: *Pentapanax leschenaultii* (DC.) Seem.

Parapentapanax Hutch., *Gen. Fl. Pl.* 2: 56. 1967.

Type species: *Parapentapanax racemosus* (Seem.) Hutch.

Unarmed shrubs or trees, branched, glabrous or with simple trichomes. Leaves pinnate, rarely bipinnate or tripinnate (*A. wilsonii* and *A. plumosa*), stipulate to exstipulate. Umbels or occasionally racemes (*A. gigantean*, *A. lihengiana*, and *A. subcordata*), then aggregated into panicles or umbellate panicles, inflorescence terminal, subtended by persistent bracts at the base. Flowers 5-merous, styles connate, or connate at the base, rarely free. Fruits dark purple.

Number of species: 19.

Type species: *Aralia leschenaultii* (Seem.) J. Wen

Distribution: widely distributed in Asia, especially in the Sino-Himalayan region such as northern India, Nepal, and western China, also extending to Java in Indonesia, northern Thailand, and northern Vietnam.

List and distribution of species in *Aralia* sect. *Pentapanax*

1. *Aralia wilsonii* Harms

China

2. *Aralia plumosa* H. L. Li

China

3. *Aralia caesia* Hand.-Mazz.

China

4. *Aralia delavayi* J. Wen

China

5. *Aralia shangiana* J. Wen

China

6. *Aralia franchetii* J. Wen

China

7. *Aralia tomentella* Franch.

China

8. *Aralia stellata* (King) J. Wen

China & N Thailand

9. *Aralia castanopsicola* (Hayata) J. Wen

Taiwan, China

10. *Aralia parasitica* (D. Don) J. Wen

China & Himalaya

11. *Aralia laevis* J. Wen

SE Asia

12. *Aralia verticillata* (Dunn) J. Wen

China & N Vietnam

13. *Aralia hypoglauca* (C. J. Qi & T. R. Cao) J. Wen & Y.-F. Deng

China

14. *Aralia glabrifoliolata* (C. B. Shang) J. Wen

China

15. *Aralia leschenaultii* (DC.) J. Wen

E Asia

16. *Aralia kingdon-wardii* J. Wen, Lowry & Esser

Himalaya

17. *Aralia gigantea* J. Wen

Himalaya

18. *Aralia lihengiana* J. Wen, L. Deng & X. Shi

W China

19. *Aralia subcordata* (Don) J. Wen

Himalaya

V. *Aralia* sect. *Sciadodendron* (Griseb.) J. Wen

Aralia sect. *Sciadodendron* (Griseb.) J. Wen, comb. et stat. nov.

Sciadodendron Griseb., *Bonplandia* 6: 7. 1858.

Type species: *Sciadodendron excelsum* Griseb.

Coudenbergia Marchal, *Bull. Acad. Roy. Sci. Belgique* 47: 514, 1879. Type species:

Coudenbergia warmingiana (Marchal)

Marchal.

Megalopanax Ekman ex Harms, *Notizbl. Bot. Gart. Berlin* 9: 122, 1924. Type species:

Megalopanax rex Ekman ex Harms.

Unarmed glabrous trees or large shrubs, branched. Leaves 3- to 4- or 2-pinnate. Umbels clustered into panicles, several inflorescences usually aggregated at tip of stem, with persistent bracts at the base. Flowers 5-, 6-10-(12)-merous, styles connate or at least at the base. Fruits dark purple.

Number of species: 5.

Type species: *Aralia excelsa* (Griseb.) J. Wen

Distribution: Central and South America.

List and distribution of species in *Aralia* sect.

Sciadodendron

1. *Aralia soratensis* Marchal
S America
2. *Aralia warmingiana* (Marchal) J. Wen
S America
3. *Aralia rex* (Ekman ex Harms) J. Wen
Cuba
4. *Aralia excelsa* (Griseb.) J. Wen
C & S America
5. *Aralia bahiana* J. Wen
E Brazil

VI. *Aralia* sect. *Dimorphanthus* (Miq.) Miq.

- Aralia* sect. *Dimorphanthus* (Miq.) Miq., Ann. Mus. Lugd.bat. 1: 6. 1863.
Aralia sect. *Arborescentes* Harms, Bot. Jahrb. 23: 16. 1896.
Aralia sect. *Capituligeræ* Harms, Bot. Jahrb. 23: 19. 1896.
Aralia sect. *Digitatipanicula* Hoo in Hoo & Tseng, Acta Phytotax. Sin., suppl. 1: 170. 1965.

Armed shrubs or trees, andromonoecious or hermaphrodite. Leaves bipinnate, sometimes 3-pinnate to 4-pinnate (e.g., *A. armata*, *A. finlaysoniana* and *A. ferox*), stipulate, trichomes simple. Umbels numerous, aggregated into a paniculate to umbellate structure, inflorescence large (20150 cm long) and terminal. Flowers 5-merous, styles free or connate at the base. Fruits dark purple to black.

Number of species: 29.

Type species: *Aralia elata* (Miq.) Miq.

Distribution: disjunct between temperate and tropical Asia and eastern North America.

List and distribution of species in *Aralia* sect. *Dimorphanthus*

1. *Aralia spinosa* L.
E North America
2. *Aralia hispida* Vent.
E North America
3. *Aralia stipulata* Franch.
China
4. *Aralia gantungensis* C. Y. Wu
China
5. *Aralia undulata* Hand.-Mazz.
China
6. *Aralia officinalis* Z. Z. Wang

- China
7. *Aralia debilis* J. Wen
China
8. *Aralia echinocaulis* Hand.-Mazz.
China
- 9a. *Aralia elata* (Miq.) Seem. var. *elata*
China & Japan
- 9b. *Aralia elata* (Miq.) Seem. var. *mandshurica* (Rupr. & Maxim.) J. Wen
China & E Russia
- 9c. *Aralia elata* (Miq.) Seem. var. *ryukyuensis* J. Wen
S Japan
- 9d. *Aralia elata* (Miq.) Seem. var. *inermis* (Yanagita) J. Wen
S Japan
10. *Aralia dasyphylloides* (Hand.-Mazz.) J. Wen
China
11. *Aralia scaberula* G. Hoo
China
- 12a. *Aralia bipinnata* Blanco var. *bipinnata*
The Philippines & Taiwan
- 12b. *Aralia bipinnata* Blanco var. *apoensis* (Elmer) J. Wen
The Philippines
13. *Aralia decaisneana* Hance
Taiwan, China
14. *Aralia finlaysoniana* (Wall. ex Don) Seem.
China & Indochina
15. *Aralia spinifolia* Merr.
China
16. *Aralia merrillii* C. B. Shang
SE Asia
17. *Aralia ferox* Miq.
SE Asia
18. *Aralia foliolosa* Seem. ex C. B. Clarke
China & Himalaya
19. *Aralia montana* Blume
SE Asia
20. *Aralia frodiniana* J. Wen
Sulawesi
21. *Aralia malabarica* Bedd.
S India
22. *Aralia armata* (Wall. ex Don) Seem.
China & Himalaya
23. *Aralia chinensis* L.
China
24. *Aralia hiepiana* J. Wen & Lowry
Vietnam
25. *Aralia thomsonii* Seem. ex C. B. Clarke
China & Indochina

- | | |
|--|--|
| 26. <i>Aralia vietnamensis</i> T.-D. Ha
China & Indochina | 28. <i>Aralia dasyphylla</i> Miq.
SE Asia |
| 27. <i>Aralia searelliana</i> Dunn
China & N Vietnam | 29. <i>Aralia urticifolia</i> Miq.
Java |

KEY TO SECTIONS OF *ARALIA*

1. Herbs or sometimes with woody rhizomes 2
 1. Shrubs or trees 3
2. Acaulescent dioecious herbs with long horizontal woody rhizomes Sect. *Nanae*
 2. Caulescent andromonoecious herbs with short and thick rhizomes Sect. *Aralia*
3. Shrubs or trees with prickles on stems Sect. *Dimorphanthus*
 3. Shrubs or trees with unarmed stems 4
 4. Trichomes on lower leaflet surface branched Sect. *Humiles*
 4. Trichomes on lower leaflet surface simple if they are present 5
5. Leaves 3-4-pinnately compound, ovaries 5-10 (-12)-locular, from Central & S America
 Sect. *Sciadodendron*
 5. Leaves 1-2-pinnately or occasionally 3-pinnately compound, ovaries 5-locular, from eastern to
 southeastern Asia Sect. *Pentapanax*

REPRODUCTIVE BIOLOGY

The reproductive biology of a few *Aralia* species has been documented. Possible evolutionary pathways leading to various reproductive systems have been proposed for the New Caledonian Araliaceae (Schlessman et al. 1990, 2001). A range of reproductive systems are present in *Aralia*, e.g., dioecious, andromonoecious, and hermaphroditic (Wen 2004).

Lovell (1898) noted that protandrous dichogamy is strongly developed in *Aralia racemosa*, a member of the herbaceous *Aralia* sect. *Aralia*. At the beginning of anthesis, the styles are initially united and only about 1 mm long and the stamens are about 3 mm long with the anthers horizontal or inclining outward. Small dipterans visit the flowers, thrusting their heads between the stamens or the bodies of the larger ones passing through them. With the stamens and petals falling away, the styles elongate to about 3 mm long and become reflexed finally. Abundant nectar is

produced and can be seen as minute drops on the floral disk. The honey-bee was observed to make 40 or so visits in one minute, and *Lucilia cornicina* was seen to visit 26 flowers in the same time. Lovell (1898) reported that a large number of less specialized hymenopterans, such as ichneumonflies and wasps visited the flowers.

The reproductive biology of *Aralia nudicaulis* (sect. *Nanae*) has been well studied (e.g., Barrett and Helenuum 1981; Barrett and Thomson 1982; Bawa et al. 1982; Edwards 1984; Flanagan and Moser 1985; Thomson and Brunet 1990). *Aralia nudicaulis* is dioecious in the boreal and temperate forests of North America. The species is pollinated mostly by bumble bees. The female ramets have fewer flowers per umbel than the male ramets and reach peak flowering before the male ramets. The sex-related differences in the frequency of flowering have been examined in detail in the species by Bawa et al. (1982). Bawa et al. (1982) also noted that a large proportion of sexually

mature ramets may not flower in a given year.

Aralia hispida (sect. *Dimorphanthus*) is andromonoecious and maintains outcrossing through synchronous dichogamy (Thomson and Barrett 1981; Thomson et al. 1982; Thomson 1988; Thomson et al. 1990). This species blooms in three ranks (primary, secondary, and tertiary) of umbel orders. All flowers of one order complete opening before flowers of the next order start. The flowers

are protandrous, with the flowers open first as males. After 5-7 days, the styles elongate and diverge, signaling the functioning female-phase of the flower. The female-phase flowers are cross-pollinated before the opening of flowers of the next order. Pollinators of *A. hispida* are primarily *Bombus* spp. (Thomson et al. 1982; Thomson 1988).

SPECIES CONCEPTS

In this treatment, species have been delimited using a phylogenetic concept sensu Nixon and Wheeler (1990). All species of *Aralia* are recognized by a unique combination of character states in comparable individuals. Once again, I view species as hypotheses based on available characters (also see Wen 2002, 2004). The circumscription may be revised as needed when additional data become available.

Species-delimiting characters must show fixation throughout the distributional range. Some "species" were based on extreme conditions of certain characters. For example, *Aralia pubescens* was described by de Candolle (1813) based on the highly pubescent specimens from Chiapas. When collections of *Aralia humilis* were examined throughout its distributional range, I realized that pubescence on leaves, inflorescence and pedicels is highly variable in this species. It is difficult to discern any discontinuity in this character nor any geographic integrity of the pubescent "form." Therefore I have treated *Aralia humilis* broadly and placed *A. pubescens* as a synonym of *A. humilis*.

Aralia bicrenata was previously recognized as a variety or a subspecies of *A. racemosa* or simply

treated as a synonym of *A. racemosa*. Our field studies in Colorado, New Mexico, Arizona, and Texas suggest that *A. bicrenata* differs from *A. racemosa* in its inflorescence structure, leaflet margin, stipule morphology, and stem color. Our herbarium work also shows that these morphological differences are consistent throughout the distributional range of both taxa. Geographically there is no overlap between the two taxa. Varieties are considered by this author to have one or a few morphological distinctions that have geographic integrity (Lewis 1955; Stuessy 1990). Unlike species, some geographic overlap may occur among other conspecific varieties, but such overlap is common at this level in the hierarchy (Lawrence 1951; Stuessy 1990). In my previous revisions of *Aralia* such as in sect. *Dimorphanthus*, morphological differences among conspecific varieties are mostly related to pubescence, shape, texture, number of lateral veins of leaflets, and pedicel length. Considering the differences in several morphological characters and the lack of geographic overlap, I recognize *Aralia bicrenata* as a species distinct from *A. racemosa*.

DISTRIBUTION AND BIOGEOGRAPHY

Early evolutionary radiation in *Aralia*

Our phylogenetic analyses using multiple markers have not generated a well resolved phylogeny of *Aralia* at "deep" level (see Figs. 1 & 2). The sections I presently recognize are all supported as monophyletic groups, yet the

relationships among them remain poorly resolved. I propose that the major lineages of the genus diversified as an evolutionary radiation in a very short period of time.

It is significant that the New World harbors a relatively high diversity of major lineages even though it has only 14 of the 71 species of *Aralia*.

The New World species of the genus belong to five sections, of which three are endemic to the New World (sect. *Humiles*, sect. *Nanae*, and sect. *Sciadodendron*) and two sections disjunct with Asia (sect. *Aralia* and sect. *Dimorphanthus*). The 57 Asian species belong to three sections (sect. *Aralia*, sect. *Dimorphanthus*, and sect. *Pentapanax*) with only sect. *Pentapanax* endemic to Asia, and the other two sections disjunct between Asia and North America. Most species in Asia are from two sections: sects. *Aralia* (eleven out of 14 in Asia) and *Dimorphanthus* (27 out of 29 in Asia).

Aralia* sect. *Aralia

This section has a wide intercontinental disjunct distribution in the northern hemisphere, with eleven species in eastern Asia and three species allopatrically distributed in North America. Within eastern Asia, species are primarily allopatric in distribution. Only distantly related taxa, such as *A. continentalis*, *A. fargesii* and *A. henryi* in Central China may occur in the same mountain. In North America, *A. racemosa* is in eastern North America, *A. bicrenata* is in southwestern North America and northern Mexico, and *A. californica* is in California and southern Oregon. Wen et al. (1998) suggested the origin of the section in eastern Asia and that the ancestor of the North American taxa migrated across the Bering land bridge in the late Tertiary and diversified in North America. Within North America, an eastern and western North American biogeographic track is supported by the distribution of *A. racemosa* – *A. bicrenata* – *A. californica*. The eastern species *A. racemosa* occupies an extensive distributional area, whereas the western *A. californica* is more restricted to California and southern Oregon. This may be due to the fact that *A. californica* has co-existed and co-adapted with the redwood and the Douglas fir forests, which are ecologically restricted in western North America.

Within Asia, the *Aralia cordata* – *A. taiwaniana* – *A. continentalis* – *A. schmidtii* – *A. tibetana* – *A. cachemirica* group shows an eastern Asian biogeographic track spanning from Japan, across China and to the western Himalaya in the East – West direction. The *Aralia cordata* – *A. continentalis* group shows a close biogeographic relationship of the Sino-Japanese region as a biogeographic track. This track is also supported in *Aralia* by the distribution of *A. glabra* in Japan

and *A. fargesii* in central China.

The phylogeographic relationship of the *Aralia cordata* complex (*A. cordata*, *A. taiwaniana*, *A. continentalis*, *A. schmidtii*, *A. cachemirica* and *A. tibetana*) needs to be carefully examined. The six species occur allopatrically and are morphologically similar. *Aralia taiwaniana* may have been derived from *A. cordata* in Japan and been preserved in the central mountains in Taiwan. *Aralia schmidtii* from the Sakhalin and Kuril islands in eastern Russia, north of the Japanese archipelago in the North Pacific may have its origin from *A. cordata* in Japan. The split between *A. continentalis* and *A. cordata* may be more ancient. Because of the presumably central role of *A. cordata* in giving rise to other species in the complex, it may be difficult to discern the evolutionary relationships among these species.

Aralia* sect. *Humiles

This section is distributed in relatively dry habitats from southern Arizona across Mexico to Guatemala, Honduras, and Nicaragua. Phylogenetic analysis has not been conducted for the section. Based on morphological comparisons, *Aralia scopulorum* from Baja California may be a derivative species of the more widespread *Aralia humilis*, especially from populations of northern Mexico. Furthermore *A. regeliana* may also be a derivative of *A. humilis*, likely from a bipinnate form in central or southern Mexico. The two species in each presumed progenitor-derivative pair do not overlap in geographic distribution, and allopatric speciation via geographic and habitat isolation may explain such a pattern.

Aralia* sect. *Sciadodendron

The five species of *Aralia* in this section are primarily allopatric in distribution in the neotropics. *Aralia rex* occurs in the Caribbean island of Cuba; *A. excelsa* is distributed in Central America, extending south to Colombia and Venezuela; *A. soratensis* is found in the Andes of Peru, Bolivia, and Argentina; *Aralia bahiana* is a new species recorded only from Bahia, Brazil; and *A. warmingiana* is primarily in the lowland areas in Brazil and Paraguay. These five species are morphologically highly distinct and may have radiated early in the evolutionary history of the

section, and developed in separate trajectories in Central and South America. *Aralia bahiana* and *A. excelsa* both have non-articulated pedicels. This character state may be apomorphic in *Aralia* and may be the synapomorphy for the two species. The geographically highly restricted *A. bahiana* may be a derivative of the more widespread *A. excelsa*. Nevertheless, it is also possible that *A. bahiana* was derived from *A. warmingiana* of Brazil.

Aralia soratensis from South America is

morphologically similar to the North American *A. spinosa*, which belongs to *Aralia* sect. *Dimorphanthus* (see Wen 2004). They differ primarily in the presence of prickles in *A. spinosa*, and in the more congested and more compact inflorescence of *A. soratensis*. The morphological similarities of the two species suggest the close relationship between sect. *Sciadodendron* of the neotropics and sect. *Dimorphanthus* primarily of the northern hemisphere.

TAXONOMY

- Aralia* L., Sp. Pl. 273. 1753.; Gen. Pl., ed. 5: 134. 1754. TYPE SPECIES: *Aralia racemosa* L.
Dimorphanthus Miq., Comm. Phytogr. 3: 95. 1840. TYPE SPECIES: *Dimorphanthus elatus* Miq.
Sciadodendron Griseb., Bonplandia 6: 7. 1858. TYPE SPECIES: *Sciadodendron excelsum* Griseb.
Pentapanax Seem., J. Bot. 2: 294. 1864. TYPE SPECIES: *Pentapanax leschenaultii* (DC.) Seem.
Coemansia Marchal, Bull. Acad. Roy. Sci. Belgique 47: 94. 1879. *nom. illeg.*, non Tiegh. & Monnier in Ann. Sci. Nat. Bot., Ser. 5, 17: 392. 1873.
Coudenbergia Marchal, Bull. Acad. Roy. Sci. Belgique 47: 514. 1879. TYPE SPECIES: *Coudenbergia warmingiana* (Marchal) Marchal.
Acanthophora Merr., Philipp. J. Sci. 13: 316. 1918. *nom. illeg.*, non J. V. Lamour. 1813.
Neoacanthophora Bennet, Indian J. Forest. 2: 283. 1979. TYPE SPECIES: *Neoacanthophora scandens* (Merr.) Bennet.
Cwangayana Rauschert, Taxon 31: 556. 1982. TYPE SPECIES: *Cwangayana scandens* (Merrill) Rauschert.
Megalopanax Ekman ex Harms, Notizbl. Bot. Gart. Berlin 9: 122. 1924. TYPE SPECIES: *Megalopanax rex* Ekman ex Harms.
Parapentapanax Hutch., Gen. Fl. Pl. 2:56. 1967. TYPE SPECIES: *Parapentapanax racemosus* (Seemann) Hutch.

Trees, shrubs, lianas or herbs with rhizomes, armed or unarmed; leaves alternate, 14pinnate, rachis articulated, mostly stipulate; inflorescence terminal, paniculate or corymbose or umbellate, usually consisting of umbels, capitula or racemes, occasionally umbels solitary; flowers 512merous, with pedicels articulated below, only occasionally non-articulated; sepals 512; petals 5-12, imbricate; stamens 5-12, recurved in buds; ovary inferior, 512locular, occasionally aborted into 3, with a

floral disk, styles distinct or connate at the base or completely connate; fruit a berry, 512-locular, more or less globose.

Aralia consists of 71 species disjunctly distributed from eastern Asia to southeastern Asia and the Americas from Canada to Argentina, Bolivia, Peru and Brazil. Eastern and southeastern Asia is especially rich in *Aralia* species (57 spp), whereas South America, North America and Central America together have 14 species.

ARALIA L. SECT. ARALIA

Aralia sect. *Genuinae* Harms, Bot. Jahrb. 23: 15. 1896.

Aralia sect. *Anomalae* Harms, Bot. Jahrb. 23: 12. 1896, synonym nov.

Branched unarmed herbs with rhizomes. Leaves alternate, stipulate, ternately bi- or tripinnate on lower portion of stem, pinnate to bipinnate on upper portion of stem, petiole articulated. Trichomes simple, biseriate. Inflorescence terminal and axillary, paniculately or umbellately arranged, with many umbels, pedicels articulated below the flowers. Sepals 5, minute, triangular or rounded. Petals 5, imbricate. Stamens 5. Ovary inferior, 5-locular, styles 5, connate at the base, floral disc small and flat. Fruit a berry, 5-seeded, dark purple when mature.

Endosperm smooth.

The section consists of 14 species disjunctly distributed between eastern Asia (11 spp.) including the Himalayas and North America (3 spp.). Species of this section are perennial herbs primarily in mesic temperate forests.

Species in the section are largely differentiated based on stipule morphology, leaf architecture, pubescence, leaflet size, shape and margin, inflorescence architecture, number of flowers per umbel, division of styles, and fruit size, shape and color.

Key to species of *Aralia* sect. *Aralia*

1. Fruits red; inflorescence with fewer than 10 umbels, each terminal umbel with fewer than 10 flowers *A. henryi*
1. Fruits dark purple; inflorescence with more than 20 umbels, each terminal umbel with more than 10 flowers 2
2. Inflorescence a dense panicle with more than 25 primary branches 3
2. Inflorescence a loose panicle or an umbellate structure with fewer than 15 primary branches 11
3. Fruits 5.5-7 mm in diameter *A. californica*
3. Fruits 3-5 mm in diameter 4
4. Inflorescence corymbose in architecture 5
4. Inflorescence paniculate to racemose in architecture, primary bracts usually not leafy 7
5. Inflorescence with leaves and leafy bracts subtending the primary inflorescence branches; terminal umbels with 12-20 (25) flowers; in southwestern US and in northern Mexico *A. bicrenata*
5. Inflorescence with leaves subtending the primary inflorescence branches, with the leaves decreasing in size drastically from lower part of the inflorescence to the upper part; terminal umbels with (25-) 35-60 flowers 6
6. Leaflet margin finely serrulate, base of leaflets cordate, stipules lanceolate; endemic to the Sakhalin & Kuril islands of far eastern Russia *A. schmidtii*
6. Leaflet margin doubly serrate, base of leaflets obliquely truncate to subcordate, rarely cordate, stipules narrowly triangular; endemic to Taiwan *A. taiwaniana*
7. Terminal umbels usually with fewer than 35 flowers 8
7. Terminal umbels usually with 35 or more flowers 9
8. Stem dark purple to greenish purple, without stiff hairs at the base of stem; stipules narrowly triangular, not leafy; flowers smaller with petals 1.4-1.6 mm long, 0.9-1.1 mm wide; eastern U.S. and Canada *A. racemosa*
8. Stem green to greenish purple, with stiff hairs at the base of stem; stipules leafy; flowers longer with petals 1.8-2 mm long, 0.9-1.1 mm wide; mainland China, Korea & eastern Russia *A. continentalis*

9. The pair of leaflets below the terminal leaflet narrowly ovate, base rounded to subcordate *A. cachemirica*
9. The pair of leaflets below the terminal leaflet ovate to broadly so, base cordate 10
10. Leaves primarily tripinnately ternate; leaflets membranaceous; stipules not leafy *A. tibetana*
10. Leaves primarily bipinnately ternate; leaflets papery or chartaceous; stipules usually leafy on the lower part of the stem *A. cordata*
11. Leaflets glabrous throughout; pedicels 12-45 mm long *A. glabra*
11. Leaflets pilose to pubescent; pedicels less than 15 mm long in general 12
12. Leaflet margin irregularly doubly serrate with deep teeth, sometimes lobed *A. apioides*
12. Leaflet margin serrate to doubly so without deep teeth, never lobed 13
13. Pedicels 8-12 mm long in terminal umbels; styles completely distinct to the base *A. atropurpurea*
13. Pedicels 5-6 mm long in terminal umbels; styles connate to the middle or more *A. fargesii*

1. *Aralia californica* S. Watson — Fig. 16; color plate 1: A-F.

Aralia californica S. Watson, Proc. Amer. Acad. Arts 11: 144. 1876. TYPE: U.S.A. CALIFORNIA: northern California, 1860-62, *W. H. Brewer 747* (lectotype: US!, here designated; isolectotype: GH!, UC!).

Aralia californica S. Watson var. *acuminata* S. Watson ex Howell, Fl. N. W. Amer. 1: 271. 1898. TYPE: U.S.A. OREGON: southern Oregon, Siskiyou Mountains, Jul 1888, *T. Howell 786* (lectotype: GH!, here designated).

Robust spreading perennial herb, shrub-like, 1.5-3.5 m tall, 1-3 m in spread, andromonoecious. Stem pilose, green to light purplish green, with 3-5 leaves; rhizomes thick and horizontal, bearing purple buds. Leaves 40-150 cm long, 35-160 cm wide, ternately compound, spreading, lower leaves tripinnate, uppermost ones pinnate; stipules 1.2-7.0 cm long, 1-7.0 cm wide, leafy on lower leaves, triangular to irregularly ovate on upper leaves; petioles (8) 15-35 cm long, sparsely pilose, green to purplish green; leaflets 8-45 cm long, 4.5-22 cm wide, papery, ovate, narrowly ovate to broadly so, acuminate to acute at apex, subcordate, cordate to rounded at base, commonly oblique on lateral leaflets, serrate to doubly serrate at margin; lateral veins 9-12 on each side, conspicuous on both surfaces, green above and light green below, slightly pilose along the veins on both surfaces, petiolules 0.2-4, mostly 0.5-1.5 cm long, slightly

pilose and thick. Inflorescence terminal and axillary, pilose, green, sometimes purple, axillary inflorescences 20-30 cm long, terminal inflorescence 30-75 cm long, 10-25 cm wide, consisting of numerous umbels, twice or thrice branched, primary branches many, racemously arranged on a main axis, often 3-8 forming a circle on the main axis, each primary branch 5-10 cm long, consisting of 3-10 umbels, with a few lateral umbels bearing no fruits (functionally male umbels); terminal umbels 30-75-flowered, pedicels 12-20 mm long, pubescent; lateral umbels 20-30-flowered, pedicels 6-12 mm long; bracts of primary branches linear to lanceolate or often leaf-like, pilose, the upper ones 10-20 (30) mm long, 1-2 mm wide, the lower ones transitioning into a bipinnately ternate leaf or a pinnate leaf subtending the inflorescence branch; bracteoles linear, nearly glabrous and ciliate at margin, 2-2.5 mm long. Flowers cream white; calyx of 5 teeth, sepals 0.5-0.6 mm long and wide, triangular, persistent on fruits, with a conspicuous vascular bundle in the middle; petals 2-2.3 mm long, 1.1-1.3 mm wide, narrowly triangular to narrowly ovate, greenish white to white, with a conspicuous vascular bundle in the middle; stamens 5, recurved in buds, filaments 2.3-2.6 mm long; ovaries 5-locular, hypanthium with 10 conspicuous vascular bundles. Fruits 6-7 mm long, 5-6 mm wide, globose, dark purple to blackish, persistent styles 2.2-2.6 mm long, divided to the middle or only connate at the base.

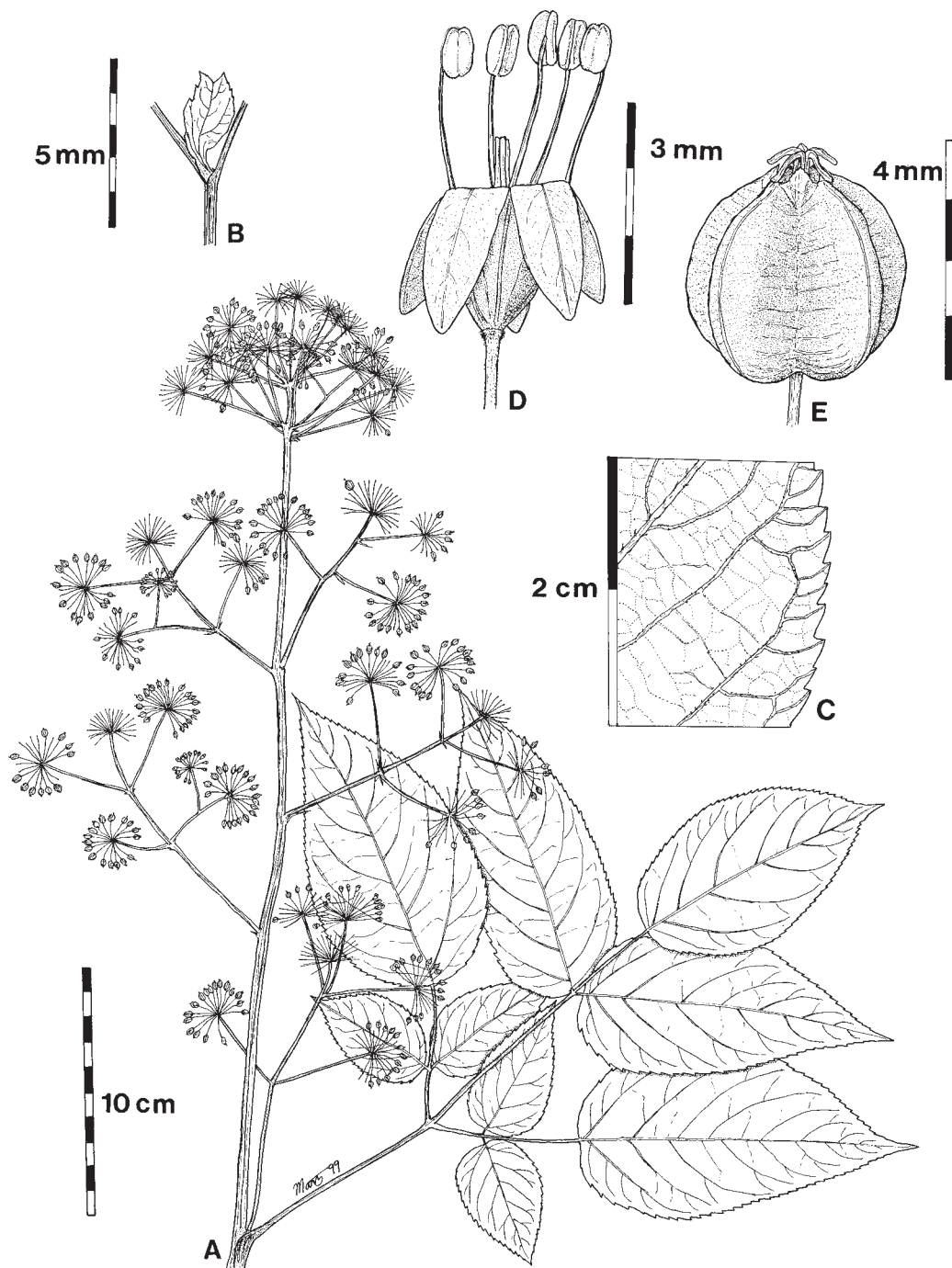


Fig. 16. *Aralia californica* S. Watson. A. Habit with a leaf and an inflorescence. B. Leafy stipule. C. Close-up of leaflet margin and veinlets. D. Flower. E. Young fruit.

Common names: spikenard, California spikenard, Californian spikenard, California ginseng, elk clover, western aralia, and western spikenard.

Uses: roots used as a tonic or for curing menstrual disorders.

Phenology: flowering in June to July; fruiting in August to September.

Distribution: California and southern Oregon of U.S.A. (Fig. 17).

Ecology: in shady and moist habitats, e.g., in moist redwood, Douglas fir, and/or pine forests, mountain slopes and valleys, at the edge of forests, along river banks, shaded streams, creeks, and ravines; 0-1830 m.

Representative specimens examined: **U.S.A.** CALIFORNIA: Alameda Co., Strawberry Canyon, near creek, 4 Sep 1932, *J. E. Adams 21* (UNCC); Oakland Hills, ravines, *Dr. Bolander s.n.* (NY); Berkeley, Strawberry Canyon, University of California campus, 22 Aug 1939, *H. P. Bracelin 1092* (L, 3 sheets); lower Strawberry Canyon, 15 Mar 1936, *J. A. Ewan 9433* (UC); Oakland, 9 Jul 1881, young fr, *M. E. Jones 2375* (NY, US); Oakland, 9 Jul 1881, *M. E. Jones 13414* (BM, NY, OS, PH, UC, US); Strawberry Canyon, Aug 1930, *H. E. Parks 710* (UC); in creek bed west of Botanical Garden, Strawberry Canyon, University of California Campus, Berkeley, 11 Aug 1943, *B. Rodin 311* (UC); vicinity of Berkeley, Jul-Sep 1906, *H. A. Walker 401* (L, PH, UC); Strawberry Canyon, at the bottom of the canyon, moist area, growing with *Rubus* and ferns, large perennial 2-3 m tall, leaves ca. 150 cm long, 160 cm wide, fruits dark purple, 12 Sep 1990, fr, *J. Wen 747* (OS). Amador Co., Panther Creek, 4000 ft, Aug 1892, *G. Hansen 325* (LE). Butte Co., at the Forbestown Reservoir, ca. 5 mi NE of Forbestown, 450 m, 24 Jul 1983, *L. & P. Ahart 4214* (MO, TEX); ca. 1 mi S of Ponderosa Dam across the south fork of the Feather River, ca. 3 mi NW of Forbestown, 1800 ft, 1 Jul 1985, *L. Ahart 5106* (MO). Colusa Co., Paradise Creek at crossing of trail between Fouts Camp and Box Springs, Snow Mountain, 4500 ft, 10 Jul 1972, *A. Q. Howard 13* (JEPS). Contra Costa Co., Donner Canyon, 800-1000 ft, 21 Jun 1933, *M. L. Bowerman 233* (UC). Del Norte Co., Smith River, 20 Jul 1935, *G. N. Jones 7842* (GH, 2 sheets); Patrick Creek, *H. E. & S. E. Parks 24030* (UC); along SR 199, ca. 9 miles east of jct with Rt

101, dry area, plant ca. 2 m tall, 15 Sep 1990, fr, fruit very dark purple, styles completely divided, *J. Wen 762* (OS). El Dorado Co., north fork Webber Creek, ca. 3 mi E of Camino, 3000 ft, 16 Jul 1945, *G. T. Robbins 2066* (GH, UC, US). Humboldt Co., near Hoopa Reservation, Trinity River, 3 Sep 1948, *A. M. Alexander et al. 5587* (UC); Hoopa Valley, 22 Sep 1920, *D. Duncan s.n.* (UC); Eel River, *H. M. Hall s.n.* (UC); east fork of Willow Creek, 1500 ft, 1 Sep 1941, *S. K. & C. C. Harris et al. 6976* (GH, 2 sheets); Van Duzen River Valley, east of Bridgeville, 2400 ft, 22 Aug 1975, fl, *A. L. & H. N. Moldenke 30238* (TEX, US); Bull Creek, 7 Jul 1911, fl, *H. H. Smith 3942* (F, GH, MO, MU, NY, US); Mt. Chamisai, below summit, ca. 1900 ft, 5 Aug 1965, *R. F. Thorne et al. 35137* (BM, ENCB, UC); along Willow Creek, 1000 ft, 5 Jul 1911, *J. P. Tracy 3320* (UC); Hoopa Valley, near Hoopa Reservation, abundant along creek, 14 Sep 1990, fr, fruits globose, green, milky white, purple to dark purple, *J. Wen 755* (OS); same locality as *Wen 755*, plant smaller, fr & fl, hypanthium greenish white, sepals pale greenish, petals white, filaments long, anthers pale yellow, fruits dark purple, *J. Wen 756* (OS); Humboldt Redwoods State Park, ca. 4 miles N of Myers Flat, in redwood forest, ca. 2 m tall, 1.4 m in spread, 15 Sep 1990, fr, *J. Wen 757* (OS); Humboldt Redwoods State Park, along Pesula Road, abundant, inflorescence purple, 15 Sep 1990, *J. Wen 758* (OS); Humboldt Redwoods State Park, Lower Bull Creek, along Bull Creek Road, inside Rockefeller Redwood Forest, 15 Sep 1990, *J. Wen 759* (OS); North Coast Range, Bull Creek – Petrolia Road, 12 mi W of Redwood Highway, 1500 ft, 8 Sep 1937, *C. B. Wolf 3060* (UC). Lake Co., Blue Lakes, 7 Sep 1929, *J. W. Blankinship s.n.* (MO, 2 sheets); Bear Creek, E of Timber Lake, Snow Mt., 5150 ft., 28 Jul 1981, *L. R. Keckard et al. 5683* (JEPS). Los Angeles Co., Mt. Wilson, Little Santa Anita Canyon, 1350 ft, 31 Aug 1910, fr, *S. F. Blake 837* (GH, US); moist bank in canon in Mt. Wilson, 25 Jul 1915, *J. F. Macbride et al. 882* (GH); Pasadena, 16 Sep 1892, fr, *A. J. McClatchie s.n.* (NY); Fallen Leaf Spring, W of Sunset Peak, draining northward to Cow Canyon, 4400 ft, seepage on north-facing shaded granitic slope along drainage with *Alnus rhombifolia*, *Acer macrophyllum*, *Boykinia rotundifolia*, *Umbellularia californica*, *Ribes* sp., 22 Nov 1991, past fr, *T. S. Ross & A. H. Ross 6025* (F); mountain, woods, wet, rocky, Jul 1901, fl, *G. B. Grant 4450*

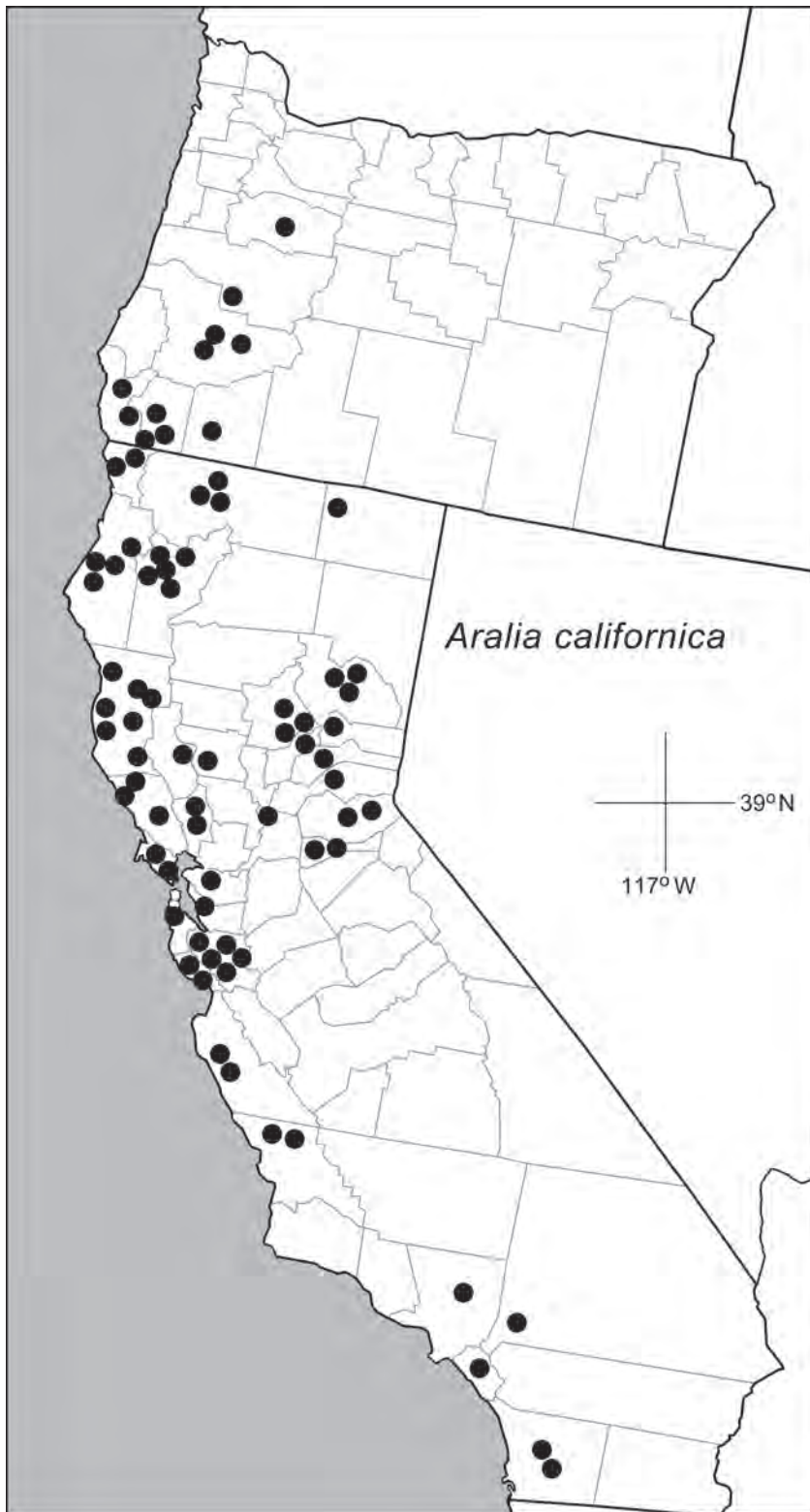


Fig. 17. Map of California and Oregon showing the distribution of *Aralia californica* S. Watson.

(NY, US). Marin Co., Hwy 1, 20 km W of the Tamalpais junction, E of Stinson Beach, coastal scrub/creekside vegetation, 75 m, herbaceous perennial to 2.5 m tall, under trees on moist sites, flowers white, 12 Jun 1986, *B. Anderson 3041* (NY, 2 sheets); Mt. Tamalpais, Jun 1915, floral buds, *F. Beckwith 128* (NY); Mill Valley, 28 Aug 1892, *F. T. Bioletti s.n.* (UC); Mt. Tamalpais, Jun 1905, *K. Brandegee s.n.* (UC); Mt. Tamalpais, *Brandegee s.n.* (DS); Paper Mill Creek, Jul + Oct 1880, fr, *J. W. Congdon s.n.* (NY); Mt. Tamalpais, 2 Oct 1897, *B. Davy s.n.* (UC, 8 sheets); Mt. Tamalpais, 11 Jul 1926, *A. Eastwood 13922* (CAS); Lagunitas, Aug 1876, fr, *H. Edwards s.n.* (NY); Phoenix Lake road 1.5 mi below Lake Lagunitas, 8 Mar 1936, *J. A. Ewan 9426* (UC); Mt. Tamalpais, on the railroad between Mill Valley trail and the water tank, 18 Jun 1902, *A. A. Heller 5717* (DS, E, F, GH, LE, MO, NY, PH, US); n slope of Bolinas Ridge, above Alpine Lake, shady canyons, 13 Aug 1949, fr, *L. S. Lewis 49158* (NY); Mill Valley, 28 Aug 1892, fr, *Michener & Bioletti s.n.* (NY, 2 sheets); road west of Geronim, following creek at conspicuous water trough, 8 ft tall growing in moist area, 23 Sep 1939, fr, *D. G. Nelson 633* (NY); Bolinas Ridge, 14-16 Jun 1892, floral buds, *E. Palmer 2408* (NY, US); near Lagunitas Lake, Jun 1935, *H. M. Pollard s.n.* (UC); foot of Mt. Tamalpais, Jun 1881, *V. Rattan s. n.* (DS); Mill Valley, *G. P. Rixford s.n.* (CAS); north slope of Bolinas Ridge, above Alpine Lake, 13 Aug 1949, *L. S. Rose 49158* (NY, UC); Lone Pine Beach, Tomales Bay, 25 Jul 1938, *B. O. Schreiber 685* (UC); by a brook in the forest north of Mill Valley, 12 Jul 1913, *W. N. Suksdorf 484* (UC); Audubon Canyon Ranch, Pike County Gulch (Galloway Canyon), on western slope of Bolinas ridge, ca. 3 mi N of Stinson Beach, alt. 10-25 ft, 17 Aug 1977, *G. H. True 8455* (CAS); Mt. Tamalpais, Jul 1880, fl, *G. R. Vasey 233* (NY); Mill Valley, 4 Jul 1907, *H. A. Walker s.n.* (US); Mt. Tamalpais State Forest, at the bottom of a creek, under the canopy of *Alnus* trees, spreading plant ca. 1.5 m tall, rhizomes big and thick, bearing purple buds, 13 Sep 1990, fr, *J. Wen 748* (OS); Mt. Tamalpais State Park, near a stream, plant ca. 3 m tall, 12 Sep 1990, fr, *J. Wen 751* (OS). Mendocino Co., Mendocino, Aug 1898, fr, *H. E. Brown 903* (F, NY, US); Round Valley, 440 m, *V. K. Chestnut 220* (US, 2 sheets); Glen Blair, Jul 1894, *A. McCallum s.n.* (CAS); Big River, Jul 1903, fl, *J. McMurphy 4* (NY, US); under redwoods along river

road just W of confluence of Gualala & North Fork Gualala rivers, ca. 6.5 km E of town of Gualala, 3 Aug 1981, *G. L. Smith & C. R. Wheeler 7288* (CAS, 2 sheets); Bear Creek off Usal Creek, 1500 ft, in shade, in ravine on SW slope in redwood tan oak, madrono DF, logged forest, 3 Aug 1959, fl, *L. C. Wheeler 7626* (F); 1875, *G. R. Vasey, s.n.* (US, 2 sheets); Redwood Highway – Rockport Road, 2 mi W of S fork of Eel River, 300 ft, 30 Jun 1934, *C. B. Wolf 5831* (GH, TEX). Monterey Co., Jamesburg, W of Church Creek divide, 3700 ft, 25 Oct 1932, *R. St. John 312* (UC); headwaters of Arroyo Seco, Santa Lucia Mountains, 25 Oct 1930, *H. L. Mason 5759* (UC). Napa Co., near Haven Place, above St. Helena, 10 Sep 1967, *F. R. Fosberg 48647* (US); Howell Mountain, beds of Moore's Creek, 1500 ft, 6 Jul 1899, *J. P. Tracy 416* (UC); Bothe Napa Valley State Park, Richey Creek, at the bottom of stream right near water, moist and rocky area, occasional, plant 1-1.5 m tall, common name as alder-clover by the rangers, 13 Sep 1990, fr, *J. Wen 752* (OS); Bothe Napa Valley State Park, Upper Valley Creek, at bottom of stream, abundant, 13 Sep 1990, fr, *J. Wen 753* (OS). Nevada Co., Alpha Road 1.5 miles south of Washington, 3300 ft, shady north slope, yellow pine forest, 23 Aug 1965, fr, *G. H. True & J. T. Howell 2453* (CAS). Orange Co., Silverado Canyon, Santa Ana Mts., Cleveland National Forest, Trabuco District, 4200 ft, *E. W. Lathrop 7656* (UC); Trabuco, 3800 ft, 9 Oct 1912, fr, *H. H. Smith 5357* (F). Placer Co., Canyon Creek, Dutch Flat, 14 Jul 1934, fl, *F. G. MacFadden s.n.* (NY). Plumas Co., Mill Creek, Jun 1877, fl, *R. M. Austin s.n.* (NY); Mill Creek, Sep 1896, *R. M. Austin 512* (US); canñon just W of Quiney, 3700 ft, 4 Aug 1912, *H. M. Hall 9383* (UC, 2 sheets); Downieville, 1 mi S and 1/3 mi W of Nelson Pt., 4300 ft, *E. Nourse 34* (UC); Forest Lodge, 3400 ft, 2 Aug 1941, *H. S. Reed s.n.* (UC); 1st Water Trough Creek, N Greenville, 4000 ft, with *Acer*, *Alnus* and *Cornus*, occasional, 24 Jul 1931, fl, *L. W. Swift 40* (CAS). San Bernardino Co., Lytle Creek – Falls, 25 Jul 1901, fl, *L. R. Abrams 1954* (NY); *S. B. Parish, s.n.* (UC); San Bernardino Mts., Jul 1881, fl & young fr, *S. B. & W. F. Parish 437* (F, NY, US); San Gabriel Mts., Angeles National Forest, ca. 1 mi up Icehouse Canñon, ca. 5700 ft, *R. F. Thorne 35425* (UC); on La Porte Rd., 10 km S of jct with Hwy 70, 39°53'N, 120°52'W, 1400 m, associated with *Acer*, *Alnus*, *Pseudotsuga*, and *Pinus*, growing at edge of creek in pine forest,

rhizomatous herb ca. 1.6 m tall, 3 Aug 1994, young fr, *J. B. Walker et al.* 872 (NY). San Diego Co., in ravine on S side of Pauma Creek, Palomar Mountain, 33°21'N, 116°56'W, 4200 ft, 30 Jul 1968, *C. V. Meyer s.n.* (UC, US, 2 sheets). San Mateo Co., woodside, 4 Jul 1919, fl, *E. Walther s.n.* (CAS). Santa Clara Co., Loma Prieta Peak, Aug 1903, young fr, *A. D. E. Elmer* 4987 (CAS, MO, NY, UC, US); foothills of the eastern side of the Santa Cruz Mountains, 5 mi S of center of Palo Alto, along Los Trancos Creek, moist canyon in foothill woodland, 600-1800 ft, 4 Jul 1974, *R. Martineau* 359 (DS); Loma Prieta, Santa Cruz Mountains, 3200 ft, 15 Aug 1939, *E. H. Nelson s.n.* (UC, 2 sheets); the Santa Cruz Peninsula, Steven's Creek, 10 Jul 1907, *J. D. Randall* 6 (DS, 2 sheets, MU); 2 mi S of Saratoga Springs, ca. 1000 ft, 3 Jul 1966, *L. S. Rose* 66045 (AUT, ENCB, GH); eastern slope of Mount Hamilton, 3300 ft, 22 May 1936, *H. K. Sharsmith* 3721 (UC, 2 sheets), 3000 ft., 3883 (UC). Santa Cruz Co., Redwood forest, *J. Ball s.n.* (US); Waddell Creek, 23 Sep 1901, *W. R. Dudley s.n.* (DS); near Glenwood, Santa Cruz Mtns, bottom of shady ravine, 4 Jun 1931, fl, *F. R. Fosberg* 55286 (NY); Boulder Creek, 16 Oct 1938, *L. S. Rose* 38304 (B, 2 sheets, MO, 3 sheets, UC, 2 sheets); Big Basin Redwoods State Park, along Opal Creek, 30 Sep 1950, *J. H. Thomas* 2439 (MU); 1.3 mi below Empire Grade on Alba Rd., 1800 ft, *J. H. Thomas* 3467 (DS, 2 sheets, UC); Big Basin Redwoods State Park, near a stream close to the Ranger Station, shady area, plant ca. 2 m tall, 17 Sep 1990, *J. Wen* 774 (OS); along Empire Grade Rd., ca. 1 mi NMW of Santa Cruz (jct. of Empire Grade Rd. and Hellier Ave.), roadside and near a ravine, plant ca. 1.5 m tall, 17 Sep 1990, *J. Wen* 775 (OS); along SR 9, 3.5 mi from Santa Cruz toward Felton, on hillside of Redwood forest, shady, plant ca. 1.5 m tall, 17 Sep 1990, *J. Wen* 776 (OS). Shasta Co., Shasta National Forest, along Castle Creek ca. 1 mi W of Castle Crags State Park, 21 Sep 1972, *R. F. Thorne et al.* 42376 (BM, ENCB, KLU, MO, UNCC). Sierra Co., 1875, *J. G. Lemmon* 564 (GH); at Indian Hill loop, ca. 4 mi NE of Camptonville, 3100 ft, 20 Aug 1982, fl, *M. S. Taylor & R. Wessel* 5028 (CAS); northern Sierra Nevada, north fork of Yuba River, 5 miles above Downieville, 3500 ft, arid transition – *Pseudotsuga*, wet slopes, rocky loam, shade, perennial 6 ft, spread 6 ft, 6 Aug 1937, young fr, *C. B. Wolf* 9047 (NY, 2 sheets). Siskiyou Co., 6 mi W from Red Bank F. S. Camp, on road to Somesbar from Sawyers Bar, 2000 ft, 24 Oct 1959, *P. C. Everett et al.* 23942 (UC); near Cantarra, 10 Jul 1905, *L. Krautter s.n.* (BM, 2 sheets); along Cade Creek near its mouth, 3 miles east of Happy Camp, 8 Jul 1940, fl, *M. Ownbey & F. G. Meyer* 2221 (GH, MO, 2 sheets, NY); Klamath National Forest, along Indian Creek Rd., 8.2 miles NW of Happy Camp, dry habitat, granite bedrock, plant 1-1.5 m tall, ca. 1 m in spread, 16 Sep 1990, fr, *J. Wen* 771 (OS); along SR 96, 4.4 miles E of Happy Camp, near a small creek, locally abundant, plant 1.5-2 m tall, 16 Sep 1990, *J. Wen* 772 (OS); Seiad Valley, along SR 96, ca. 2.5 miles E of Seiad Creek between milestones 63 and 64, in a small creek, poor soil, rocky area, 16 Sep 1990, fr, *J. Wen* 773 (OS); gravel bar in S fork of Salmon R, 9.5 mi above Cecilville, 3500 ft, 22 Jul 1955, fl, *I. L. Wiggins* 13455 (NY). Sonoma Co., Stewart Pt., Jul 1923, *A. Griffin s.n.* (CAS). Trinity Co., Trinity Mountains, Dedrick, 2500 ft., 13 Aug 1948, *A. M. Alexander et al.* 5480 (UC); creek bank 30 miles west of Weaverville, 1500 ft, 18 Jul 1930, fl, *L. Benson* 2196 (NY); North Fork Trinity River, Hobo Gulch Camp and vicinity, 18 miles NW of Weaverville, near mouth of Keystone Meadows Gulch, moist shaded creek bank, 2950 ft, 13 Aug 1971, fl, *E. Carter* 331 (CAS). Tehama Co., off Hwy 32, Potato Patch Campground in Lassen National Forest, beside Deer Creek in shady mixed deciduous & coniferous forest, 24 Jun 2003, *J. Wen* 7104 (US). Tulare Co., Sequoia National Park, 24 Aug 1966, fr, *J. Redden s.n.* (ASU). Yuba Co., near Slate Creek, yellow pine forest, 1200 m, 25 Jul 1980, fl, *L. Ahart* 2483 (CAS). Bolmer Bay, 9 Apr 1854, *J. M. Bigelow s.n.* (NY). Upper Sacramento, *Wilkes Expedition s.n.* (US, 2 sheets). OREGON: Curry Co., mouth of Waters Creek, near Agness, 22 Aug 1938, *G. M. Hansen s.n.* (UC); along Cheteu River 7 mi above Harbor, 19 Jul 1919, fl, *M. E. Peck* 8914 (GH, MO, NY). Douglas Co., east fork of north fork of Umpqua River, 6-10 miles east of Peel, 1500 ft, 14 Jul 1898, fl, *E. I. Applegate* 2703 (NY, US, 2 sheets); Umpqua National Forest, North Umpqua River road at Fairview Creek, 1115 ft, 20 Jul 1950, *E. C. Earle* 4596 (PH); Coast Range, along Umqua River, 10 Aug 1880, *G. Engelmann s.n.* (MO); West Fork, Cow Creek Canyon, 9 Aug 1898, *F. A. Walpole* 57 (US). Jackson Co., Sykes Creek, near Wimer, 12 Jul 1892, *E. W. Hammond* 168 (MO, NY, US).

Josephine Co., Steve Peak, Siskiyou Mountains, Applegate River watershed, *E. I. Applegate* 6528 (DS); south slope of Sexton Mt., 21 Aug 1928, *N. P. Gales* 325 (MO, 2 sheets); near McMullin Creek on McMullin Creek Rd., 6.5 mi E of US 199 and Selma, 7 mi N of Cave Creek jct., 2 Aug 1997, fl & young fr, *W. Hess et al.* 7817 (F, NY); Grayback Forest Camp, 8 mi west of Oregon Caves National Monument, 6 Jul 1939, fl, *C. L. Hitchcock & J. S. Martin* 5191 (NY); Siskiyou Mountains, Jun 1884, *T. Howell s.n.* (LE); along streams near Oregon Caves, Siskiyou Mts., 6000 ft, 31 Jul 1935, fl, *J. W. Thompson* 12422 (GH, NY, UC, US); along SR 46, 0.2 mi E of Grayback Creek (or 10.2 miles E of Cave Jct.), on the bed of a small creek, limestone, 15 Sep 1990, fr, *J. Wen* 763 (OS); along SR 46, on hillside between milestones 12 and 13, near a small ravine, locally abundant, about 100 individuals in the ravine, 1.5-2.5 m tall, fruits dark purple to black, styles connate at base, 16 Sep. 1990, fr, *J. Wen* 764 (OS); along SR 46, on hillside between milestones 16 and 17, locally abundant, 16 Sep 1990, fr, *J. Wen* 765 (OS); Oregon Caves, near a small creek, plant 1.5-2 m tall, 16 Sep 1990, fr, *J. Wen* 766 (OS). Lane Co., Salt Creek, forest above Oakridge, Jul 1922, *L. Constance s.n.* (UC); Gold Hill, deep canyon, moderately moist, dense shade, SE slope, coniferous forest, *Pseudotsuga-Acer circinatum-Corylus*, 8 Sep 1962, fl, *L. E. Detling* 9040 (RSA). Linn Co., along US hwy 20, 32 mi W of junction with state hwy 22, 1000 ft, perennial to 3 m tall, 24 Jul 1962, fl, *A. S. Barclay et al.* 1456 (LL); western foothills of the Cascade Range on the N side of Green Peter Reservoir, along Quartzville Road 4.4 miles NE of the Thistle Creek Boat Ramp, flowers white, mature fruits black purple, perennial 2.2 m tall, aromatic, on roadside with *Alnus*, *Hypericum*, *Pteridium*, *Pseudotsuga*, *Polystichum*, and *Agrostis*, 317 m, 17 Aug 1999, fl & fr, *R. R. Halse* 5634 (NY, 2 sheets, RSA); near Cascadia, 22 Sep 1952, *J. Seibert s.n.* (GH). Multnomah Co., Portland, Foley Springs Road, moist creek banks, 16 Jul 1903, *M. W. Gorman* 1668 (US).

Cultivated material: **U.S.A.** CALIFORNIA: Alameda Co., Berkeley, the garden of Anson and Anita Blake, 29 Jun 1941, *N. F. Bracelin* 1439 (L); 13 Sep 1942, *N. F. Bracelin* 2290 (L, NY);

2. *Aralia racemosa* L. — Fig. 18; color plate 2: A-F.

Aralia racemosa L., Sp. Pl.: 273. 1753. TYPE: **U.S.A.** VIRGINIA: Herb. Linn. 394.6 (lectotype: LINN!, designated by Wen and Reveal 1992).

Aralia racemosa var. *foliosa* Vict. & J. Rousseau, Contr. Inst. Bot. Univ. Montréal 36: 37. 1940. *Aralia racemosa* L. f. *foliosa* (Vict. & J. Rousseau) Scoggan, Fl. Canada 1: 52. 1978. TYPE: **Canada.** QUÉBEC: Lac-Saint-Jean Co., Pointe-Bleue, à découvert sur les berges calcaires du lac Saint-Jean, élément du taillis de *Sambucus*, *Viburnum*, etc, 25 Jul 1935, *Marie-Victorin, Rolland-Germain & Meilleur* 44562 (MT!).

Perennial herb, 0.6-2.5 m tall with large aromatic roots. Stem pilose, dark purple to greenish purple, with 4-5 leaves; rhizomes thick and horizontal. Leaves 50-83 cm long, 54-87 cm wide, ternately compound, spreading, purple at nodes; stipules 1.2-1.5 cm long, 0.4-0.9 cm wide, narrowly triangular to lanceolate, not leafy, glabrous, ciliate at margin, thick papery; petioles 15-30 cm long, purple; leaflets 7-20.5 cm long, 4.5-14 cm wide, thin papery, the pair of leaflets below the terminal leaflet ovate, other leaflets ovate to broadly so, acute at apex, subcordate to cordate at base, commonly oblique on lateral leaflets, doubly serrate at margin; lateral veins 8-9 on each side, conspicuous on both surfaces, leaflets green, nearly glabrescent on upper surface, pilose on lower surface, petiolules 0-3 cm long, pilose. Inflorescence terminal and axillary, pubescent; axillary inflorescences 6-21 cm long; terminal inflorescence 15-40 cm long, 3-10 cm wide, consisting of numerous umbels, primary inflorescence branches 15-25, racemously arranged on a main axis, often 3-5 forming a circle on the upper part of the main inflorescence axis, each primary branch 3-14.5 cm long, consisting of 1-10 umbels, with a few lateral umbels bearing no fruits (functionally male umbels); terminal umbels 20-25-flowered, pedicels 6-8 mm long, pubescent, tip enlarged conspicuously at anthesis, somewhat slightly enclosing the base of the hypanthium; lateral umbels 10-20-flowered, pedicels 3-5 mm long; bracts of primary branches 3-5 mm long, 0.5-1 mm wide, linear, more or less pilose, ciliate at margin; bracteoles 1.0-1.5 mm long, 0.2-0.3 mm wide, linear, ciliate at margin. Sepals 0.2-0.3 mm long and wide, triangular, glabrous, persistent on

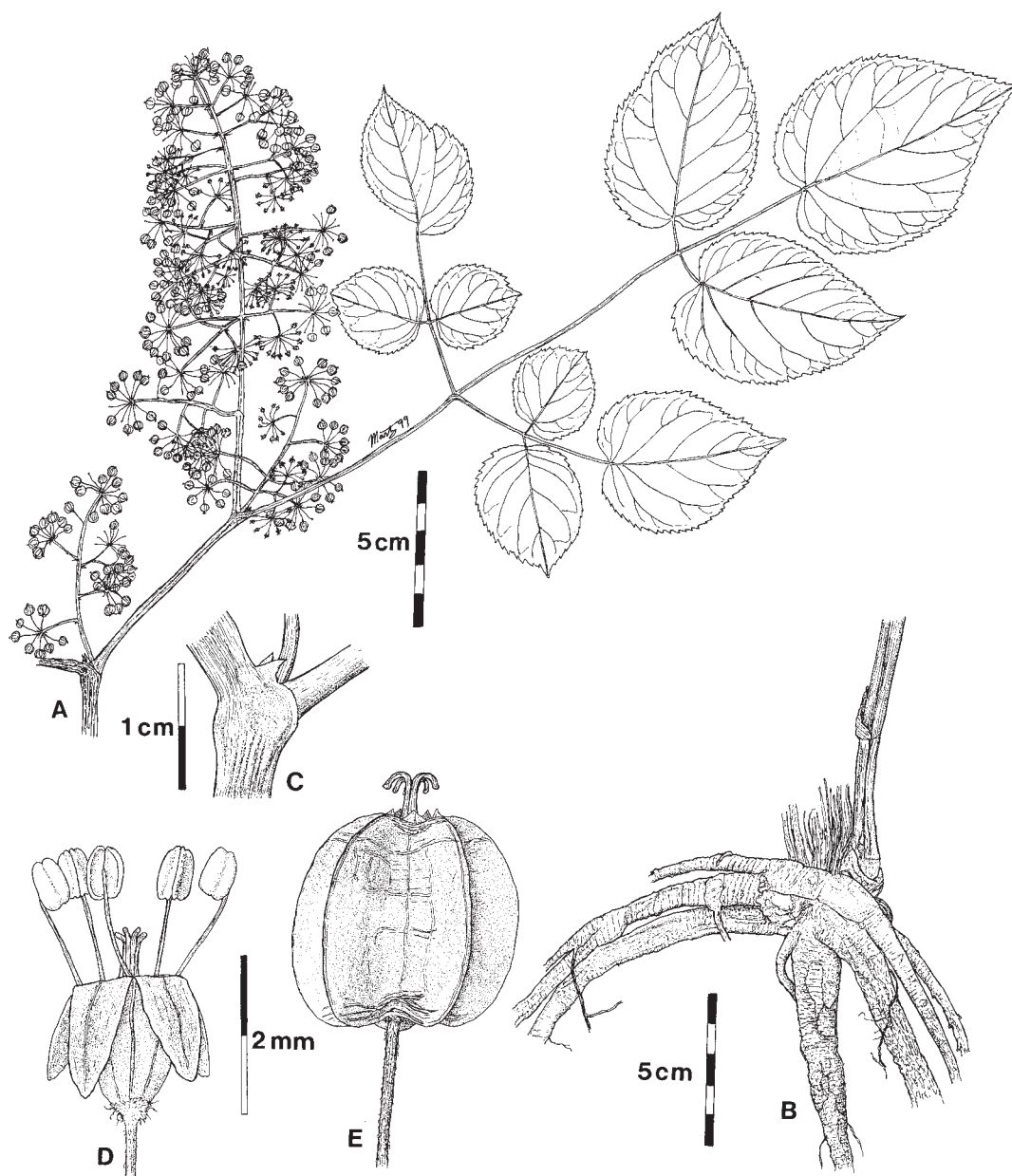


Fig. 18. *Aralia racemosa* L. A. Habit with a leaf and a terminal and an axillary inflorescence. B. Root and rhizome. C. Leaf base showing triangular stipules. D. Flower. E. Fruit.

fruits; petals 1.4-1.6 mm long, 0.9-1.1 mm wide, ovate, greenish white to white, with a conspicuous vascular bundle in the middle, spreading to recurved at anthesis; stamens 5, erect at anthesis, filaments 1.3-1.5 mm long, anthers 0.4-0.5 mm long, 0.2-0.3 mm wide, oblong, whitish yellow; ovaries 5-locular, styles 0.6-0.7 mm long at anthesis, base of styles more or less enlarged,

appearing like a stylopodium. Fruits 4-4.5 mm long, 3.5-4.5 mm wide, globose, dark purple to purple, turning dark maroon-red when mature, persistent styles divided to the middle, 1.3-1.5 mm long. Seeds 2-2.2 mm long, 1-1.2 mm wide, 0.2-0.25 mm thick, kidney-shaped, whitish gray, smooth.

Common names: spikenard, American spikenard, Indian root, spignet, spiceberry, petty-morrel, life-of-man, and old man's root.

Uses: aromatic roots used in syrup of spikenard, a tonic, or for cough and irritation of the bronchopulmonary tract.

Phenology: flowering in June to August; fruiting in August to October.

Distribution: widely distributed in eastern U.S.A. and Canada, westward to South Dakota and North Dakota, south to Georgia and Alabama (Fig. 19).

Ecology: rich deciduous forests, wooded slopes, ravines, moist bluffs, riverside forests, creeksides, and streamsides; 100-1500 m.

Representative specimens examined: **Canada.** Georgeville, 18 Aug 1886, *J. R. Churchill s.n.* (MO). NEW BRUNSWICK: ca. 20 mi NE of Fredericton, 10 Aug 1955, *H. J. Scoggan 12795* (W); Hillsborough, ca. 15 miles SSE of Moncton, 18 Aug 1955, *H. J. Scoggan & D. Erskine 12953* (W). Kent Co., Bass River, 1868, *J. Fowler s.n.* (F). NOVA SCOTIA: Hants Co., Gypsum Cliff, Five Mile River, 1 Sep 1927, fr, *A. R. Prince & C. E. Atwood 764* (DS). ONTARIO: Bruce Peninsula, Stokes Bay, mixed rocky woods, 9 Jul 1934, fl, *P. V. Krotkov 9263* (NY, US). Carleton Co., Ottawa Dist., Taylor Hill, 25 Jul 1953, *L. Jenkins 3227* (W); Ile Bizard, 4 Aug 1929, *P. Louis-Marie s.n.* (CAS, W). Hastings Co., abundant in scrub hardwood, N side of highway, 1 mi W of Coe Hill, 25 Aug 1959, fr, *C. E. Heidenreich 437* (MO). Kingston, Muskoka, Aug 1893, fl, *J. Fowler s.n.* (MO); Kingston, 25 Jul 1893, fl, *J. Fowler s.n.* (US). Leeds Co., Rideau Park, Rideau Ferry, Aug 1898, young fr, *T. W. Edmondson 1333* (NY). Swamp, Golden Lake, 27 Jul 1899, fl, *L. M. Umbach s.n.* (F). Near Sucker Lake, 4 Aug 1904, *W. F. Wright 163* (US), *166* (2 sheets, US). Thunder Bay Dist., N48°12', W90°05', opposite gravel pit, 3.5 km S on East Arrow Lake Road, Hardwick Twp., 19 Jul 1988, young fr, *C. E. Garton 24121* (NY). QUÉBEC: Argenteuil Co., Carillon, along rt 344, just E of Carillon, N45°33.832', W74°22.094', 51 m, 11 Aug 2008, fl, herb 1-1.5 m tall, petals white, *J. Wen 10489* (US). Bonaventure Co., ravine, bluffs, west of Carleton, 26 Jul 1904, fl, *J. F. Collins & A. S. Pease s.n.* (CAS); talus découverts sur les bords de la rivière Restigouche, 1 Aug 1936, fl, *F. Marie-Victorin et al. 48990* (F,

NY, US). Brome Co., Glen Sutton, talus dominant un ruisseau, avec *Rubus odoratus*, 9 Aug 1942, fl & young fr, *F. F. Marie-Victorin et al. 56252* (US). Cabano, edge of woods, 6 Aug 1956, floral buds, *H. J. Scoggan 13255* (NY). Gatineau Co., Ottawa Dist., Hull Twp., Gatineau Park, E of Ridge Rd., 23 Jul 1941, fl, *H. A. Senn et al. 1073* (MO). Labelle Co., Belleville, 10 Jul 1942, *F. F. Lucien & Louis-Marie 1202* (CAS); Frog Lake, Blue Sea Lake, 17 Aug 1922, *M. O. Malte 700/22* (W); Nomingue, forêt des Laurentides, 2 Aug 1947, *F. Rolland-Germain 3200* (DS, F, NY, U, US, W); Nomingue, 24 Jul 1929, fl, *E. Roy 1203* (US). Montreal Island Co., Montreal, 12 Aug 1882, *C. Mohr s.n.* (US). Papineau Co., Montebello, along an unpaved road, just N of rt 148, between rt 323 and rt 321, ca 0.5 km west of the jct with rt 323, near Papineauville secteur Sainte-Angélique, N45°39.988', W74°57.842', 168 m, 11 Aug 2008, herb ca 1 m tall and 1 m in diameter, stem and petiole purple, *J. Wen 10482* (US); near the county line of Les Laurentides Co., along local rt 7, ca 5 km NE of Duhamel, N46°05.750', W75°08.727', 229 m, 11 Aug 2008, fl, herb ca 1.5 m tall, petals white, anthers white, *J. Wen 10483* (US). Rouville Co., NE corner of Yamaska Mountain, 960-1180 ft, dry-mesic deciduous forest of *Acer saccharum* – *Ostrya virginiana* – *Tilia americana*, 3 Aug 1962, fl, *A. Auclair & A. Walther 57* (NY). Pickanock, Quebec, 16 Aug 1894, fr, *J. Macon s.n.* (US). **U.S.A.** ALABAMA: Marshall Co., shaded cool moist sandy ravine by trail to boat landing on Reservoir, Bucks Pocket State Park, 10 Aug 1973, fl, *R. Kral 51097* (MO). ARKANSAS: Newton Co., narrow ravine with extensive sandstone exposures along upper reaches of Terrapin Branch, 700-800 ft, scattered along lower slope, 24 Jul 1971, fl, *P. L. Redfearn Jr & W. Weber 27516* (NCU). Pope Co., Nogo, 9 Jul 1941, *G. M. Merrill 583* (TEX). CONNECTICUT: Fairfield Co., Bridgeport, 5 Aug 1886, fl, *A. L. Winton s.n.* (YU). Litchfield Co., Washington, 18 Aug 1919, young fr, *A. W. Eames s.n.* (YU); Kent, Macedonia Brook State Park, in woods, 23 Aug 1958, young fr, *J. Ebinger 857* (YU); Woodbury, 30 Sep 1905, fr, dry rocky woods, *Eames & Godfrey 269* (YU); Salisbury, Tom's Mountain, woody roadside, 27 Aug 1915, fl & young fr, *C. C. Godfrey s.n.* (YU). Middlesex Co., Chester, thicket, 1 Aug 1932, fl, *R. H. Burton s.n.* (YU); Killingworth, 5 Sep 1932, fl & young fr, *E. B. Harger s.n.* (YU); East

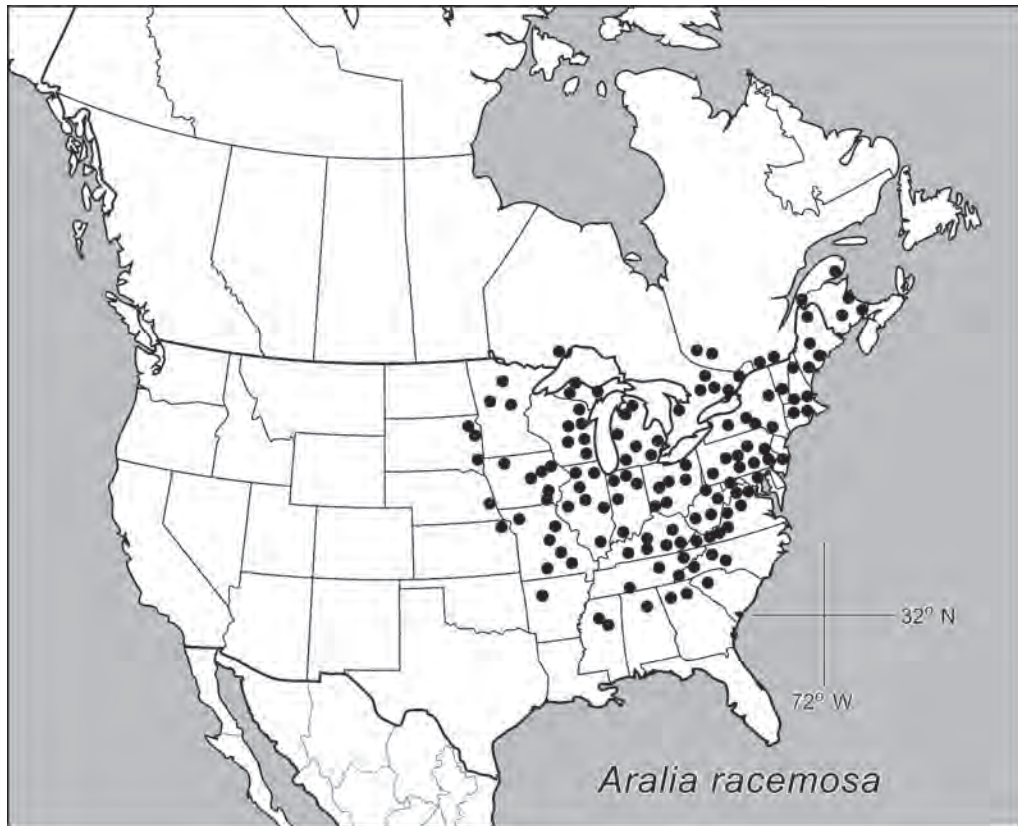


Fig. 19. Map of North America showing the distribution of *Aralia racemosa* L.

Haddam, 16 Aug 1923, fl, *J. F. Smith s.n.* (YU); town of Killingworth, rich shaded soil by small pond NW of junction of routes 80 and 81, 28 Jun 1975, *G. C. Tucker 36* (YU). New Haven Co., Waterbury, rich woods, 8 Aug 1908, young fr, *A. E. Blewitt 2587* (YU); Milford, Meadows End, 27 Aug 1909, *H. S. Clark s.n.* (YU); Meriden, Aug 1856, young fr, *D. C. Eaton s.n.* (YU); New Haven, *D. C. Eaton s.n.* (LE); New Haven, 5 Aug 1873, fl, *G. W. Harris s.n.* (YU); New Haven, 1874, *G. R. Kleeberger s.n.* (CAS). New London Co., Franklin, Dragon's Den, 27 Aug 1885, fr, *G. Waldo s.n.* (YU). Tolland Co., near the town of Willington, along rt.

320, ca. 1 mi S of jct with rt 74, at the edge of deciduous forest, 14 May 1991, *J. Wen 796* (A). DELAWARE: ex Herb. *W. M. Canby s.n.* (P). DISTRICT OF COLUMBIA: 26 May 1880, *E. S. Burgess s.n.* (NY). GEORGIA: Murray Co., Cohutta Wildlife Management Area, ca. 8 mi E of Eton, along West Cowpens Rd. to FS 17, NE of Grassy Mountain, stem red, infrequent, 10 Sep 1982, in late fl., *N. C. Coile 3376* (NCSC); moist sandy loam under white pine – hemlock, ravine drainage north to damsite, Carters Dam area, 16 Jul 1973, fl, *R. Kral 50610* (MO). Rabun Co., northern flank of Big Mt. South of Rock Gorge,

along jeep trail, 1850 ft., 21 Jul 1968, in fl., *D. M. DuMond 1307* (NCSC); Patterson Gap Road above Moon Valley, moist edge of woods and road embankment at edge of Happins-so property, 13 Jul 1991, fl, *Stiles 409* (MO). Union Co., Sosebee Cove, along rocky stream, on slope of Sosebee Cove, scattered, 11 Jun 1991, *J. Wen et al. 982* (A). White Co., 4 miles N of Helen along rt 75, at the base of a big sandstone rock, moist area, plant 1.9 m tall, 5 Sep 1986, fr, *J. Wen 148* (OS); 7 miles N of the town Helen along Rt 75, 5 Sep 1986, fr, fruits purple, *J. Wen 149* (OS). ILLINOIS: Beverly Hills, 24 Sep 1903, fr, *R. Bebb 1572* (F). Highland Park, *W. C. Ohlendorf 4154* (F). Ravinia, Silva Ravinia, N Chicago area, 4 Sep 1905, fr, *F. C. Gates 864* (F); Skokie Marsh, Ravinia, 24 Aug 1911, fr, *E. E. Sherff s.n.* (F). Bureau Co., vic. De Peu, along rte. 29, about 5 mi N of jct. of Rte 29 and rte 26, abundant on wooded slope with rich black soil, 4 Sep 1981, fr, *D. D. Soejarto 5446* (F). Carroll Co., along Sunset Trail in woods, Mississippi Palisades State Park, 30 Aug 1955, *J. W. Thieret 1578* (F). Cook Co., Palos Twp., Swallow Cliffs Forest Preserve, SW of jct US Hwy 45 and State Hwy 83, scarce in transitional oak-maple forest at slope crest, S of toboggan run, 22 Aug 1997, young fr, *T. G. Lammers 10297* (F). Gallatin Co., the Pounds, SSE of Gibsonia, base of cliff in woods, 27 Aug 1956, *J. W. Thieret 2427* (F). Grundy Co., Moris, Mason Creek, between Gooselake Praire preserve and Moris, a clump of 30-50 plants, 23 Jul 1980, fl, *D. D. Soejarto 5133* (F). Jackson Co., on moist sandstone ledge, 30 Jul 1967, young fr, *R. T. Johnson 419* (NY). Jo Daviess Co., in woods N of dirt road, NE corner of sec 28, Derinda Twp., 4.5 miles N of north section of Mississippi Palisades State Park, 30 Aug 1955, *J. W. Thieret 1590* (F). Kane Co., Elgin, Trout Park Woods, wet to swampy forest floor, rich woods, 23 Aug 1979, fl, *D. D. Soejarto 5034* (F, 2 sheets); Elgin, 20 Aug 1918, young fr, *H. C. Benke 362* (F). Lasalle Co., the Illinois State Park at Starved Rock, May-Sep 1921, *F. Thone 97* (F). Peoria Co., NW of Mossville, wooded hillside, 4 Sep 1949, *V. H. Chase 10781* (F, 3 sheets); Peoria Heights, 17 Aug 1953, young fr, *V. H. Chase 13596* (LL). Tazewell Co., 2 mi E of Upper Bridge (Peoria), 5 Sep 1920, *V. H. Chase 3455* (DS, W). Union Co., 27 Jul 1878, fl, *G. H. French s.n.* (US). INDIANA: Bluffton, 25 Aug 1897, fl, *C. C. Deam s.n.* (F). Jennings Co., rich woods, 6 Aug 1932, fl, *S. McCoy 585* (NY).

Laporte Co., Michigan City, thickets, 15 Jul 1903, *C. D. Mell 130* (US). Martin Co., bluffs of White River near point locally known as Old Man's Nose, 6 miles NE of Shoals, dry, sunny, 22 Aug 1935, fr, *R. M. Tryon Jr. 1935* (F). Monroe Co., near a small stream, 14 miles southeast of Bloomington, 18 Jul 1946, fl, *V. Foley s.n.* (TEX). Porter Co., in woods near Long Lake near the town of Black Hawk Beach, 14 Jul 1952, floral buds, *F. A. Swink 1465* (F); in shaded ground of a decadent red maple-yellow birch bog between Route 20 and the Baltimore & Ohio Railroad, just E of County Line Road SW of Ogden Dunes, 27 Jul 1952, fl, *F. A. Swink 1587* (F). Wells Co., Harrison Twp., in woods, 29 Aug 1905, fl, *C. C. Deam 495* (US). IOWA: Black Hawk Co., red oak forest, 9 Jul 1929, fl, *M. Burk 505* (MO, 2 sheets). Clayton Co., deep upland woods at Pike's Peak McGregor, 18 Jul 1927, fl, *B. Shimek s.n.* (MO); upland woods, Pike's Peak McGregor, 8 Aug 1921, fr, *B. Shimek s.n.* (US). Dickinson Co., wooded bluff, west side of Little Sioux River, 3.5 mi north of west from Milford, 1 Jul 1918, fl, *B. Shimek s.n.* (MO); ungrazed woods along Little Sioux River, 2 miles W of Milford, Okoboji Twp., 7 Aug 1953, young fr, *R. F. Thorne 13220* (US). Fayette Co., spreading herb 3-4.5 ft tall, 15 Jul 1894, fl, *B. Fink 250* (US, on the same sheet with nearly mature fruits collected on 31 Jul 1894). Hardin Co., Aug 1876, young fr, *M. E. Jones s.n.* (NY). Van Buren Co., Bentonsport, rich woods, Aug 1926, fr, *E. W. Graves s.n.* (MO). KANSAS: Doniphan Co., 5 miles north and 2 miles east of Troy, thicket, rich moist loam, scattered in local colonies, 3 Sep 1952, fr, *W. H. Horr 4243* (LL, NY). KENTUCKY: Barren Co., deciduous woods, Bonayre Forest, ca. 5 mi W of Glasgow, 29 Sep 1970, *K. A. Nicely 3126* (NCSC). Carter Co., Carter Caves State Park, E end of bridge over Tygarts Creek, NW exposure, Ky 182, Cumberland Plateau Province, 1 Jul 1961, floral buds, *E. M. Browne & E. T. Browne Jr 4417* (NCU). Edmondson Co., Chameleon Springs, 13 Aug 1899, fr, *S. F. Price s.n.* (MO). Estill Co., 5 mi NW of Irvine, 14 Aug 1939, fr, *M. E. Wharton 5177a* (MO). Harlan Co., on Big Black Mountain, Aug 1893, *T. H. Kearney Jr. 148* (F, 2 sheets, MO, NY, US). Hart Co., Big Woods, mesophytic woods, 8 Sep 1940, fr, *E. L. Braun 3579* (US). Lewis Co., rich wooded north slope 1 mile east of Vanceburg, 1 Aug 1939, young fr, *M. E. Wharton 4992* (NCU). Menifee Co., Red River Gorge, Daniel Boone

National Forest, in maple-hickory-*Magnolia* deciduous forest, associated with *Carpinus caroliniana*, *Acer*, *Magnolia tripetala*, *Rhododendron maximum*, *Circaea*, *Hydrangea*, *Impatiens*, and *Parthenocissus quinquefolia*, 29 Jun 1991, *J. Wen 1071* (A). Pike Co., Pine Mountain, near Bald Knob, 2600 ft, 30 Aug 1981, fl, *F. Levy s.n.* (NCU). Powell Co., 1.8 miles east of Kentucky routes 11-15 on Kentucky route 77, Nada Tunnel in Daniel Boone National Forest, 1 Sep 1974, young fr, *D. E. Boufford et al. 15452* (NCU). Wayne Co., Beaver Creek, SW of Monticello, 12-14 Jul 1937, floral buds, *L. B. Smith & A. R. Hodgdon 3935* (F, NY, US). Wolfe Co., in rich moist woods along Swift Camp Creek, 3 Sep 1969, fr, *P. D. Higgins 1827* (NCU). MAINE: Aroostook Co., 0.4 mi W of Center Brook, T11R15, region of Clayton Lake, 8 Aug 1967, *F. C. Seymour & H. K. Svenson 25868* (CAS, MO); Mars Hill, 23 Aug 1967, fr, *F. C. Seymour 26295* (MO). Hancock Co., Mount Desert Island, Southwest Valley, 29 Aug 1889, fr, *E. L. Rand s.n.* (CAS); Mt. Desert Island, 29 Aug 1891, fr, *J. H. Redfield s.n.* (UC). Knox Co., in rich woods, 4 miles northwest of Washington, 19 Aug 1929, young fr, *J. A. Steyermark 1017* (MO); Camp Medomak, near Washington, 22 Jul 1930, fl, *J. A. Steyermark 4115* (F). Lincoln Co., Monhegan Island, woods, between ledges, 3 Sep 1921, *J. R. Churchill s.n.* (MO). Somerset Co., Athens, moist thickets, 14 Aug 1888, fl, *H. H. Tucker s.n.* (F). MARYLAND: Baltimore Co., near Baltimore, 1873, *E. Foreman s.n.* (NY); Gunpowder Falls State Park, area between end of Schroeder Ave. and Perry Hall Rd., Perry Hall, north-facing slope, shaded rocky habitat, near a river, locally rare, 22 May 1991, *J. Wen 817* (A). Garrett Co., Swanton, at RR crossing near Crabtree Creek, foot of Backbone Mtn., 2300-2500 ft, fruits purple, occasional herb 1.5 m tall, wet woods, roadside, 20 Sep 1980, fr, *S. R. Hill 9576* (NY). Harford Co., rocky banks along Susquehanna River, at old Conowingo Bridge, SE of Flintville, 5-6 Aug 1927, fr, *J. W. Adams & G. Hopkins 897* (MO). MASSACHUSETTS: Berkshire Co., Cheshire, 26 Jul 1915, fl, *J. R. Churchill s.n.* (MO); Aug 1898, *J. M. Milligan s.n.* (US). Hampshire Co., Florence, woodland, 3 Sep 1977, *H. E. Ahles 84804* (ASU, BKF); Quincy, Blue Hill Reservation, 3 Sep 1917, *S. F. Blake 6725* (LL). Hampton Co., wooded bank of Chicopee River, Chicopee Falls, 16 Jul 1950, fl, *T. Delevoryas s.n.* (TEX); Granville, 20 Sep 1913, sterile, *F. C. Seymour 52* (MO, 2 sheets). Middlesex Co., Hopkinton, moist open woods, 20 Aug 1911, fr, *C. H. Knowlton s.n.* (ASU). Norfolk Co., Canton, 31 Jul 1901, Clark s.n. (LL); Milton, 15 Jul 1903, floral buds, *J. Murdoch 1367* (F). Worcester Co., Petersham, Turnpike Road in shady site, 29 Jul 1947, fr, *J. E. Canright 327a* (ASU), *327* (ASU). Unknown locality, *Chapman s.n.* (CAS). MICHIGAN: Alger Co., Miner's Castle, Munising, 30 Jul 1940, fl, *A. Chandler 816* (MO); 3.2 mi N of jct with SR 28 on Koski Road, mixed hardwood forest, 46°27'39"N, 86°47'47"W, 270 m, shrub 1 m tall, 28 Aug 1993, fr, *H. H. Schmidt & M. Merello 1082* (MO). Baraga Co., near Otter Lake area, at the Access site of DNR of the Otter River Dam, in maple-*Tilia-Fraxinus* mixed deciduous forest, associated with *Tilia americana*, *Acer* sp., *Aralia nudicaulis*, *Corylus cornuta*, *Prunus serotina*, *Prunus* sp., *Fraxinus* sp., *Osmorhiza claytonii*, *O. longistylis*, *Parthenocissus quinquefolia*, *Trillium* sp., and *Cornus* sp., 27 Jun 1999, perennial 0.6-0.9 m tall, stem purplish, 3-4 ternately compound leaves per individual plant, abundant, *J. Wen 4714* (F, US). Berrien Co., New Buffalo Twp., red and white oak woods, 19 Aug 1950, in fl., *G. W. Parmelee 1769* (MSC). Cheboygan Co., Douglas Lake, 7 Jul 1911, in fl., *F. C. Gates 130* (MSC). Chippewa Co., deciduous woodland, roadside ca. 5 miles east of ferry, N end of Sugar Island, 1 Sep 1947, *R. McVaugh 8794* (DS). Ingham Co., Michigan State Univ., Water Quality Area, Sandhill Woodlot, 20 Aug 1971, in fl., *D. M. Valasek 889* (MSC); Ironwood, 28 Jul 1909, *J. Clemens s.n.* (CAS). Jackson Co., Waterloo Twp., in slight depression under closed canopy of black and white oaks, 6 Aug 1948, in fl., *G. W. Parmelee 687* (MSC). Keweenaw Co., W side of Bare Mountain, E of Bete Grise, in old logging road/trail in deep forest, 6 Jul 1999, in fl., *M. Chamberland 950* (MSC). Macomb Co., Bruce Twp., *Thuja* swamp, 29 Aug. 1950, in young fr., *G. W. Parmelee 1911* (MSC). Mason Co., Hamlin Lake, Ludington, 20 Aug 1910, young fr., *R. W. Chaney 187* (F, NY). St. Clair Co., Port Huron, 5 Jul 1895, fl, *C. K. Dodge s.n.* (TEX). MINNESOTA: Becker Co., along SR 113 S of Itasca State Park, 12 Jul 1963, *C. R. Janssen 498* (U). Clearwater Co., Itasca State Park, along road from main drive to the Campgrounds, 14 Aug 1962, *C. R. Janssen 257* (U); mixed forest, NW part Bear

- Paw Point, Itasca State Park, 20 Jul 1962, fl, *R. F. Thorne 31188* (DS). Cass Co., Gull Lake, Jul 1893, *C. A. Ballard s.n.* (LE). Itasca Co., woods at the n end of Bowstring Lake, 27 Aug 1930, fr, *N. Hotchkiss & P. Jones 4068* (US). Wabasha Co., on the way from Lake City to Wabasha, 19 miles S of Red Wing along SR 61 between milestones 70 and 71, or 3 miles S of Lake City, N44°25.294', W92°13.089', 230 m, 5 Sep 2007, fr, perennial herb with horizontal rhizome, fruits light purple turning to purple, *J. Wen 9949* (US). MISSISSIPPI: Grenada Co., Camp McCain, at 0.2 mi S Grant Road and 0.03 mi E of western boundary of Camp McCain, T22N R5E Sect. 35 NW/4 of SE/4 of NE/4, upper creek terrace, near base of mesic slope, 24 Jul 1996, sterile, *C. T. Bryson 15469* (MO). Tallahatchie Co., 7.2 mi N jct MS Hwys 32 & 35, N of Charleston, E of MS Hwy 32, ravine behind Mt. Zion M. B. Church, 14 Sep 1990, fr, *C. T. Bryson 10410* (MO). MISSOURI: Callaway Co., crevices of north-facing limestone bluffs along Stinson Creek, T47N, R9W, sect. 34, 3 mi SE of Pulton, 10 Sep 1937, fr, *J. A. Steyermark 26090* (F). De Kalb Co., at base of wooded n-facing slope bordering Lost Creek, 2 mi N of Maysville, 21 Jun 1938, floral buds, *J. A. Steyermark 5946* (F). Douglas Co., N-facing limestone bluffs with Roubidoux sandstone above, along Rippee Creek, 2.5-3 mi SE of Sweden, 1 Sep 1951, fr, *J. A. Steyermark 72525* (F). Pulaski Co., clefts of limestone bluffs by Peterson Cave along Hasconade River, sect. 8, 5 mi NW of Waynesville, 24 Aug 1937, fr, *J. A. Steyermark 25258* (F). Ralls Co., Ilasco, 13 Aug 1915, fl, *J. Davis 4853* (F). Texas Co., N-facing wooded limestone exposures along North Prong of Jacks Fork, 4 mi NE of Clear Springs, 11 Aug 1951, fr, *J. A. Steyermark 72377* (F). NEBRASKA: Nebraska City, Aug 1889, *T. A. Williams s.n.* (US). NEW HAMPSHIRE: Carroll Co., Chocorua, 5 Aug 1889, *G. J. Peirce s.n.* (DS). Coos Co., White Mountains National Forest, by Townline Brook, ca. 4 miles NW of jct with St. 16, 071 14.75W, 044 21.67N, mixed hardwood-coniferous forest with deep duff, with *Betula lenta*, *Tsuga*, *Picea*, *Acer rubrum*, *Viburnum*, *Clintonia*, 12 Jul 1999, fl, *W. Hess et al. 8770* (F). Nelson, 18 Jul 1932, *C. F. Batchelder s.n.* (MO). NEW JERSEY: Mercer Co., Princeton, 5 Aug 1851, young fr, *A. Schott s.n.* (F). Morris Co., Morris Plains, rocky woods, 13 Aug 1905, fr, *K. K. Mackenzie 1607* (MO). Passaic Co., Ringwood jc, rocky woods, Sep 1908, *K. K. Mackenzie 3895* (MO). Somerset Co., Watchung, sprawling herb in woods, 29 Jul 1949, floral buds, *H. N. Moldenke 20270* (NY). NEW YORK: Broome Co., Binghamton, Glenmoor Ravine, Lat. 42.6N, Long. 75.54N, 1882, *C. F. Millspaugh s.n.* (F); cliff along stream east-southeast of Union Center, Susquehanna River Drainage, 18 Sep 1949, fr, *R. T. Clausen 7904* (NY). Chemung Co., the upper waters of the Susquehanna, Elmira, 5 Aug 1896, fl, *T. F. Lucy 8779* (F). Essex Co., open woods E of Newcomb, 15 Aug 1940, fr, *H. D. House 27588* (MO). Oneida Co., Trenton Falls, woods, Sep 1871, fr, *J. H. Redfield 2036* (MO). Rensselaer Co., Troy, 1828-1834, *J. Hall s.n.* (F). Sullivan Co., Cohecton, Aug 1887, *J. Scheruk s.n.* (MO). Tompkins Co., Ithaca, Beebe Lake, 8 Aug 1920, *W. C. Muenschler & A. R. Bechtel 477* (CAS). Warren Co., moist woods, n of Bolton Landing, Lake George, 27 Sep 1945, fr, *H. D. House 29957* (TEX). Washington Co., damp woods, Lake George, 3 Sep 1941, fr, *H. D. House 28182* (TEX). NORTH CAROLINA: Alleghany Co., Blue Ridge Parkway, Doughton Park, *L. A. Mullen II 590* (NCSC). Ashe Co., wooded edge of Long Hope Waterfalls, 10 Aug 1969, young fr, *J. K. Moore 2488* (NCU). Avery Co., Lost Cove, along road 464A near the gate, 3000 ft., 2 Aug 1986, in young fr., *T. L. Bradshaw s.n.* (NCSC); along Blue Ridge Parkway, ca 0.7 mi N of Graybeard Mtn View Lookout, 28 Apr 2002, sterile, *J. Wen 6250* (US). Buncombe Co., vicinity of Montreat, thick woods, 23 Aug 1913, young fr, *P. C. Standley & H. C. Bollman 9982* (US). Burke Co., near jct of Shiny Creek and Jacob Fork River, 21 Sep 1975, in fr., *L. Smith 45* (NCSC). Cherokee Co., Joe Brown Highway (SR 1326), gap at north end of Buck Knob, between Unaka and Violet, steep forested slopes, 16 Jul 1998, sterile, *B. A. Sorrie 9845* (NCU, 2 sheets). Forsyth Co., wooded slope, 2.4 miles north of Stanleyville on US 52, 17 May 1958, sterile, *H. E. Ahles 40851* (NCU). Graham Co., common along trail to Stratton Bald in Joyce Kilmer Memorial Forest ca. 15 mi W of Robbinsville, 26 Aug 1955, in young fr., *R. L. Wilbur 4592* (NCSC). Haywood Co., Mt. Sterling, near Waterville, 0.2 mi NW of the town Mt. Sterling on the road to Davenport, 2 Sep 1986, *J. Wen et al. 139* (OS). Henderson Co., growing in hardwoods on mountain side, 2 miles NW of Fruitland in Baldwin Gap, 2 Sep 1956, fr, *D. Pittillo 346* (NY).

Color Plate 1



A-F. *Aralia californica* S. Watson
A & B - Wen 758;
C-F - L. Janeway 10133
Arrow in F indicates leafy
stipule



Color Plate 2



A-F. *Aralia racemosa* L.

A-C - Wen 9841;

D-F - Wen 10507



Color Plate 3



A-G. *Aralia bicrenata* Wooton & Standl.
A, D-G - Wen 4983;
B & C - Wen 4972



Color Plate 4



A-C. *Aralia cordata* Thunb.

A & C - Wen 8542

B - Wen 2456

D & E. *Aralia schmidtii*

Pojark.

D & E - photo by

M. Hasebe

Color Plate 5



A-H. *Aralia taiwaniana* Y.
C. Liu & F. Y. Lu
A-H - Wen 9424



Color Plate 6



A-E. *Aralia continentalis* Kitag.
A - Wen 11550; D - Wen 8138;
B, C & E - Wen 5545

Color Plate 7



A-F. *Aralia tibetana* G. Hoo

A-D - Nie et al. 1023;

E & F - Nie et al. 788;

A-F - photo by Z.-L. Nie



Color Plate 8



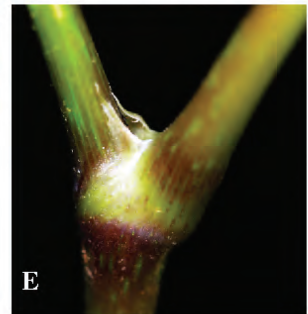
A-F. *Aralia fargesii* Franch.
A-E - Wen 5446;
F - Wen 3079



Color Plate 9



A-H. *Aralia atropurpurea* Franch.
 A, B, E-G - Wen et al. 926;
 C & D - Wen 3057



Color Plate 10



A-G. *Aralia apioides* Hand.-Mazz.
 A, C, E-G - Wen *et al.* 2382;
 B & D - Wen *et al.* 1241;
 B - photo by Z.-L. Nie



Color Plate 11



A-G. *Aralia nudicaulis* L.
A, B & E - Wen 10440;
C & F - Wen 6269;
D & G - Wen 186



Color Plate 12



A-G. *Aralia humilis* Cav.
 A, B, E & G - Wen 4974;
 C, D & F - Wen & Martinez 8707



Color Plate 13



A-B. *Aralia scopulorum* Brandegee

A - photo by J. L. Leon

B - Wen 565

C-F. *Aralia regaliana* Marchal

C-F - Wen & Martinez 384

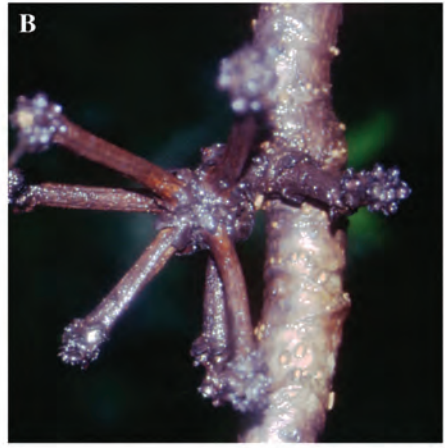


Color Plate 14

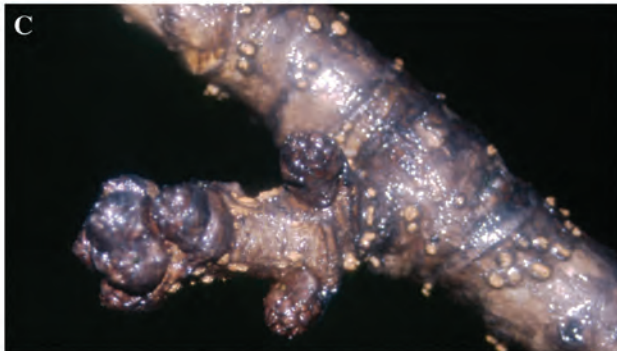
A-F. *Aralia soratensis* Marchal
A-F - Nee & Wen 53845



Color Plate 15



A-F. *Aralia excelsa* (Griseb.) J.Wen
A-F - Wen & Aguilar 6779



Color Plate 16



A-B. *Aralia henryi* Harms
A & B - Shui *et al.* 43014;
Photos by Y. M. Shui



Jackson Co., rich cove, head of Shortoff Creek, E slope of Shortoff Mt., 26 Aug 1951, *W. B. Fox & R. K. Godfrey 5378* (NCSC); Wolf Creek Preserve on Cullowhee Mt., 3600 ft, 26 Sep 1967, *J. D. Pittillo 2877* (LL, NCU, U); Whiterock Road (Co. 1164), plants scattered in moist coves along edge of road, plant 0.5-1.5 m tall, 10 Aug 1970, fl, *D. Pittillo 3161* (MO, NCU); N of Cashiers, along NC 1120, near Cedar Creek, 30 May 1991, *J. Wen 895* (A). Macon Co., in bramble thickets, cut-over hemlock forest, between Cole Mt. Gap and Yellow Mt. Gap, *R. K. Godfrey & J. E. Oconnell 51881* (NCSC); near the Coweeta Hydrological Laboratory, ca. 15 miles W of Highlands, on the W side of US 23, rich woods, 29 May 1991, *J. Wen 883* (A); Dry Falls 3 miles W of Highlands on SR 64, abundant along the trail down to the falls, 31 May 1991, *J. Wen 906* (A); Highlands area, along the road to Glen Falls, ca 0.2 mi from jct with Rt 106, 29 Apr 2002, sterile, *J. Wen 6270* (US). Madison Co., 8.4 mi W of SR 209 on the Forest Service road to Max Patch, 35°46'50"N, 82°57'42"W, 1140 m, shrub 1.5 m tall, corollas cream colored, 11 Aug 1994, fl, *J. S. Miller & N. Snow 8345* (MO, 2 sheets). McDowell Co., near Marion, in the property of Richard Weaver, ca. 6 miles S of Marion, ca. 2 miles along Polly Spout Rd. from its jct with NC 221, 28 May 1991, *J. Wen 880* (A). Mitchell Co., wooded slope, Iron Mountain Gap on NC 26 (northwest of Buladean), 25 Sep 1958, fr, *H. E. Ahles 49872* (NCU). Orange Co., dry rocky woods on Enu River, 3.5 miles E of Hillsboro, 21 Jul 1952, fl, *A. E. Radford 6258* (NCU). Polk Co., along old logging road from Green River to Long Ridge, margins of logging trail in cut over woods, 1400 ft., 7 Sep 1973, in fr., *D. M. DuMond 1809* (NCSC); common in cool mountain forests, in rich loam, Vaughan's Gap, Rocky Spur, 14 Aug 1921, fl, *D. C. Peattie 1212A* (F). Randolph Co., foot of Carroway Mt., 20 May 1959, sterile, *L. Melvin 3393* (NCU). Swain Co., mixed deciduous forest, near NC 28, 1.5 miles south of Lauada, 24 Aug 1956, fr, *A. E. Radford 17228* (NCU). Transylvania Co., moist cove, in gap near N.C. Rt. 178, 4.5 mi S of Rosman, 27 Aug 1951, in young fr., *W. B. Fox & R. K. Godfrey 5415* (NCSC). Watauga Co., mixed woods, 2.5 miles north of Sands on NC 194, 23 Sep 1958, fr, *H. E. Ahles 49417* (ASU); low rocky bank of Watauga River, near Shull's Mill, 8 Sep 1949, in fr., *W. B. Fox & R. K. Godfrey 3388* (NCSC); Rich Mountain N of Boone, in mixed forest, 27 May 1991, plant 1.2 m tall, stem purple, stipule small, not leafy, *J. Wen 855* (A); on the N side of Rich Mountain Rd, ca 1 mile E of jct with US Rt 421, 1 Jun 1994, *J. Wen 1514* (US). Wilkes Co., on shady moist road bank, west slope, dirt road from Gilreath P. O. to Hidnite, 7.6 miles south of Sunland Orchards, 23 Jul 1940, *Radford & Stewart 1769* (TEX). Yancey Co., wooded cove, 3.8 miles north of Swiss, 16 Jul 1958, fl, *H. E. Ahles 46779* (NCU, 3 sheets). OHIO: Butler Co., Oxford, along Tallawanda, 3 Aug 1910, fl, *L. Braun s.n.* (MO). Champaign Co., Cedar Swamp, 12 Aug 1917, young fr, *E. C. Leonard 1699* (US, 2 sheets), 6 Sep 1920, fr, *E. C. Leonard 2101* (US, 2 sheets). Coshocton Co., in open woodland, North Appalachian Experimental Watershed, near Coshocton, 2 Aug 1942, *H. N. Moldenke 13532* (MEXU). Fairfield Co., Ohio State University (OSU) Property, Clear Creek, 10 May 1986, *J. Wen 84* (OS); Clear Creek, OSU property, 16 Jul 1986, fl, *J. Wen 95* (OS); Clear Creek, 25 Sep 1988, fr, *J. Wen 625* (OS, US); Clear Creek, in mixed deciduous forest, plant 1.5 m tall, stem highly zig-zag, 25 Sep 1990, *J. Wen 783* (OS). Hamilton Co., mesophytic woods, 7 Jul 1903, fl, *E. L. Braun s.n.* (US). Hocking Co., Conkel's Hollow, in sandstone area, associated with *Tsuga canadensis*, *Ulmus americana*, and ferns, 4 Jul 1986, *J. Wen 87* (OS). Licking Co., Blackhand Gorge, on sandstone cliff, 30 Jul 1986, *J. Wen 109* (OS). Lorain Co., Oberlin, 4 Aug 1894, fl, *A. E. Ricksecker s.n.* (US). Portage Co., infrequent, N-facing hemlock slope on S side of South Fork of Eagle Creek, 300 yards W of Wadsworth Rd., Windham Twp., 30 Jun 1978, floral buds, *B. A. Andreas & T. S. Cooperrider 2186* (US). Vinton Co., Jackson Twp., along Co. Rd. 17, 0.5 mi north of jct with Co. Rd. 44, mesic forest, 6 Jul 1986, fl, *J. Wen & T. Lammers 88* (OS). PENNSYLVANIA: Bedford Co., mountains of S. Pennsylvania, in the vicinity of Hyndman, 19-23 Aug 1890, fr, *J. K. Small s.n.* (F). Lancaster Co., on the Welsh Mountains, between Churchtown and Beartown, 7 Sep 1892, young fr, 500 ft, *J. K. Small s.n.* (F). Lehigh Co., woods 1 mile NW of Lowhill, 17 Aug 1950, young fr, *R. L. Schaeffer Jr. 34359* (US); 1.25 miles NE of Lynnport, 25 Aug 1951, young fr, *R. L. Schaeffer Jr. 37866* (US). Lycoming Co., Deer Hole Mountain, South Williamsport to summit, 200-400 m, 21 Sep 1928, fr, *W. W. Eggleston & J. W. Kelly 22748* (US). Mifflin Co.,

10 Aug 1867, fl, *J. T. Rothrock s.n.* (F). Monroe Co., 13-15 Jul 1889, *N. L. Britton et al. s.n.* (F). Perry Co., Marysville, 9 Aug 1888, fl, *J. K. Small s.n.* (F). Philadelphia, rich woods, 15 Aug 1888, fl, *J. B. Brinton s.n.* (F). Pocono Plateau, Jul-Aug 1904, *J. W. Harshberger s.n.* (F, MO). RHODE ISLAND: Providence Co., near Limestone Rock, 2 Oct 1910, fr, *J. M. Greenman 2554* (MO). SOUTH CAROLINA: Greenville Co., rich woods, Hogback Mt., 2500 ft, *D. C. Peattie 1244* (F), *1244A* (F). Oconee Co., open wooded bank of Thompson River, above Jocassee, 21 Aug 1951, in young fr., *R. K. Godfrey & J. E. O'Connell 52001* (NCSC). SOUTH DAKOTA: Grant Co., dark woods west side of Big Stone Lake, 27 Jul 1916, fl, *W. H. Over 1951* (US); Big Stone, 23 Aug 1892, fr, *T. A. Williams s.n.* (US). Marshall Co., Sieche Hollow, 29 Jun 1959, floral buds, *B. Ailts 234* (ASU). Minnehata Co., 3 mi S of Garretson, densely wooded Sioux quartzite bluffs, relatively rare in moist ravines, 10 Jul 1965, floral buds, *L. J. Harms 2673* (NY). Roberts Co., common in damp rich woods, Jul 1922, fl, *W. H. Over 14415* (US). Rare in *Acer saccharum* woods, Sieche Hollow, Sisseton, 31 May 1957, sterile, *O. A. Stevens & D. R. Moir 1690* (US). TENNESSEE: Blount Co., along edge of woods at base of Chilhowee Mountain beside Reed Creek Road east of Walland near Sevier County line west of Waldens Creek, 9 Aug 1994, young fr, *R. D. Thomas et al. 141164* (NY). Cocke Co., 5.6 mi SE of Del Rio on SR 107 in Cherokee National Forest, 35°51'41"N, 082°58'58"W, 600 m, 19 Aug 1977, fr, *J. S. Miller et al. 8889* (MO); ca. 10 miles E of NC State line, just west of Pigeon River from I40 to Waterville, E of Carolina Power and Light Co. Water Plant, roadside wet area, ca. 1 m tall, 1.5 m in spread, 1 Sep 1986, fr, *J. Wen et al. 138* (OS). Green Co., Yellow Spring Rd., 29 Jul 1965, *L. A. Mullen II s.n.* (NCSC). Grundy Co., creekside forest in Fiery Gizzard Cove, near Grundy State Forest, 20 Aug 1964, fl, *R. C. Clark 1165* (NCU). Monroe Co., Cherokee National Forest, along Miller Cemetery Road south of Tellico River and Tenn 165 east of Tellico Plains, 20 Jul 1996, fl, *R. D. Thomas & B. R. Thomas 149978* (NY). Putnam Co., E of Monterey on escarpment, sandstone bluffs by I-40, 2 Aug 1973, fl, *R. Kral 51004* (MO, 2 sheets). Sevier Co., near Gatlinburg, Great Smoky National Park, Ramsay Creek, 19 Oct 1944, fr, *G. S. Miller 2101* (US). Tipton Co., heavily

wooded hillsides at Bear Creek, turn S on farm road about 2.6 miles W of road jct at Drummonds, creek at bottom of hill on west side of cultivated fields, 1 Sep 1968, young fr, *S. J. Warrington 373* (NCU). Unicoi Co., Limestone Cove, along rt 173, ca 5 miles E of Unicoi, roadside woods, N36°10.553', W82°17.427', 683 m, 31 Aug 2008, fr, perennial ca 1.5 m tall, fruits purple, flowers whitish, *J. Wen 10507* (US). Wayne Co., Natchez Trace Parkway, bottomland forest, 23 Jul 1947, fl, *W. B. McDougall 1413* (US). VERMONT: Bennington Co., Manchester, 28 Jul 1898, fl, *M. A. Day 77* (US); Pownal Twp., along paved road, 1.7 miles north of North Pownal Post Office, mesic forest, associated with *Impatiens*, *Sambucus canadensis*, and *Quercus*, 9 Aug 1986, *J. Wen et al. 130* (OS); along SR 9, opposite to Woodford State Park, moist woods, 9 Aug 1986, *J. Wen et al. 132* (OS); Woodford State Park, at the edge of *Quercus-Larix* forest, 9 Aug 1986, *J. Wen et al. 134* (OS). Caledonia Co., Peacham, 10 Sep 1883, *F. Blanchard s.n.* (DS); Peacham, 29 Jul 1892, *F. Blanchard s.n.* (DS, F, MO). Chittenden Co., wooded bank, Williston, 240 ft, 29 Jul 1911, fl, *S. F. Blake 2329* (LL). Franklin Co., rich woods at northern end of Metcalf Pond, 25 Sep 1964, fr, *F. C. Seymour & W. D. Countryman 22569* (MO). Lamoille Co., in deep wet woods, Smiggler's Notch, Mount Mansfield, 24 Aug 1976, fl, *A. L. & H. N. Moldenke 31095* (LL). Rutland Co., Middletown Springs, *D. S. Carpenter s.n.* (CAS); Brandon, rich woods, 500 ft, 11 Aug 1923, *D. L. Dutton s.n.* (DS). Windham Co., Jamaica, in dense woods, 26 Aug 1935, *H. N. Moldenke 8741* (F, MO). VIRGINIA: Augusta Co., summit of Elliott Knob, 1360 m, 4 Jul 1937, floral buds, *H. A. Allard 3158* (US). Bedford Co., Peaks of Otter, 1871, *A. H. Curtiss s.n.* (LE, MO, NY). Fauquier Co., the Plains, Kinloch Farm, 15 Sep 1984, young fr., *T. Plowman 13862* (F). Giles Co., Mountain Lake, 12 Aug 1950, in fl., *B. W. Wells s.n.* (NCSC); along rt 700 near Mountain Lake, 9 Sep 1986, *J. Wen et al. 182* (OS). Loudoun Co., wooded bluff, Goose Creek on Co. Rt. 621 (vic. Of Evergreen Mills), 11 Sep 1965, sterile, *H. E. Ahles 61512* (NCU, 2 sheets). Madison Co., Stony Man Mountain, rocky woods, 2000 ft, 25 Aug 1901, young fr, *W. Palmer & W. H. King 142* (US). Nelson Co., along road to Spy Rock above Fish Hatchery, rich soil, ravine, *R. S. Freer 2442* (US). Page Co., Stony Man Mountain, rocky woods, 2500 ft, rare, 24 Aug 1901,

fl, *W. Palmer & W. H. King 126* (US); Matthew's Arm Rd., roadside, 14 Aug 1938, young fr, *E. H. Walker 2677* (US); Stony Man Mountain & vicinity in the Blue Ridge, near Luray, 20 Aug 1901, fr, 3500 ft, *E. S. Steele 25* (MO, NY). Rappahannock Co., Shenandoah National Park, on Appalachian trail north of Pinnacle Mountain, on rocky slope near crest of Blue Ridge, 21 Sep 1941, fr, *E. H. Walker 3212* (US). Shenandoah Co., at the top of Short Mountain, along Rt. 374, roadside, near Mt. Jackson, large perennial about 2.5 m tall, terminal infl 40 cm long, 26 cm wide, berries purple, 10 Sep 1994, fr, *J. Wen 1800* (US); Short Mountain, near the top, 22 Sep 1994, *J. Wen 1824* (US). Smyth Co., on Nick's Creek, at base of Pine Glade Mountain, 5 Aug 1892, fl, 2500 ft, *J. K. Small s.n.* (F, MO). Surry Co., rich calcareous wooded gullies along James River, Claremont Wharf, 23 Aug 1938, young fr, *M. L. Fernald & B. Long 9112* (US). Warren Co., Linden, G. Thompson Wildlife Management Area, along main trail near Parking Area 6, in woods, N38°57'13.3", W78°01'37.4", 648 m, 8 May 2007, sterile, herb ca 1 m tall, stem purple, *J. Wen 9697* (US); near Rangeview Overlook on Skyline Dr., Shenandoah National Park, ca 12 miles S of Dickey Ridge Visitor Center, N 38°45'58.6", W78°13'42.8", 850 m, 4 Jul 2007, herb ca 1.5 m tall, stem dark purple, *J. Wen 9841* (US). Washington Co., ravine just north of Mendota, 6 Sep 1967, young fr, *A. M. Harvill 17768* (NCU). Wythe Co., on Reed Creek, at base of Lower Rocks, 23 Jul 1892, fl, 2000 ft, *J. K. Small s.n.* (F). WEST VIRGINIA: Greenbrier Co., rocky woods, frequent, 2 Sep 1903, fr, *K. K. Mackenzie 429* (NY). Hampshire Co., hill about 2 miles northeast of Levels, 1 Aug 1967, young fr, *R. M. Downs 1580* (NCU). Mineral Co., mixed deciduous woods on north slope facing north branch of Potomac River, scattered outcrops of Greenbrier limestone in varicolored shales and sandstones, ca. 1 mile southeast of Piedmont, 9 Aug 1969, sterile, *R. M. Downs 8124* (NCU). Pendleton Co., North Fork Mountain, west-facing slope, 28 Aug 1945, fl, *J. W. Roller 348* (US). Putnam Co., wooded margin of Lake Washington, near Hurricane, 20 Jul 1940, *F. A. Gilbert et al. 876* (DS, MO, 2 sheets). Summers Co., from WV Hwy 20 in Hinton, follow Hwy 3 west about 1.25 miles, south of Beech Run Creek, 3 Aug 2001, young fr, *P. Diamond 1297* (NCU). Tucker Co., Canaan Valley, 900-1200 m, 3 Aug 1945, fl, *H. A.*

Allard 11526 (US, 2 sheets). Wetzel Co., woods at mouth of Brown's Run, 2 mi E of Littleton, 8 Aug 1931, *O. Haught 737* (DS, 2 sheets). Locality unknown in West Virginia, Brookside, 17 Aug 1898, fl, *H. W. Olds s.n.* (US). WISCONSIN: woods along lake, S of Milwaukee, 11 Aug 1902, young fr, *A. Chase 1949* (F). Woods, Williams Bay, 21 Aug 1897, young fr, *L. M. Umbach s.n.* (F, 2 sheets, MO). Brown Co., Oneida Reservation, 3 Aug 1886, young fr, *J. H. Schuette s.n.* (F). Chippewa Co., along rte M on the way from Holcombe to New Auburn, ca 1 mi E of the junction with county Rte E, or 11.7 miles east of the junction with rte 40, N45°14.073', W91°13.940', 395 m, in maple-birch-*Populus* forest, 3 Sep 2007, fr, perennial ca 1.5 m tall, stem dark purple, fruits light purple, *J. Wen 9931* (US). Door Co., Ellison Bay, 31 Jul 1887, young fr, *J. H. Schuette s.n.* (F); Sister Bay, 2 Aug 1887, *J. H. Schuette s.n.* (US). Shawano Co., 4 mi SSE of Bonduel, on farm of Lorenz Liesner, 30 Sep 1984, past fr, *R. Liesner 17208* (MO). Walworth Co., in woods of Covenant Harbor near Lake Geneva, 4 Jul 1953, floral buds, *F. A. Swink 2268* (F).

Cultivated specimens: **U.S.A.** NEW YORK: New York Botanical Garden, Herbaceous Grounds, 29 Aug 1907, fl, *N. Taylor & R. C. Schneider 0619* (NY). PENNSYLVANIA: Berks Co., Landis Store, District Township, a perennial herb 8 dm tall, leaves compound, flowers white, 30 Jul 1973, fl, *W. C. Brumbach 8414* (NY). Lancaster Co., Rawlinsville, 1883, *J. Galen 1047* (US).

Marie-Victorin and Rousseau (1940) described *Aralia racemosa* var. *foliosa* Vict. & J. Rousseau based on the presence of leafy bracts or leaf-like structures on the inflorescence in some collections from Québec, Canada. This character is occasionally observed in specimens from other areas (e.g., *Raud s.n.* collected from Hancock Co. of Maine on 29 Aug 1889; and *Clemens s.n.* collected from Ironwood, Michigan on 28 Jul 1909). Scoggan (1978) proposed to recognize it as a form: *Aralia racemosa* L. f. *foliosa* (Vict. & J. Rousseau) Scoggan. I have found that the species is quite variable and I prefer not to recognize forms in this treatment.

Aralia racemosa is easily distinguished from *A. californica* by the former's non-leafy stipules, much narrower inflorescence (3-10 cm vs. 10-25

cm wide), fewer flowers (20-25 vs. 30-75) per terminal umbel, shorter pedicels (6-8 mm vs. 12-20 mm long) on terminal umbels, and smaller fruits (4-4.5 vs. 6-7 mm long). The distinction between *A. racemosa* and *A. bicrenata* is discussed under *A. bicrenata*.

3. *Aralia bicrenata* Wooton & Standl. — Fig. 20; color plate 3: A-G.

Aralia bicrenata Wooton & Standl., Contr. U. S. Natl. Herb 16: 157. 1913. *Aralia racemosa* subsp. *bicrenata* (Wooton & Standl.) S. L. Welsh & J. T. Atwood, Great Basin Naturalist 35: 333. 1975. TYPE: U.S.A. NEW MEXICO: Socorro Co., near Holts Ranch in the Mogollon Mountains, 20 Jul 1900, fl., *E. O. Wooton s.n.* (holotype: US!, US Herb. # 563963; isotype: US!, US Herb. # 736551).

Aralia arizonica Eastw., Proc. Calif. Acad. Sci., IV, 20: 148. 1931. TYPE: U.S.A. ARIZONA: Cochise Co., Chiricahua Mountains, Cave Creek Canyon, 6-8000 ft., 26-29 Jun 1927, *J. A. Kusche s.n.* (holotype: CAS!, photo at US!).

Robust perennial herb, 1-2.2 m tall, andromonoecious. Stem sparsely pubescent on the older parts, pubescent on the younger parts, green to greenish purple, with 4-6 leaves; rhizomes thick and horizontal. Leaves 73-120 cm long, 60-118 cm wide, ternate, spreading; stipule 3.2-8.9 cm long, 1.1-5.8 cm wide, leafy; petioles 25-45 cm long, light green to purplish green; leaflets 6-14 cm long, 3-8 cm wide, thin papery to papery, the pair of leaflets below the terminal leaflet narrowly ovate, other leaflets ovate to broadly so, acuminate to acute at apex, truncate, broadly acute to subcordate at base, commonly oblique on lateral leaflets, doubly serrate at margin; lateral veins 8-9 on each side, conspicuous on both surfaces, green and sparsely pilose on veins and veinlets on the adaxial surface, light green and pilose on veins and veinlets on the abaxial surface, petiolules 0.2-4 cm long, pilose. Inflorescence 35-50 cm long, 30-50 cm wide, terminal and axillary, the transition between the axillary inflorescence below and the upper terminal inflorescence gradual, essentially the inflorescence terminal with the lower primary branches subtended by bipinnately ternate leaves and the upper primary branches subtended by leafy bracts, the overall architecture corymbose,

consisting of 10-20 primary branches, primary branches often 3-5 forming one or two circles on the upper part of the main inflorescence axis, each primary branch 8-30 cm long, consisting of 3-30 umbels, with some lateral umbels functionally male; terminal umbels 12-20 (-25)-flowered, pedicels 7-12 mm long, pubescent, tip enlarged; lateral umbels 8-15-flowered, pedicels 3-6 mm long; bracts of the upper primary branches leafy to lanceolate or linear, the leafy ones varied in size, 1-5 cm long, 0.4-3 cm wide, the lanceolate to linear true bracts 5-12 mm long, 1-3 mm wide, pilose, ciliate at margin; bracteoles 1.1-2.0 mm long, 0.4-0.7 mm wide, lanceolate, pilose, ciliate at margin. Sepals 0.4-0.6 mm long and wide, triangular, persistent on fruits; petals 1.9-2.0 mm long, 1.1-1.3 mm wide, ovate, greenish white to white, with a conspicuous vascular bundle in the middle; stamens 5, filaments 2-2.4 mm long, anthers oblong, 0.9-1 mm long, 0.6-0.7 mm wide; ovaries 5-locular, styles 0.6-0.8 mm long at anthesis, base of styles slightly enlarged. Fruits 3.5-4.5 mm in diameter, globose, occasionally ovoid globose, dark purple, persistent styles divided to 1/3 to the base, 1.5-1.7 mm long. Seeds 2.5-2.9 mm long, 1.5-2.0 mm wide, 0.4-0.5 mm thick, kidney-shaped, whitish gray, smooth.

Common name: spikenard.

Phenology: flowering in July to August; fruiting in August to October.

Distribution: in Arizona and New Mexico, rare in Colorado (La Plata Co. and Mineral Co.), Utah, and Texas (a single population on Mt. Livermore, Jeff Davis Co.) of U.S.A. as well as in northern Mexico (Chihuahua, Coahuila, and Sonora) (Fig. 21).

Ecology: deciduous or mixed broadleaf and coniferous forests, edges of forests, along streams, on rocky cliffs in moist habitats, and roadsides near forests; 1500-3000 m.

Representative specimens examined. **Mexico.** CHIHUAHUA: Mpio. Madera, arroyo de las Garrochas, ejido "El Largo-Madera", 18 Oct 1990, fl, 2600 m, *A. Benítez P. 2930* (MEXU); Mpio. De Madera, arroyo de las Garrochas, ejido El Largo, bosque mixto de coníferas y latifoliadas, 2600 m, 28 Aug 1990, fl, *O. Bravo Bolaños 1314* (MEXU); Mpio. De Bocoyna, Rio Oteros, ca. 10 mi W of Creel, near bend in river at stand of *Picea*

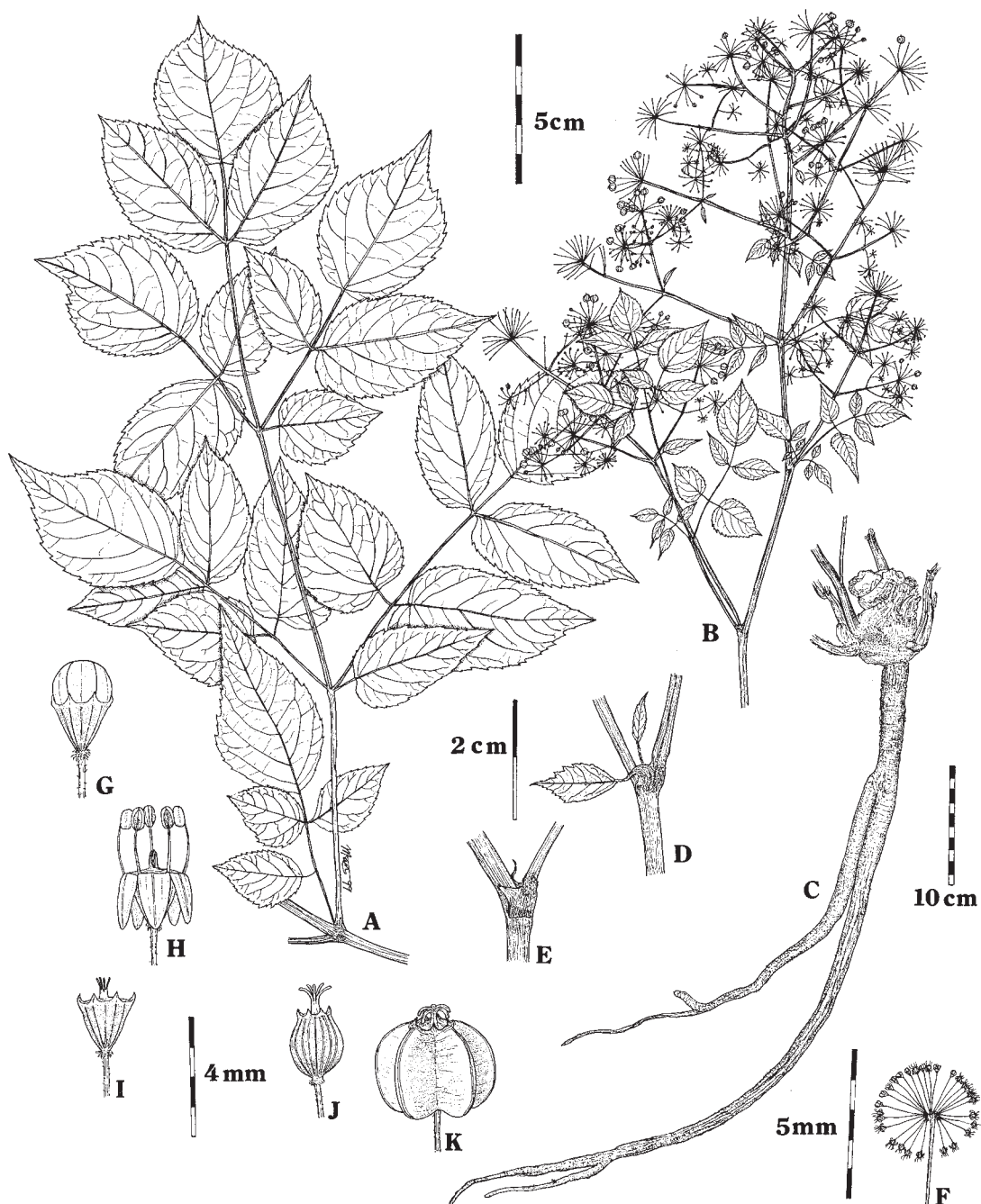


Fig. 20. *Aralia bicrenata* Wootton & Standl. A. Leaf with an accessory pinna. B. Inflorescence with transitional leaves and leafy bracts subtending the primary branches. C. Root and rhizome. D. Leafy stipules. E. Upper non-leafy stipules. F. Umbel. G. Floral bud. H. Flower. I. Flower after anthesis. J. Young fruit. K. Fruit.

chihuahuana, 7600 ft, 30 Jul 1974, R. A. Bye 6628 (MEXU); Chuichupa, Sierra Madre Mts., 21 Sep 1903, fr, 7000 feet, M. E. Jones s.n. (RSA); Largo Canyon, Sierra Madre Mts., 7000 ft, 26 Sep 1903, fr, M. E. Jones s.n. (BM, RSA, 2 sheets, US); Chuchuchupa, Aug-Sep 1936, fr, H. LeSueur 940 (F, MO); Salto de Bapuora, 20 Jul 1937, fl, H. LeSueur 1400 (F, MO); Sierra Madre, Jun-Jul 1899, E. W. Nelson 6141 (K, US); 5 mi SE of Colonia Garcia in the Sierra Madres, 7500 ft, 27 Jul 1899, fl, C. H. T. Townsend & C. M. Barber 183 (BM, 2 sheets, F, G, MEXU, MO, MSC, P, 2 sheets, US, WU). COAHUILA: ca. 20 (air) miles ESE of Boquillas in Sierra del Carmen, ca. 2.5 miles E of Rancho El Jardin in Canyon Hundido on the northernmost north-facing igneous canyon of the Sierra del Carmen, infrequent in shaded temperate forest with mid-canyon, with *Quercus*, *Pinus*, *Prunus*, *Viburnum*, and *Cornus*, near spring, 6600 ft, 27 Jul 1973, young fr, 29°06'N, 102°37'W, J. Henrickson 11442 (RSA); Canyon Hundido on N side of Pico de Centinela, Sierra del Jardin, 8 km E of Rancho El Jardin by winding road, 29°06'-29°08'N, 102°37'-102°38'W, 1500-2250 m, 27 Jul 1973, fl, M. C. Johnston et al. 11819 (F, MEXU, MO); Del Carmen Mts., 12 Sep 1936, fl, E. G. Marsh Jr. 828 (F); Sierra Maderas del Carmen, Cañon El Dos, in middle, deep, very mesic part of canyon, from ca. 1 mi above jct with Cañon El Oso up to washed-out bridge ca. 1/2 mi down from Campo El Dos, mesic woods of *Quercus hypoleucoides*, *Pinus ponderosa*, *P. stromiformis*, *Tilia*, *Acer*, *Pseudotsuga*, *Cupressus*, *Salix lasiolepis*, and *Ostrya*, rhyolitic area, 28°59'N, 102°35'-36'W, 2000-2200 m, 3 Aug 1974, fl, T. Wendt & A. Adamcewicz 462 (MEXU). SONORA: upper Arroyo Frijolito, north slope of Cerro de las Flores, 30°56'N, 109°57'30"W, 2300 m, growing on north-facing slope, above arroyo bottom, across from base of steep cliffs with *Abies concolor*, *Symphoricarpos oreophilus*, *Geranium richarsonii*, and *Acer grandidentatum*, common, 9 Oct 1992, fr, M. Fishbein et al. 704 (MEXU); Arroyo Frijolito, 30°56'30"N, 109°57'W, 2200 m, growing at base of limestone walls in narrow canyon bottom in pine-oak woods with *Acer grandidentatum*, *Bromus*, *Robinia neomexicana*, *Habenaria limosa* and *Smilacina stellata*, common, 9 Oct 1992, fr, M. Fishbein et al. 725 (ASU, MEXU, MO). U.S.A. ARIZONA: Apache Co., Ryan Ranch, Apache Res., 2 Oct 1927, fr, G. J.

Harrison 4849 (US); Badger Lake, near McNary, 7200 ft, Jun 1956, floral buds, J. A. McCleary s.n. (ASU). Cochise Co., Chiricahua Mountains, Chaperon Canyon, shady gulch along Living Brook, at road Cold Living Brook, 7300 ft, 25 Aug 1907, young fr, J. C. Blumer 1625 (F, NY, US), 1625a (US); Miller Cañon, Huachuca Mts., 6 May 1919, sterile, R. D. Camp 38-3 (F); Miller's Cañon, Huachuca Mts., 5 Aug 1909, L. N. Goodding 324 (CAS, G, NY); Miller Cañon, 2 Aug 1909, fl, along moist canyons, L. N. Goodding s.n. (NY); Ramsey Cañon, Huachuca Mountains, 29 Sep 1929, fr, M. E. Jones 24945 (NY, RSA); Huachuca Mts., Miller Cañon, 7500 ft, 4-5 ft tall, in moist situations, 28 Sep 1916, fr, F. Shrieve 5087 (US); Coronado National Forest in Chiricahua Mountains, at the west end of Fores Road 713, along a creek, N31°52.758', W109°14.920', 1975 m, moist rocky habitat in *Pseudotsuga-Pinus-Juglans* mixed forest, associated with *Pseudotruga*, *Pinus*, *Juglans*, *Thalictrum*, *Quercus*, *Rubus*, *Aquilegia*, and *Rhamnus*, 14 Jul 2000, fl, J. Wen 4981 (F, US). Coconino Co., western foothill region of San Francisco Peak, 2300 m, 21 Aug 1901, fr, J. B. Leiberger 5883 (US); Oak Creek near Flagstaff, shaded soil in cañon, 3-7 ft high, 29 Jul 1891, fl, D. T. MacDougal 465 (US); Oak Creek Canyon, 0.5 miles north of Cave Spring Forest Camp, along stream, 28 Jun 1969, floral buds, Pinkava et al. 16143 (ASU, RSA); Sycamore Canyon Wilderness Area, Kaibab National Forest, Sycamore Canyon, ca. 0.5 mi E of Sycamore Falls, at the bottom of the canyon, on rocky cliffs and sandy soil, N35°08.193', W112°01.112', 1930 m, associated with *Pseudotsuga*, *Acer negundo*, *Quercus* sp., *Parthenocissus vitacea*, *Vitis* sp., *Cornus*, *Humulus*, *Acer glabrum*, *Robinia pseudoacacia*, *Ribes*, and *Thalictrum*, 15 Jul 2000, fl, J. Wen 4982 (F, US); SW of US route 89A in Sterling Canyon ca. 3.10 km NW of the summit of Ritter Butte, in rocky alluvial soil (basalt, limestone, sandstone) near permanent spring in canyon bottom, shaded riparian/mixed conifer community with *Cornus*, *Equisetum*, *Acer* and *Pinus*, 5775 ft, 19 Sep 1995, fr, M. D. Windham 95-268 (NY); Sycamore Canyon Wilderness Area, Big Spring Canyon, 1.9 km NNW of White Horse Lake, 6280 ft, canyon bottom, rooted on north-facing limestone rock face, fruits blue-black, sweet but with bitter aftertaste, 20 Sep 1992, fr, T. Wright 92-332 (ASU, RSA). Gila Co., Tonto forest area, along creek – Workman Falls,

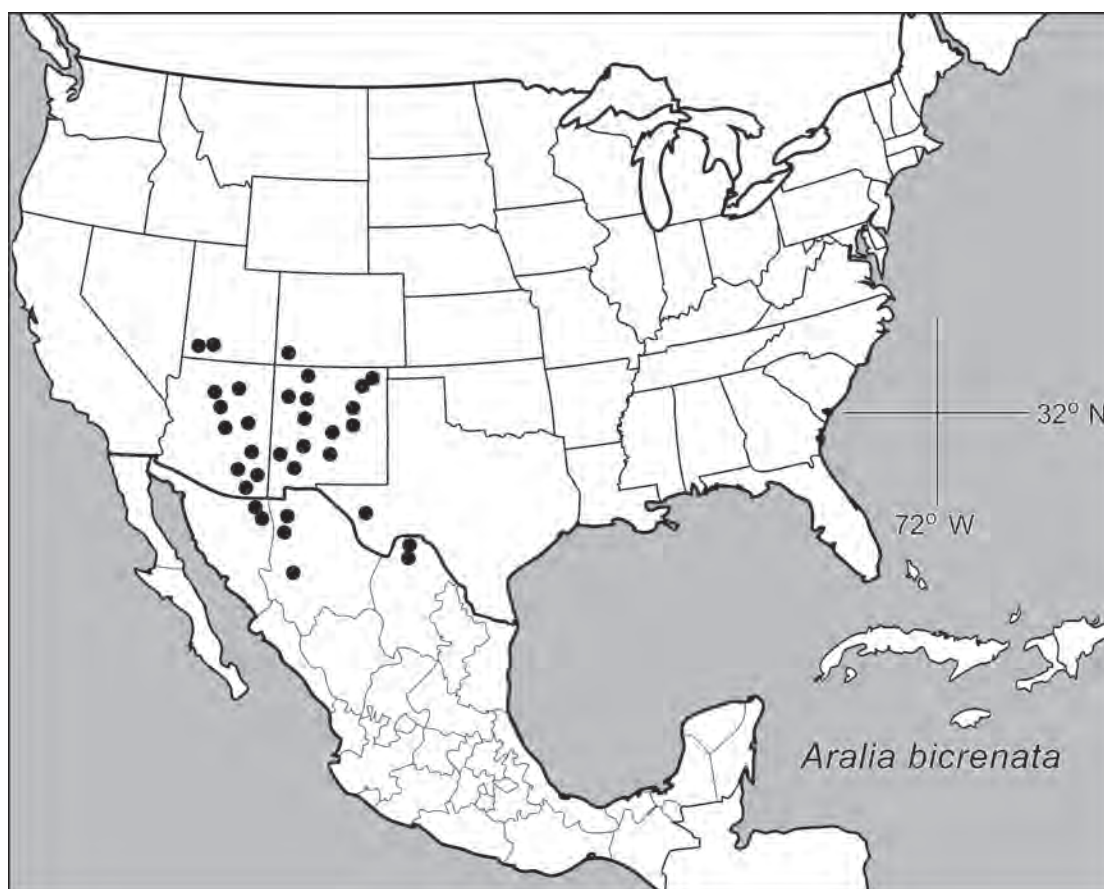


Fig. 21. Map of U.S.A. and Mexico showing the distribution of *Aralia bicrenata* Wooton & Standl.

very scarce with *Abies*, *Acer*, *Cornus*, *Cimicifuga*, 25 Aug 1976, fl, R. K. Gierisch 3789 (ASU, UNM, 2 sheets); Workman Creek area near falls, Sierra Anchas Mountains, mixed conifer-oak hillside near swiftly flowing stream, 7000 ft, 29 Jul 1968, fl, C. Pase & D. Keil 3461 (RSA); near waterfalls of Workman Canyon, rich moist area beside the Workman Creek, in mixed Douglas fir, *Acer*, and *Alnus* forest, plant 2-5.5 ft tall, basal leaves ca. 1 m long and 1 m wide, young fruits purplish green, 18 Sep 1999, J. Wen 4972 (CS, F, US). Graham Co., Mt. Graham, 9500 ft, 12 Aug 1934, fl, T. H. Kearney & R. H. Peebles 9901 (US); Mt. Graham, 22 Jul 1927, fl, R. H. Peebles et al. 4486 (US); Pinaleno Mts., Swift Trail (Hwy 366), Twilight Canyon, 13.5 mi W of jct of Hwy 666, 1.4 mi W of Arcadia Campground, permanent stream with rocky, mossy banks, maple, box elder, *Ribes*, 2195 m, 28 Jul 1975, fl, T. Reeves 3889 (ASU, 2 sheets).

Pima Co., along the trail to Potato Patch, Santa Catalina Mountains, 7700 ft, 12 Oct 1968, fr, V. L. Bohrer 1263 (NCU); Pinal Mountains, south-central Arizona, south of the town of Globe, Sixshooter Canyon Trail, on north side of Pinal Peak, mixed conifer forest, over 2 m tall, 7200 ft, 10 Jul 1982, floral buds, S. Forbes 1702 (ASU); Santa Catalina Mts, 5-10 Sep 1904, fr, D. Griffiths 7122 (MO); Sierra Ancha Mountains and Wilderness Area, 2.25 mi E of Young hwy, off FSR 487, 2133 m, near Workman Creek, with Douglas-fir, *Acer grandidentatum*, infrequent, 22 Aug 1984, young fr, W. Hodgson 3230 (ASU); Sierra Ancha Wilderness Area in Tonto National Forest, Reynold's Creek below Knoll's Hole Spring, along trail 150, growing with *Pinus ponderosa*, *Abies concolor*, *Pseudotsuga menziesii*, *Alnus oblongifolia* and *Acer grandidentatum*, along creek, ca. 3 m tall, 7000 ft, 29 Aug 1992, fr, G. J.

Imdorf 988 (ASU); Sierra Ancha, Workman Creek below falls, 5500 ft, 9 Sep 1964, fr, *C. P. Pase* 1413 (ASU); in rocky gorge in Soldier Camp above dam, Santa Catalina Mts., 7400 ft, 27 Jul 1944, fl, *W. S. Phillips* 2467 (NY). Navaho Reservation, only in wet caves, total shade, Jul 1916, young fr, *Collector unknown s.n.* (NY). COLORADO: La Plata Co., Elbert Creek ca. 1.2 mi SW of conf with Sawmill Creek and Animas River, 7500 ft, 11 Jul 2000, fl, *J. Wen* 4977 (F, US). Mineral Co., San Juan Mtns., 5 miles below summit Wolf Creek Pass-west side, 8000-8500 ft, 28 Jul 1928, fl, *C. B. Wolf* 3071 (CAS, RSA, 2 sheets). NEW MEXICO: Catron Co., Gila National Forest, along drainage beginning NNE of Bearwallow Lookout Mt., 8160-9800 ft, rich coniferous forest with *Picea*, *Abies*, *Pinus*, *Pseudotsuga*, *Populus*, *Quercus*, *Acer*, 33°27'10"-33°28'15", 108°40'00"-108°40'40", corolla white, scarce, 20 Jul 1984, fl, *T. F. Daniel & S. Nelson* 3572 (ASU); the Mogollon Mts of the Gila Wilderness, Gila National Forest, in the vicinity of Mogollon & Whitewater Baldy, Black, & Sacaton Mts., Silver Drip Cabin trail, by Big Dry Creek from Apache Springs, perennial near creek, 4 ft tall, 7500 ft, 1 Sep 1968, fl, *W. Hess* 2367 (NCU); ca. 1.5 mi E of Mogollon along route 159, shady moist area under pine-*Juglans-Alnus* mixed forest, associated with *Parthenocissus vitacea*, *Rubus* sp., *Potentilla* sp., *Monarda* sp., *Toxicodendron radicans*, and *Rosa* sp., N33°23.037', W108°46.392', 2090 m, along a creek on roadside, 13 Jul 2000, fl, *J. Wen* 4979 (F, US), 4980 (F, US). Colfax Co., vicinity of Ute Park, 2200-2900 m, 11 Sep 1916, fr, *P. C. Standley* 14698 (NY, US). Lincoln Co., Capitan Mountains, Pine Lodge, 29 Jun 1979, floral buds, *J. P. Hubbard s.n.* (UNM); gravel loam, vicinity of Rio Bonito, west of Bonito Lake, in the White Mountains, 7700 ft, 17 Jul 1971, fl, *Hutchins* 3492 (UNM); along shady stream in Sierra Blanca Wilderness area, 27 Jul 1974, young fr, *W. Wagner* 264 (UNM); South Fork of Rio Bonito, ca. 0.2 mi S of South Fork trailhead, Lincoln National Forest, along Rio Bonito, N33°26.806', W105°45.523', 2325 m, associated with *Urtica*, *Monarda*, *Pinus*, *Pseudotsuga*, *Ranunculus*, and *Rubus*, uncommon, 16 Jul 2000, fl, *J. Wen* 4983 (F, US); White Mts., Eagle Creek Canyon above (1 mi W of) the summer resort cabins, 2500 m, 1 Aug 1984, fl, *R. D. Worthington* 12276 (NY). Los Alamos Co., Apache Spring, Bandelier National Monument, 7900 ft, 27 Jul 1975, fl, *R. Halley* 49 (UNM); Water Canyon, 7100 ft, riparian habitat, 6 Sep 1978, fr, *G. Tierney & T. Foxx* 17 (UNM). Rio Arriba Co., vicinity of Brazos Canyon, swamp, 21 Aug 1914, fl, *P. C. Standley & H. C. Bollman* 10700 (US, 2 sheets); N. Paleo Cr., Camp Zia, San Pedro Parks Wild Area, San Pedro Mts., 22 Aug 1965, young fr, *A. Fleck s.n.* (UNM). Sandoval Co., Jemez Mountains, in low ground near stream at recreation ground north of Jemez Springs, 25 Aug 1936, fr, *M. Marcelline* 2269 1/2 (F). San Miguel Co., vicinity of Las Vegas, Aug 1923, fr, *Anect* 135 (US); Las Vegas, Porvenir Creek, 2400-2800 m, 6 Sep 1926, fr, *G. Arsène* 17733 (US); Las Vegas Hot Springs, Aug 1901, fl, *H. S. Barber* 151 (US). Santa Fe Co., Santa Clara Canyon, in shady place near stream at Rancher's Cabin Transition, 1 Jul 1936, fl, *M. Marcelline* 1905 (F). Socorro Co., gravel loam of stream area in South Canyon, in the Magdalena Mountains, 8000 ft, 28 Jul 1973, floral buds, *Hutchins* 4597 (UNM); Mogollon Mts., on Mogollon Creek, 23 Jul 1903, fl, 7500 ft., *O. B. Metcalfe* 303 (G, NY, P, RSA, US). Torrance Co., Manzano Mts., Trigo Canyon, ¼ mile E of Kennedy Camp, 2 Sep 1963, fr, *E. J. Bedker* 1543 (UNM). Union Co., on and near the Sierra Grande, 2100-2925 m, moist thickets, 19 Jun 1911, sterile, *P. C. Standley* 6136 (US). Valencia Co., Seboyeta Canyon bottom, riparian habitat near head of canyon, growing in fine moist soil in shade, 7200 ft, 25 Sep 1977, fr, *G. A. Marley* 912 (UNM). TEXAS: Jeff Davis Co., Mt. Livermore, 21 Sep 1935, *L. C. Hinckley s.n.* (SRSC); North top Mt. Livermore, 21 Aug 1935, fl, with larger fruited specimen mounted on the same sheet which was noted to be collected 21 Sep 1935, fr, *L. C. Hinckley* 405 (F, NY, 2 sheets); Davis Mountains Preserve, N side, Mt. Livermore, base of Palisades of "Laura's Rock," N30.63898, W104.17350, 7900 ft., apen/Gambel oak/talus, 9 Aug 2002, in fr., *J. P. Karges* 2002-08095-6 (SRSC); Mt. Livermore, above Bridge Gap, along road, below radio shack, 31 Jul 1997, in fr., *K. Lund et al.* 263 (SRSC); Talus and slopes below high north-facing bluffs of Mt. Livermore, 2200 m, 3 Jun 1928, sterile, *E. J. Palmer* 34334 (NY); Mt. Livermore, Davis Mts., upper slopes and near the peak, lower margin of talus, E of peak, under Gambel oak, 4 Sep 1982, in fr., *A. M. Powell & S. Powell* 3921 (SRSC); Mt. Livermore, 19 Oct 1935, fr, *O. E. Sperry* T198 (US, 2 sheets); infrequent low shrub above upper spring,

Madera Canyon, S slope of Mt. Livermore, igneous soil, 13 Sep 1947, in fl., 7800 ft., *B. H. Warnock 7511* (SRSC); infrequent herb, high on N slopes of Mt. Livermore, rare, only one plant seen, igneous soil beneath oaks, Don McIvor Ranch, 25 Aug 1977, in fr., *B. H. Warnock 21518* (SRSC); Mt. Livermore, near the top, N30°38.153', W104°10.456', 8232 ft, in rocky area at the edge of forest, associated with *Quercus depressipes*, *Quercus* spp., *Prunus serotina*, *Holodiscus discolor*, *Astragalus giganteus*, and *Ptelea* sp., 22 Aug 2003, fr, fruits dark purple, *J. Wen 7250* (F, US). UTAH: Kane Co., Water Canyon drainage area, ca. 7.5 miles west of Kanab, 6100 ft, 2 Jul 1985, floral buds, *J. S. Tuhy 2326* (NY, 2 sheets, one sterile, one with floral buds). Washington Co., Zion Cañon, 25 Jun 1933, floral buds, *A. Eastwood & J. T. Howell 1173* (CAS); Zion Cañon, 18 Jul 1922, fl, *M. E. Jones s.n.* (DS, RSA, US); Zion Narrows trail head vicinity, 4500 ft, 9 Jul 1987, fl & young fr, *S. L. Welsh 23829* (NY); Zion grotto, 25 Jun 1928, floral buds, *A. M. Woodbury 27* (US).

This species has often been treated as part of *Aralia racemosa*, either as a synonym (Smith 1944), or as a subspecies (Welsh and Atwood 1975). Kearney and Peebles (1951) also listed *A. bicrenata* as a synonym of *A. racemosa*; yet they also noted morphological differences between the two. In particular, their inflorescence architecture is highly distinct with *A. bicrenata* having the corymbose architecture and *A. racemosa* with the racemose overall structure. The stipule of *A. bicrenata* is often leafy, whereas that of *A. racemosa* is small, nonleafy and triangular. The stem of *A. bicrenata* is green to purplish green whereas that of *A. racemosa* is dark purple. Furthermore the leaflets of *A. bicrenata* are often truncate to subcordate at base, and those of *A. racemosa* are cordate to deeply so.

Kearney and Peebles (1951) documented that the fruits of *A. bicrenata* are eaten by various birds.

4. *Aralia cordata* Thunb. — Fig. 22; color plate 4: A-C.

Aralia cordata Thunb., Fl. Jap. 127. 1784. TYPE: **Japan.** *C. P. Thunberg 7577* (lectotype: UPS-THUNB, here designated).

Aralia nudicaulis Blume, Bijdr.: 870. 1826, nom. illeg.

Aralia edulis Siebold & Zucc., Fl. Jap. 1: 57, t. 25. 1837. *Dimorphanthus edulis* (Siebold & Zucc.) Miq., Comm. Phytogr. 3: 96. 1840. TYPE: **Japan.** L 0326346 (L-898,125-0047), “folia radices edulis,” *Siebold 107* (lectotype: L!, here designated; this specimen bears the hand of Zuccarini, “*Aralia edulis* S & Z. Japonica”; isolectotype: GH!).

Aralia nutans Franch. & Sav., Enum. Pl. Jap. 2: 376. 1878. TYPE: **Japan.** Hokkaido, *Savatier 3835* (holotype: P!; isotype: P!).

Perennial herb 1.5-2 m tall, andromonoecious. Lower part of stem with stiff hairs. Rhizomes stout and horizontal. Leaves 60-100 cm long and wide, tripinnately to bipinnately ternate; upper leaves pinnate to bipinnate or trifoliolate; stipules 2-2.3 cm long, 0.7-1 cm wide, narrowly triangular, often becoming leaf-like and enlarged, especially for those on the lower part of the stem; petioles 12-22 cm long, pubescent with soft and scabrous hairs; leaflets 5.5-22 cm long, 4-10.5 cm wide, papery, basal leaflets ovate, other leaflets ovate to narrowly so, acuminate to acute at apex, cordate, subcordate to rounded at base, often oblique on lateral leaflets, serrate to serrulate at margin; lateral veins 8-10 on each side, conspicuous on both surfaces, sparsely scabrous on adaxial surface, pilose along veins and veinlets on abaxial surface, petiolules 0-2 cm long, pilose. Inflorescence 30-65 cm long, a terminal panicle with the lower 2-5 primary branches subtended by leaves rather than bracts, pilose, consisting of 20-50 primary branches, mostly racemosely or sometimes paniculately arranged on a main axis, often 2-8 forming a circle on the upper half of the main inflorescence axis, each primary branch 3-22 cm long, consisting of 1-10 umbels; terminal umbels mostly 35-95-flowered, pedicels 9-14 mm long, pubescent, tip of pedicels enlarged and with a cluster of scabrous hairs; lateral umbels 18-35-flowered, pedicels 7-9 mm long; bracts of primary branches 4-9 mm long, 0.6-0.8 mm wide, linear, pilose; bracteoles 1.6-2 mm long, 0.1-0.2 mm wide, linear, pilose. Sepals 0.3-0.4 mm long, 0.2-0.3 mm wide, narrowly triangular; petals 1.5-1.8 mm long, 0.9-1 mm wide, ovate, with a conspicuous vascular bundle in the middle; stamens 5, 2.2-2.3 mm long, filaments 1.7-2 mm long, anthers 0.7-0.8 mm long, 0.4-0.5 mm wide, ovate; ovaries 5-locular, styles 0.6-0.8 mm long at anthesis, base of ovary slightly pilose with a few

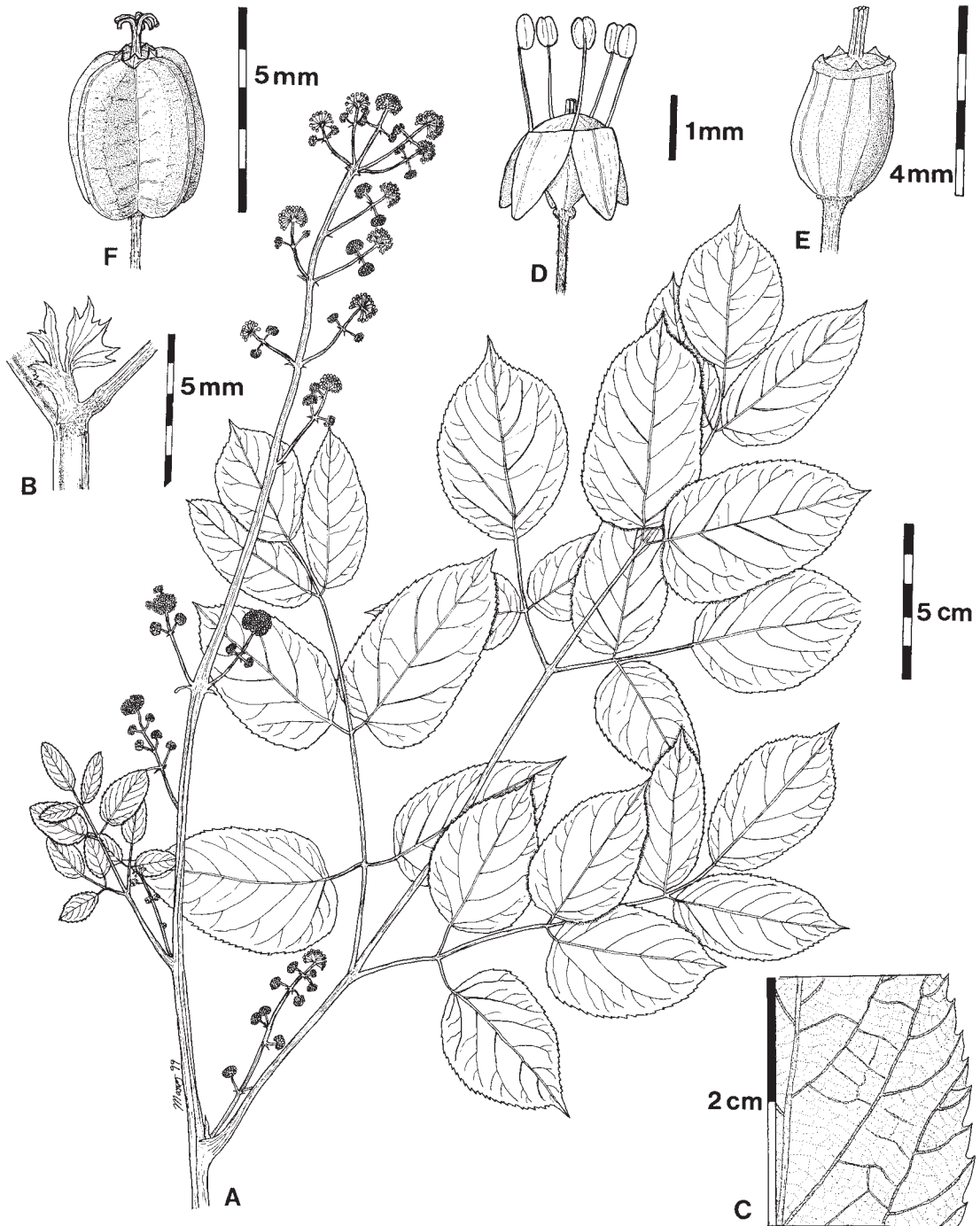


Fig. 22. *Aralia cordata* Thunb. A. Habit with leaf and inflorescences. B. Leafy stipule. C. Close-up of leaflet margin and veinlets on lower surface. D. Flower. E. Young fruit. F. Fruit.

scattered hairs, the top part of the ovary conspicuously exposed and appearing like a stylopodium. Fruits 3.2-3.5 mm long and wide, globose, persistent styles 5-divided, connate at the base.

Common names: udo.

Uses: young shoots as vegetables.

Phenology: flowering in July to September; fruiting in August to November.

Distribution: widely distributed in Japan (Fig. 23), also in Ullung-do of Korea.

Ecology: deciduous forests, or mixed broadleaf and coniferous forests, edges of forests, roadsides near forests; 50-1500 (-2000) m.

Additional specimens examined: Additional specimens examined: **Japan. Hokkaido:** Insula Jesso, circa Hakodate, 1861, *Albrecht s.n.* (K, NY, part 2 of the specimen only, part 1 is *Aralia elata* var. *elata*); west side of Shibetsu city, ca 6 km E of Soeushinai, Hokkaido Temporary Game Preserve, 280 m, mixed forests of *Quercus*, *Acer* and *Betula* and some gymnosperms, 1 Sep 1977, fl, *D. E. Boufford & E. W. Wood 19842* (RSA); Suto-gun, Kuromatsunai-cho, along a small tributary of the Higashi-gawa River, 230 m, mixed deciduous – *Abies* forest with *Sasa*, 28 Jul 1980, fl, *D. E. Boufford & M. Kato 22429* (RSA); Hakodadi, 1860, *C. P. Hoolson s.n.* (K); Yeso, *Lingriff 788* (WU); Hokkaido, Mt. Shiribeshi (Yotei-zan), Makkari course, 4 Aug 1982, fl, *H. Takahashi 2853* (RSA); Prov. Kitami, Esashi-gun, Utanobori-cho, Pankenai-sawa – Futamata-sawa, c. 200 m, 5 Aug 1986, fl, *H. Takahashi et al. 6599* (RSA); Hakodadi [Hakodate], 1859, *C. Wilford s.n.* (K); Hokadodi [Hakodate], Jul 1859, *C. Wilford s.n.* (K). **Honshu:** Aomori Pref., Aomori, Oct 1899, *Faurie 3322* (WU). Gunma Pref., Tomioka, 1866-1876, *Savatier s.n.* (K). Iwate Pref., Kesen-gun, Sanriku-machi, Okkirai — Koobezaki, 25 Jul 1978, *J. Murata et al. 5993* (TI); Iwate Pref., Hayachine National Park, on upper slopes above 1300 m on Mt. Hayachine, serpentine rock, 24 Jul 1984, fl, *D. Sather & G. Caddell 4914* (NCU, 2 sheets). Kanagawa Pref., Hayama-machi, 2 km from the coast, 19 Sep 1969, fl, 50 m, beside road along Shimoyama River, perennial ca. 5 feet high, *R. M. Beauchamp 1033* (RSA, 2 sheets); Yokohama, 1862, *Maximowicz s.n.* (K, W); Yokohama, Sep 1876, fl, *J. P. Bisset s.n.* (BM, K); Yokohama, *Milne*

s.n. (BM); Nippon media, circa Yokoska [Yokosuka], *Savatier 523* (K, 2 sheets). Kyoto Pref., SSW slope of the Mt. Mikunidade, Miyama-cho, Kitakuwada-gun, 650 m, 27 Aug 1992, fl, *S. Tsugaru & T. Takahashi 16775* (MO, 2 sheets); Yamashiro, Mt. Hieizan, 14 Aug 1931, floral buds, *M. Tagawa 224* (RSA). Miyagi Pref., Mts. Zao, Seikei-daichi, 1500 m, 16-19 Jul 1963, *H. Ohashi s.n.* (TI); circa Sendai, Oct 1903, *U. Faurie s.n.* (BM). Nagano Pref., Karuizawa, 7 Aug 1912, fl, *H. E. Fox s.n.* (BM); Nagano Pref., Prov. Shinano, Shimoinagun, Iida, Mt. Nenjo, Kamimatsukawa, 1500 m, 12 Aug 1963, *T. Yamazaki & K. Asano 7518* (TI); Nagano Pref., Prov. Shinano, Hondo, Suga-daira Osa-son (new Suga-daira Sanada-cho Chiisagata-gun) Chiisagata-gun, 1300 m, 15 Aug 1953, fl & young fr, *M. Furuse 26619* (K, 3 sheets of an entire plant); Nagano Pref., Norikura Heights, 30 km SW of Matsumoto, margin of deciduous woodland, 1500 m, 5 Sep 1993, fl & young fr, *R. K. Brummitt 19027* (K); Nagano Pref., North Alps National Park, along trail between Kamikochi and Mt. Hodakka, 20 Sep 1983, young fr, *D. Sather & G. Caddell 2749* (NCU). Niigata Pref., Isl. Sado, Aikawa-Cho, Bunadaira-yama, Ookuragawa, 600 m, 20 Aug 1985, *T. & F. Yamazaki 5069* (KUN); Basi Mt., Echigo-Koma, 4-6 Oct 1949, *J. Ohwi s.n.* (K, 2 sheets). Shizuoka Pref., Ihara-gun, Fujigawa-machi, along the Arinase River, 150-350 m, 21 Oct 1978, *Y. Tateishi et al. 4489* (U); Shizuoka Pref., Shizuoka-shi, Umegashima, Ohyakuzure, 35°18'N, 138°18'E, 1300-1400 m, 5 Oct 1990, fr, *Y. Tateishi et al. 16089* (MO). Tochigi Pref., N side of Kansei Pass Hwy, at rest area below Yumoto Toll gates, Nikko National Park, 15 Sep 1969, fl, 2000 m, *R. M. Beauchamp 1003* (RSA); Prov. Shimotsuke, Hondo, Nokado Kuriyama-son Shiwoya-gun, 10 Sep 1967, fr, *M. Furuse 45807* (K, 2 sheets); Nikko, woods near Nikko Botanical Garden, Aug 1995, *J. Wen 2456* (US). Tokyo, Oizumi, Nerima-ku, 4 Oct 1926, young fr, *T. Makino s.n.* (CAS); Oizumi, Nerima-ku, 19 Sep 1937, fl, *T. Makino s.n.* (CAS); Tokyo, Sengen-one, from Fussawa to Koiwa, Hinohara-mura, Nishitama, 22 Sep 1968, *H. Ohba 680914* (TI); woods near Tokyo, *J. Wen 2476* (US); Chiba-Ken, Narita-Shi, 500 Tokko, in secondary woods behind Hotel Nikko Narita, 21 May 2005, sterile, *J. Wen 8542* (US). Toyama Pref.: Arimine, Kaminiikawa-gun, 1000 m, 4 Aug 1965, *T. Yamazaki 9779* (TI). Wakayama Pref., along the Komori-rindo, Ryujin-



Fig. 23. Map of Japan showing the distribution of *Aralia cordata* Thunb.

mura, Hidaka-gun, sunny steep slope by roadside in deciduous forest, 1200 m, 15 Oct 1989, late fl, *T. Takahashi et al.* 1393 (MO); Wakayama Pref., Higashimuro, Kumanogawa-cho, Shikiya, foot of the mountain, 50 m, 20 Sep 1964, young fr, young stem edible, *H. Matsushita* 196 (RSA). Yamanashi Pref.: Oshino-mura, NW foot of Mt. Fuji, 900-1000 m, 23 Oct 1966, *M. Togashi et al.* s.n. (TI); W side of Mt. Fuji, 1500 m, 30 Aug 1969, fl, *H. Ohba* 69828 (BM, 2 sheets). **Kyushu:** Kumamoto Prefecture, Mount Aso National Park, in grassland at 700 m, slopes of Mt. Aso, 11 Aug 1984, fl, *D. Sather & G. Caddell* 5544 (NCU, 2 sheets). Nagasaki Pref., Nagasaki, 1862, *R. Oldham* s.n. (K); Nagasaki, Aug 1862, floral buds, cultivated as eatable vegetable, *R. Oldham* 837 (K); Nagasaki,

1862, *R. Oldham* 310 (K, 2 sheets); circa Nagasaki, Sep 1864, fl, *C. J. Maximowicz* 10960 (BM). Saga Pref., Mt. Seburi, at 800 m on road to summit of Mt. Seburi, 10 Oct 1984, fl, *D. Sather & G. Caddell* 6605 (NCU, 2 sheets). **Shikoku:** Ehime Pref.: Kamiukena-gun, Yanagidani-mura, Odamiyama-kokuyuurin, 850 m, 20 Oct 1980, *J. Murata* 10106 (TI, 2 sheets); Ehime-Ken, Kamiukena-gun, Kuma-cho, Higasimyojin, 600-700 m, 26 Oct 1995, late fl & young fr, *Y. Tateishi et al.* 40570 (TNM). **Japan, location unknown:** 11 Aug, part of the Siebold collection distributed from L, *Herb. Bürger* s.n. (K). Japan, Noeji, 4 Aug 1889, floral buds, *P. Faurie* 806 (K); Montagun, Ittomori, 11 Sep 1889, *P. Faurie* 1159 (K); Japan, Aug 1886, *P. Faurie* 1284 (K); 10 Aug 1905, *U. Faurie* 6849 (BM).

Korea. Ullung-do, path along ridge to NE of Nam Yang, infrequent perennial shrub, height & spread 3.5 m, growing in acid loam in full sun, 2 Oct 1982, fr, *Beyer et al.* 119 (K, 2 sheets).

Specimens of the taxon examined in the Siebold collection from Japan in the Leiden Herbarium (L): L 0171191 (L-898,125-0048), Keuy, "specimen authenticum ad florum japonicum conficiendam adribitum," *Siebold s.n.* [in fl.]; L 0171192 (L-898,125-0052), 1829, "specimena authentica ad florum jap. conficiendam adribita," *Siebold s.n.* [in fl. buds]; L 0326339 (L-898,125-0049), *Siebold s.n.* [in fl.]; L 0326340 (L-898,125-0051), "fol. composita!" *Siebold s.n.* [leaf only]; L 0326341 (L-898,125-0060), specimen on the right side of the sheet only, *Burger s.n.* [in fl.]; L 0326342 (L-898,125-0061), *Burger s.n.* [in fl. & floral buds]; L 0326343 (L-898,125-0063), *Burger s.n.* [in fl.]; L 0326344 (L-898,125-0062), *Burger s.n.* [in fl.]; L 0326345 (L-898,125-0059), *Burger s.n.* [in fl.]; L 0423961 (L-898,125-0057), Dosen – Shaw, *Mohnike s.n.* [in fl.]; L 0423962 (L-898,125-0055), *Textor s.n.* [in fl.]; L 0423963 (L-898,125-0058), Dosen, *Mohnike 51* [in fl.]; L 0423964 (L-898,125-0050), *Siebold 1055* [leaf only]; L 0423965 (L-898,125-0056), *Textor s.n.* [infl.].

Cultivated material: **Japan.** Botanic Garden of the Faculty of Science, the University of Kanazawa, 12 Sep 1966, *S. Yoshitake & S. Kaneda s.n.* (TI). Meguro, Meguro-ku, Tokyo Pref., 14 Aug 1900, fl, *T. Makino s.n.* (CAS). Oizumi, Nerimaku, Tokyo Pref., 2 Nov 1931, sterile, *T. Makino s.n.* (CAS). **Netherlands.** Rotterdam, Hortus Ramlehstraat, 10 Aug 1950, *B. K. Boom B3058* (L). Also cultivated in the Great Britain (see cover of Frodin and Govaerts 2003).

The isolectotype of *Aralia edulis* Siebold & Zucc. at GH (with leaves and flowers) bears the handwriting of Siebold "*Aralia edulis* S. & Z." It was a specimen originally from Herb. Lugd. Batav. (L).

5. *Aralia schmidtii* Pojark. — Fig. 24; color plate 4: D-E.

Aralia schmidtii Pojark., Fl. URSS 16: 588. 1950.

TYPE: **Russia.** Sakhalin, near Due, 2 Aug 1860, *P. Glehn s.n.* (holotype: LE!; isotypes: G!, K!, NY!).

Aralia racemosa L. var. *sachalinensis* Regel, Index Seminum Hort. Bot. Petr. 1864: 22. 1864. *Aralia cordata* Thunb. var. *sachalinensis* (Regel) Nakai, J. Arnold Arbor. 1924. TYPE: **Russia.** Sachalin, 1860, *F. Schmidt s.n.* (lectotype: LE!, here designated; isolectotypes: G!, GH!, LE!, NY!).

Aralia sachalinensis hort. ex Sieb. et Voss in Vilm. Blumengärten, 3 Aufl. I, 403. 1896, nom. nud.

Perennial herb 1-3 m tall. Leaves ternately compound, upper leaves pinnate to bipinnate or trifoliolate; stipules 5-13 mm long, 1.6-4.3 mm wide, lanceolate, sparsely covered with a few hairs, ciliate at margin; leaflets 6-21 cm long, 3-12.5 cm wide, papery, basal leaflets of the pinnae ovate, other leaflets ovate to narrowly so, acuminate at apex, cordate to subcordate at base, often oblique on lateral leaflets, serrulate at margin; lateral veins 9-11 on each side, conspicuous on both surfaces, sparsely scabrous on adaxial surface, often with scattered hairs on veins and veinlets, pubescent with scabrous hairs on abaxial surface, petiolules 0.1-2.4 cm long, pilose. Inflorescence 30-50 cm long, a terminal panicle with the lower 3-4 primary branches subtended by leaves rather than bracts, pilose, consisting of 20-30 primary inflorescence branches, mostly racemously or sometimes paniculately arranged on a main axis, often 3-5 forming a circle on the upper part of the main inflorescence axis, each primary branch 6-12 cm long, consisting of 1-3 umbels, usually only the terminal umbel of each branch bearing fruits, others becoming aborted or functionally male; terminal umbels mostly (25-) 35-60-flowered, pedicels 15-22 mm long, pubescent, tip of pedicels enlarged and with a cluster of hairs; lateral umbels 18-25-flowered, pedicels 9-15 mm long; bracts of primary branches 5-10 mm long, 0.7-0.9 mm wide, linear, somewhat pilose; bracteoles 1.7-2.2 mm long, 0.2-0.3 mm wide, linear, pilose. Sepals 0.3-0.4 mm long, 0.2-0.3 mm wide, narrowly triangular; petals 1.6-2 mm long, 1-1.1 mm wide, ovate, with a conspicuous vascular bundle in the middle; stamens 5, 2-2.3 mm long, filaments 1.8-2 mm long, anthers 0.6-0.8 mm long, ca. 0.5 mm wide, ovate; ovaries 5-locular, styles 0.6-0.8 mm long at anthesis, connate at base, base of ovary slightly pilose with a few scattered hairs, the top part of the ovary conspicuously exposed and appearing like a stylopodium. Fruits 3-3.2 mm long and wide,

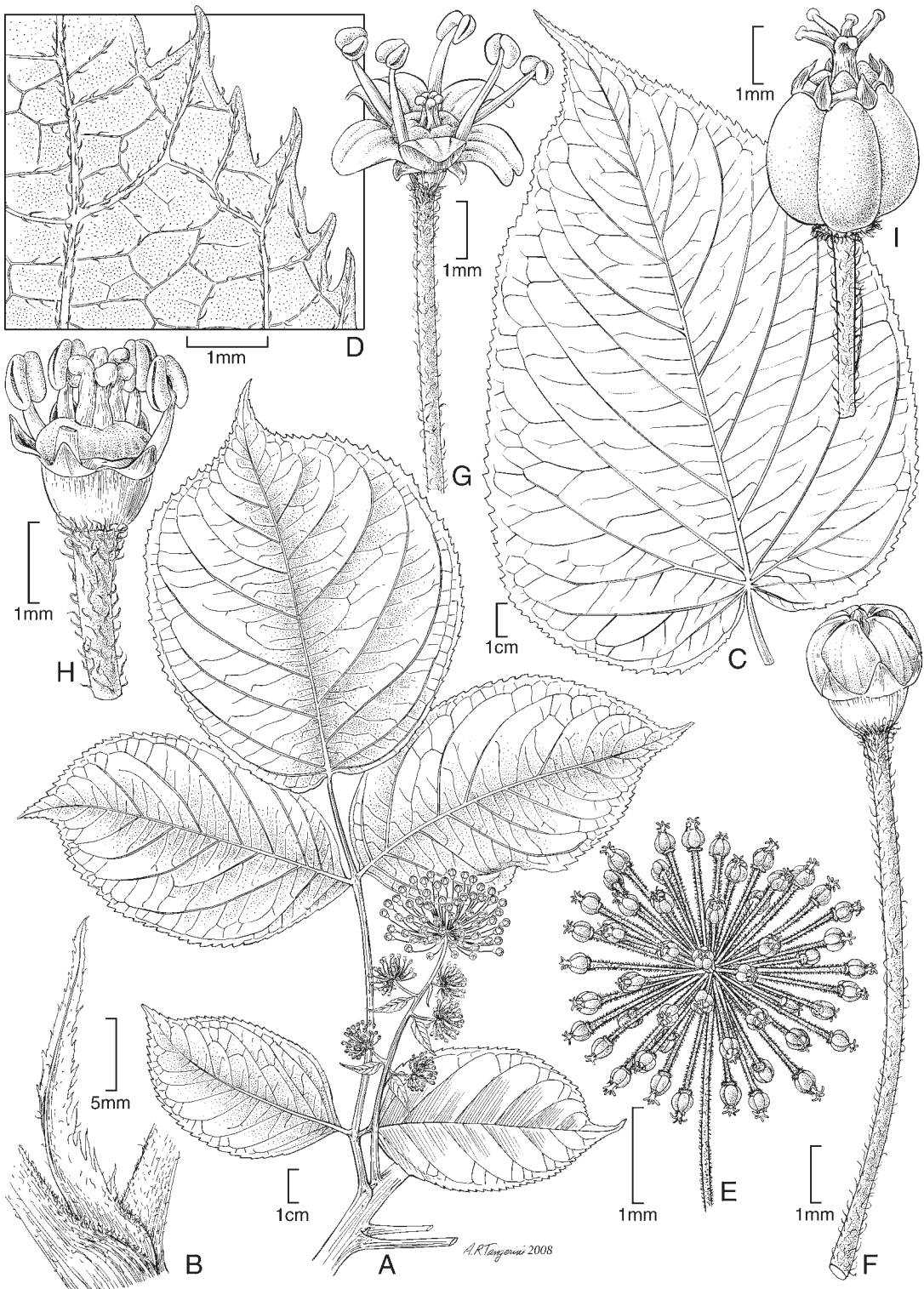


Fig. 24. *Aralia schimdtii* Pojark. A. Branch showing upper leaf and axillary inflorescence. B. Lanceolate stipule. C. Leaflet from a lower leaf. D. Leaflet lower surface showing pubescence. E. Umbel. F. Floral bud with pedicel. G. Flower with pedicel. H. Flower. I. Young fruit (A, D, & F-H – Gage 2512, NY; B, C, E & I – Gage 2632, NY).

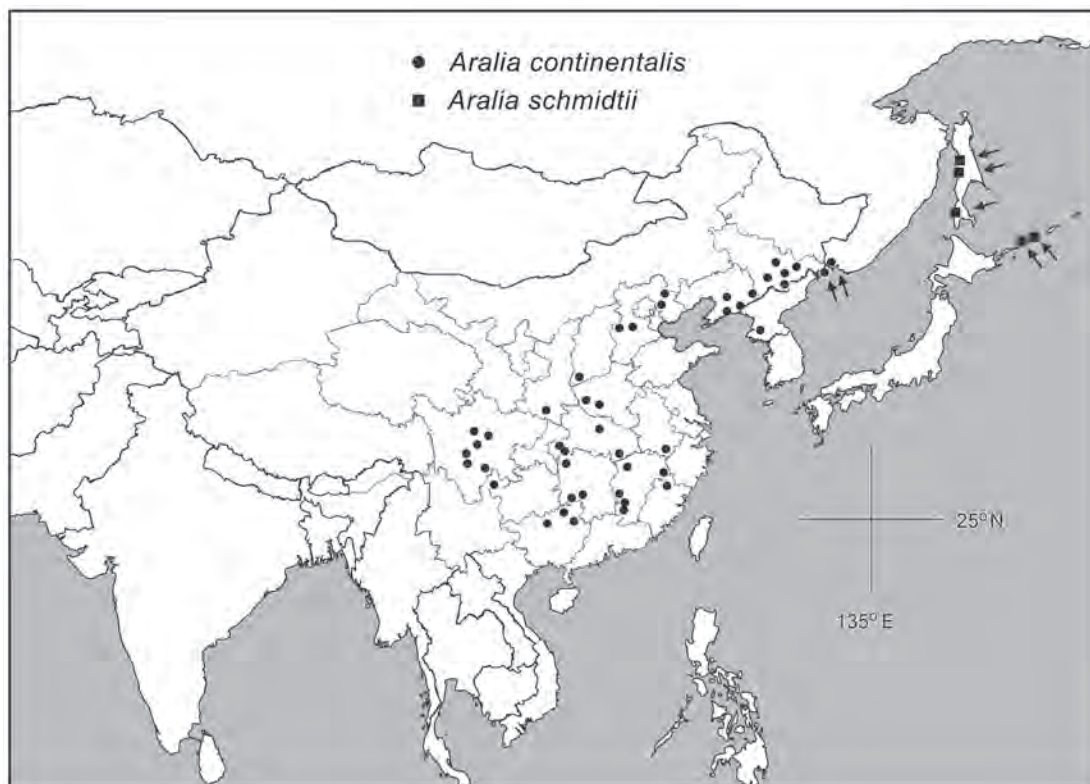


Fig. 25. Map of eastern Asia showing the distribution of *Aralia continentalis* Kitag. in China, far eastern Russia, and Korea, and *A. schmidtii* Pojark. in Sakhalin and Kuril islands.

globose, persistent styles connate at the base (divided roughly to the middle).

Phenology: flowering in July-August; fruiting in August to September.

Distribution: Sakhalin and Kuril islands, Russia (Fig. 25).

Ecology: Deciduous forests near sea shore.

Additional specimens examined: **Russia**. Kuril Islands, Kurilsk Island, 20 Jul 1982, floral buds, *V. Barkalov s.n.* (MW); Kuril Archipelago, Iturup, 5 Aug 1988, fl, *V. Barkalov s.n.* (MW); Kuril Archipelago, Iturup, Konservnaya Bay, steep slope above beach, dominated by *Sasa*, *Filipendula* with scattered trees of *Salix*, 45°20'7"N, 147°59'32"E, herb 2-3 m tall with huge stipulate compound leaves, 19 Aug 1996, fl, *S. Gage 2512* (NY); Iturup, inland of Dobroye Nachalo Bay, at Lake Natasha, forested area near lake, with *Abies*, *Prunus*,

Kalopanax, 44°46'11"N, 147°11'4"E, 22 Aug 1996, fl, *S. Gage 2632* (NY); Kuril Islands, Kunashir Island, 19 Jul 1985, floral buds, *N. Shvedtchikova s.n.* (MW); Kuril Islands, Kunashir Island, 26 Aug 1986, young fr, *N. Shvedtchikova s.n.* (MW). Sakhalin, Cholmsk, 10 Aug 1978, fl, *M. Ignotov s.n.* (MW); Sachalin, western shore, near the mouth of River Axzegu, 31 Aug 1924, *A. Kryshstofovich s.n.* (LE, 3 sheets); Sachalin, western shore, Agnevo, 14 Jul 1925, *A. Kryshstofovich 171* (LE); Sachalin, Dolinsk, 11 Aug 1952, fl, *E. Motorina* (MW). Southern Sachalin, on W side of the mountain slope on the SW shore, Valley Rantomar or Apple Valley, 20 Aug 1950, *M. G. Popov s.n.* (LE); Insula Sachalin, Kasanai, Aug 1860, *F. Schmidt s.n.* (LE); Sachalin, 1861, *F. Schmidt 18202* (BM); Sachalin, Korsakov, 20 Aug 1986, *N. Shvedtchikova s.n.* (MW); Sachalin, Kuril Islands, Kunashir Islet, 24 Jul 1986, floral buds, *M. Stolarskaya & M. Maschkova s.n.* (MW);

Sachalin, *Augustinowicz* 71 (K); Sagalien, Aug 1908, *Faurie* 398 (BM).

Nakai (1924) cited *Aralia racemosa* var. *sachalinensis* Regel as originally published by Regel (1864b; in *Gartenfl.* 13: 100. t. 432. 1864). Regel (1864a) also provided a brief description of *Aralia racemosa* var. *sachalinensis* (in *Index Seminum Hort. Bot. Petr.* 1864: 22). Regel (1864a) actually has nomenclatural priority, as it was published on March 8, whereas Regel (1864b) appeared in April. Regel (1864b) is a detailed description with an excellent illustration.

When Pojarkova (1950) originally published *Aralia schmidtii*, she clearly indicated her *Aralia schmidtii* as a new species (not a new name), and treated *Aralia racemosa* var. *sachalinensis* Regel as a synonym. She used a different type, as *A. racemosa* var. *sachalinensis* was described based on a plant raised from seeds collected by Schmidt.

Aralia schmidtii differs from the closely related *A. cordata* by the former's longer pedicels and more numerous flowers per terminal umbel.

6. *Aralia taiwaniana* Y. C. Liu & F. Y. Lu — Color plate 5: A-H.

Aralia taiwaniana Y. C. Liu & F. Y. Lu in Y. C. Liu, *Quart. J. Chinese Forest.* 9: 136, t. 8. 1976. TYPE: **China.** TAIWAN: Nantou Hsien, *F. Y. Lu & C. H. Ou* 1507 (holotype: NCUF!).

Perennial spreading herb 1-2 m tall, andromonoecious. Stem pubescent. Rhizomes thick. Leaves ternately compound, lower leaves 75-90 cm long and wide, tripinnately ternate, upper leaves pinnate to bipinnate; stipules 4-10 mm long, 2-4 mm wide, narrowly triangular to lanceolate, pilose, sparsely ciliate at margin; leaflets 5.5-15 cm long, 3-9.5 cm wide, papery, the basal leaflets of the pinnae ovate, other leaflets ovate to narrowly so, acuminate to abruptly so at apex, truncate, rounded to subcordate or sometimes cordate at base, often oblique on lateral leaflets, finely serrate to doubly so at margin; lateral veins 8-10 on each side, conspicuous on both surfaces, scabrous on adaxial surface, often with scattered hairs on veins and veinlets, pilose on abaxial surface, petiolules of lateral leaflets 0.3-2.5 cm long, pilose. Inflorescence a terminal or axillary panicle, pilose, terminal inflorescence 20-55 cm long, consisting

of 10-30 primary inflorescence branches, more or less racemosely arranged on a main axis, sometimes 6-12 forming a circle on the upper part of the main inflorescence axis, or forming 2-3 circles on the inflorescence axis, each primary branch 6-18 cm long, consisting of 2-7 umbels, terminal umbels mostly (25-) 35-65-flowered, pedicels 15-20 mm long, slender and pilose, tip of pedicels enlarged and with a cluster of hairs; lateral umbels not well developed, usually of male flowers, 15-25-flowered, pedicels 3-12 mm long; bracts of primary branches 5-20 mm long, 0.7-2 mm wide, linear, pilose, sometimes becoming leafy; bracteoles 1.8-2 mm long, 0.3-0.4 mm wide, linear, pilose. Sepals 0.3-0.5 mm long, 0.4-0.5 mm wide, triangular; petals 1.8-2 mm long, 0.9-1.1 mm wide, ovate, with a conspicuous vascular bundle in the middle, tip slightly enlarged; stamens 5, 1.7-2.2 mm long, filaments 1.5-2.1 mm long, anthers 0.6-0.7 mm long, 0.4-0.5 mm wide, ovate, light yellow; ovaries 5-locular, styles 0.5-0.6 mm long at anthesis, base of ovary nearly glabrous, top part of ovary projected, disk pale yellow turning magenta. Fruits 3.2-4 mm long and wide, globose, dark purple at maturity, persistent styles divided from the middle or nearly to the base. Seeds 1.5-1.8 mm long, 0.9-1 mm wide, 0.4-0.6 mm thick, kidney-shaped, greenish white.

Common names: Taiwan tu-dang-gui; and tu-dang-gui.

Phenology: flowering from July to September; fruiting from August to November.

Distribution: endemic to Taiwan (Chiayi, Hsinchu, Hualien, Ilan, Miaoli, Nantou and Taichung) (Fig. 26).

Ecology: in mixed coniferous and broadleaf forests, or in broadleaf forests; (1250) 1700-2900 m.

Additional specimens examined: **China.** TAIWAN: Chiayi Co., Alishan, 24 Aug 1990, fl, *C. H. Ou et al. s.n.* (TNM). Hsinchu Co., Kuanwu, 20 Jun 1990, fl, *C. H. Ou et al. s.n.* (TNM). Hualien Co., Mt. Muhkwa, a shrub near roadside, 24 Jul 1961, *M. T. Kao* 4153 (A, MSC, TAI); Hualien, Xiugu, Luanshan, 19 Jul 1973, in fl., *F. Y. Lu & C. H. Ou* 1836 (NCUF); Shoufeng District, Mt. Mukwashan Forest, Halun Station, 2000-2100 m, chromosome number $2n = 48$ from this plant, 23 Sep 1984, young fr, *C.-I. Peng* 7263 (HAST, 2



Fig. 26. Map of Taiwan showing the distribution of *Aralia taiwaniana* Y. C. Liu & F. Y. Lu.

sheets). Ilan Hsien, Tatung Hsiang, Szuchi, along Chiaping Forest Road, 121°27'50"E, 24°27'01"N, 2300 m, mixed coniferous-broadleaf forest on mountain slope, 2 m tall, 21 Aug 2000, fl, C.-H. Lin 617 (HAST, MO); Heping Forest Road, 50K, 2000 m, 3 Aug 1983, sterile, S. Y. Lu 12676 (TAIF). Miaoli Co., Talu logging tract 28-35K, 2000-2300 m, 26 Jul 1987, late fl & young fr, J. C. Wang & K. C. Yang 4895 (TAI, 2 sheets); Taian Hsiang, near 36 km marker on 230 Forest Road, 121°05'41"E, 24°22'08"N, 2400 m, 17 Sep 1995, fr, C. M. Wang 01714 (TNM); Hsishihshan, 24°23'00"N, 121°06'00"E, 2300 m, 27 Oct 1976, fr, S.-Y. Lu 5971 (TAIF, 2 sheets); Hsishihshan, 24°23'N, 121°06'E, 2500-2700 m, 27 Oct 1976, fr, B.-P. Yang 74 (TAIF). Nantou Co., Chingching, 24°04'0"N, 121°10'0"E, 1800-2000 m, 4 Aug 1970, fl, K.-S. Shyu 635 (TAIF, 2 sheets); Jenai Hsiang, Center Cross-island highway, Mayfeng to Tsuifeng, original broadleaf forest, 2100-2350 m, on wet place beside paved road, common, plant ca. 2 m tall, 11 Jul 1995, fl, W.-H. Hu 2821 (HAST, 3 sheets; PE, 3 sheets); May-Feng, 2100 m, 26 Jun 1991, late floral buds, W.-H. Hu 1435 (HAST); Mayfeng watershed, along dirt road from Provincial Rd 14-a to Mayfeng Water Source, broadleaf evergreen forest, 2150-2200 m, 9 Sep 1991, C.-I. Peng 14460 (HAST); Jenai Hsiang, Sanchiaofeng, Highlands Experiment Farm, National Taiwan University, 121°11'05"E, 24°06'07"N, 2300 m, on mountain slope, waste farmland, common, 13 Jul 2004, fl, Y.-N. Ko et al. 1382 (HAST); Mashan, along Central Cross-Island Hwy, near road mileage sign 19 km, 121°11'30"E, 24°6'43"N, 2315 m, mixed coniferous-broadleaf forest, roadside, semiexposed habitat, occasional, 30 Nov 2005, late fl, C.-I. Huang 2343 (HAST, 2 sheets); Jenai Hsiang, on the way from Tianchi Preserve Station to Tianchi, trailside, under forest, forest margin, 4 Sep 1998, fl, T. Y. A. Yang 11188 (HAST, PE); Jenai Hsiang, Kunyang, 2400-2450 m, 8 Jul 1991, fl, C.-H. Chen 1033 (PE, TAIF); Jenai Hsiang, en route from Yunhai to Tienchih, 24°03'N, 121°16'E, broadleaf forest phasing to mixed broadleaf and coniferous forest, 2360-2860 m, herb ca. 60 cm tall, fruits purplish black, 13 Oct 1992, H.-L. Ho 561 (MO); Yunhai to Tienchih, 2850 m, trailside, forest margin, 6 Sep 2001, fr, T. Y. A. Yang et al. 13875 (TNM); Jenai Hsiang, Juiyenchi Forests Nature Protected Area, 121°11'59"E, 24°07'01"N, 2250 m, mixed

Cryptomeria and broadleaf forest, ca. 2 m tall, 8 Sep 2000, young fr, Y.-Y. Huang 99 (MO); Tsuifeng – Meifeng, 2100-2350 m, 16 Aug 1984, fl & young fr, Y. Tateishi et al. 17783 (MO); Tsuifeng – Meifeng, roadside, 16 Aug 1984, W. S. Wang 652 (TAI); Tsuifeng, 8 Dec 1974, fr, C. H. Ou 2909 (TAI); Mayfong, 13 Jun 1980, floral buds, M. T. Kao 9477 (TAI, 2 sheets); Tsue-fong to Mei-fong, roadside, 2200-2000 m, 16 Aug 1984, fl, T. Y. Yang 89 (TAI); Meifeng – Chingching Farm, roadside, 1700 – 2100 m, 25 Jul 1987, floral buds, S. F. Huang & S. Y. Yang 3765 (TAI); Nantou Hsien, Jenai Hsiang, at km 23 on Hwy 14A, disturbed vegetation along roadside on steep slope, 24°06'32"N, 121°13'38"E, 2680 m, ca. 2 m tall, 23 Sep 1997, fr, P. P. Lowry II et al. 4969 (HAST, MO, 4 sheets); Juiyenhsi, 24°08'0"N, 121°12'0"E, 1800 m, 29 Jun 1999, floral buds, Y.-P. Cheng 2664 (TAIF, 4 sheets); Meifeng, 24°06'0"N, 121°10'56"E, M.-J. Lin 285 (TAIF); Meifeng, 16 Jul 1996, M.-J. Lin 154 (TAIF); Mei-feng, roadside, broadleaf forest, 2000-2100 m, 30 Jun 1996, floral buds, J. C. Wang et al. 10093 (HAST); Tsuifeng, 24°06'N, 121°11', 1700 m, 4 Sep 1973, fr, K.-Y. Wang s.n. (TAIF, 2 sheets); Tsuifeng, 121°11'52"E, 24°06'30"N, 2200 m, roadside, 19 Aug 2005, young fr, C. M. Wang 08185 (TNM); Nantou Co., on the way from Chu-Feng to Hong-Xiang, just below Chui-Feng, at Rueiyuan River area, N24°06'32", E121°11'21", 2265 m, 5 Nov 2006, fl, J. Wen 9424 (US). Pingtung Co., Gangkou, 19 Jul 1919, *Matuda-Eizi* s.n. (TAIF, 2 sheets, 18416 & 18418) [maybe cultivated as udo]; Kosyun, Kankau, 19 Jul 1919, fl, S. Sasaki s.n. (TAI, 082497) [maybe cultivated as udo]. Taichung Co., Tahsuehshan Forest Road, 24°20'N, 121°07'E, 1960 m, 19 Jul 1984, young fr, S.-Y. Lu 14919 (HAST, TAIF, 2 sheets); Hoping Hsiang, Tashueishan forest track, 1700 m, roadside, 10 Oct 1995, post fr, T. Y. A. Yang & Y. B. Cheng 06356 (HAST, TNM). Kwarenko-Tyo, between Be Derikku and Be Padahu, 2900 m, monte Tyuosenzan, 30 Jul 1936, fl, N. Fukuyama & Suzuki-Tokio ST 15202 (PE, TAI).

Aralia taiwaniana usually occurs from 1250-2900 m in altitudes in Taiwan. It is interesting to note that a few specimens from Pingtung of southern Taiwan at very low altitudes are morphologically abnormal with smaller leaflets, and shorter and fewer pedicels. The Pingtung

collections (from Gangkou) were most likely from cultivated material. The Government of Formosa Nursery formerly stood on this site and the Japanese like udo as vegetables. Gangkou is near the seashore and appears to low in altitude for natural populations of *A. taiwaniana*.

Aralia taiwaniana differs from *A. cordata* in that *A. taiwaniana* has pubescent (vs. hirsute lower stem surface) and does not have leafy stipules (cf. color plates 4C and 5D). Compared to *A. cordata*, *A. taiwaniana* tends to have leafy and smaller inflorescence.

In comparison with *Aralia continentalis*, *A. taiwaniana* has finer leaflet margin and its pedicels are statistically longer. It is interesting to note that the few specimens from Pingtung of southern Taiwan at very low altitudes are morphological abnormal with smaller leaflets, and shorter and fewer pedicels. The Pingtung collections (from Gangkou) were most likely from cultivated material. The Government of Formosa Nursery was there and the Japanese folks like udo as vegetable. Gangkou appears to be too low in altitude for *Aralia taiwaniana*, as it is near the seashore.

Aralia taiwaniana resembles *A. schmidtii* that both taxa have more than 35 flowers in each terminal umbel. Yet they can be differentiated as follows:

1. Leaflet margin finely serrulate, base of leaflets cordate, stipules lanceolate; endemic to the Sakhalin & Kuril islands of far eastern Russia *A. schmidtii*
1. Leaflet margin doubly serrate, base of leaflets obliquely truncate to subcordate, rarely cordate, stipules narrowly triangular; endemic to Taiwan *A. taiwaniana*

7. *Aralia continentalis* Kitag. — Fig. 27; color plate 6: A-E.

Aralia continentalis Kitag., Bot. Mag. (Tokyo) 49: 228, t. 3. 1935. *Aralia cordata* Thunb. var. *continentalis* (Kitag.) Y. C. Zhu in Z. Y. Chang (ed.), Pl. Medic. Chinae Bor.-Orient.: 787. 1989. TYPE: **China**. LIAONING: southern Manchuria, Fengtien Prov. [Liaoning Prov.], Jalu [Yalu] River valley, near Schildagou, 13 Aug 1897, fl, V. Komarov 1152 (lectotype: TI!, here designated; isolectotype: BM!, LE!).

Perennial spreading herb 1-3.3 m tall. Stem pubescent, lower part sometimes with stiff hairs. Rhizomes thick. Leaves 50-100 cm long and wide, ternately compound, lower leaves tripinnately ternate, upper leaves pinnate to trifoliolate or tripinnately ternate; stipules 5-20 mm long, 3.5-15 mm wide, pilose; leaflets 5-16.5 cm long, 3-9.5 cm wide, papery, the basal leaflets of the pinnae ovate, other leaflets ovate to narrowly so, acuminate to acute at apex, cordate to subcordate or sometimes rounded at base, often oblique on lateral leaflets, serrate to doubly so at margin; lateral veins 7-9 on each side, conspicuous on both surfaces, scabrous on adaxial surface, often with scattered hairs on veins and veinlets, pubescent with scabrous hairs on abaxial surface, petiolules of lateral leaflets 0.1-2.2 cm long, more or less pilose. Inflorescence a terminal or axillary panicle, pilose, terminal inflorescence 30-65 cm long, consisting of 20-35 primary branches, paniculately or racemosely arranged on a main axis, occasionally 3-5 forming a circle on the upper part of the main inflorescence axis, each primary branch 5-15 cm long, consisting of 2-18 umbels, often the primary branches further divided into a panicle; terminal umbels mostly 16-35 (-50)-flowered, pedicels 6-10 mm long, pubescent, tip of pedicels enlarged and with a cluster of hairs; lateral umbels 8-13-flowered, pedicels 4-7 mm long; bracts of primary branches 5-9 mm long, 0.6-0.8 mm wide, linear to lanceolate, somewhat pilose; bracteoles 1.2-2 mm long, 0.2-0.3 mm wide, lanceolate, pilose. Sepals 0.4-0.5 mm long, 0.6-0.7 mm wide, triangular to broadly so; petals 1.8-2 mm long, 0.9-1.1 mm wide, ovate, with a conspicuous vascular bundle in the middle, tip slightly enlarged; stamens 5, 2.5-2.7 mm long, filaments 2-2.4 mm long, anthers 0.6-0.8 mm long, 0.4-0.5 mm wide, ovate; ovaries 5-locular, styles 0.6-0.7 mm long at anthesis, base of ovary nearly glabrous, the top part of ovary slightly projected. Fruits 3.5-4 mm long and wide, globose, persistent styles divided to the middle. Seeds 2-3 mm long, 1.2-1.4 mm wide, 0.8-1 mm thick, kidney-shaped.

Common names: tu dang gui and duhe (China), and Dok-whal (Korea).

Uses: leaves as vegetables; roots as blood-regulating medicine.

Phenology: flowering in July and August; fruiting in September to October.

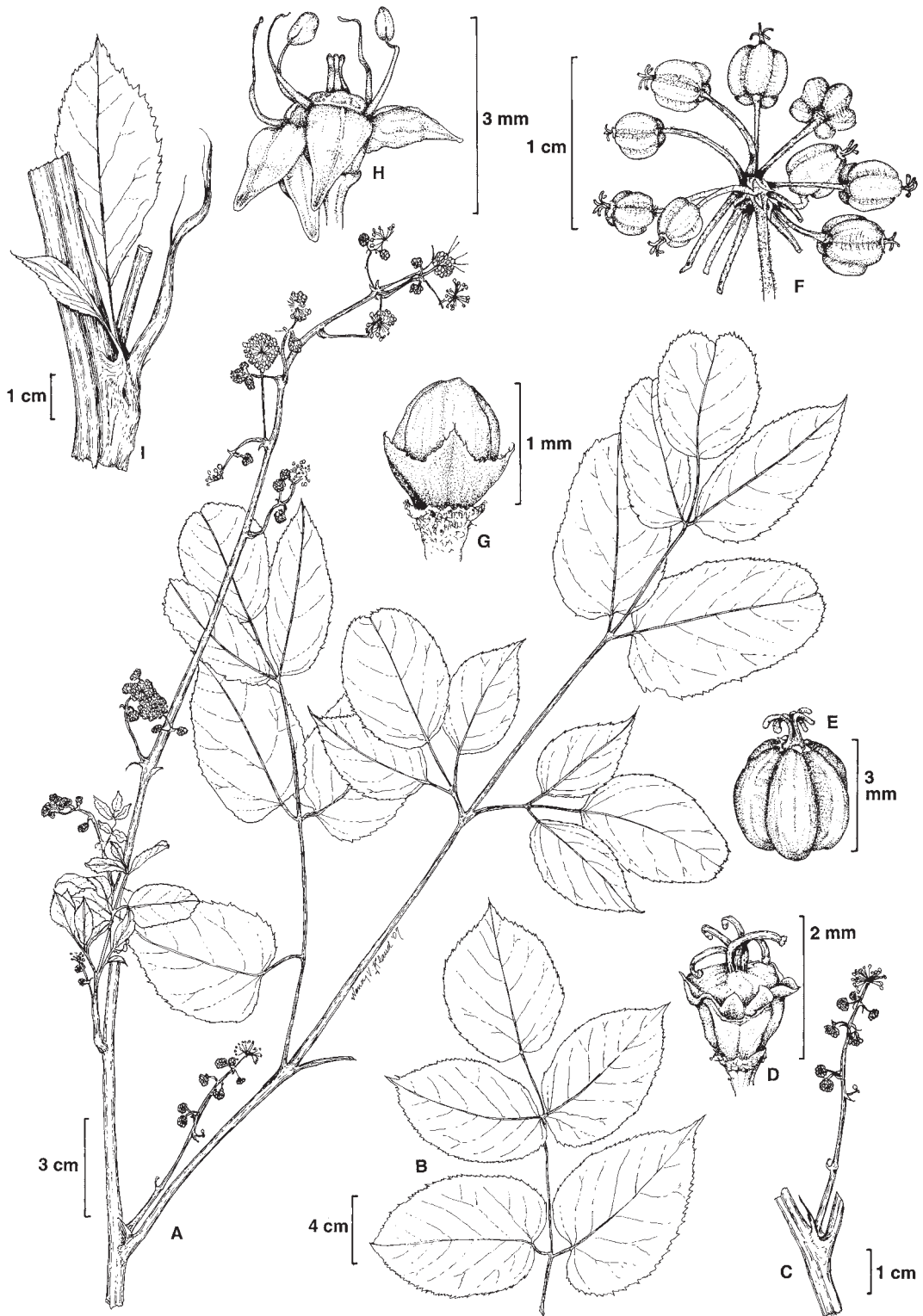


Fig. 27. *Aralia continentalis* Kitag. A. Habit showing leaves and inflorescences. B. Part of a lower leaf showing the terminal pinna. C. Axillary inflorescence. D. Flower after anthesis. E. Young fruit. F. Umbel with fruits. G. Floral buds. H. Flower. I. Leaf-like stipule (A, C & G – Ye 2002, MO; B, D & H – Biao 1104, MO; E & F – Wang 60812, A; I – Ching 2957, A).

Distribution: eastern Russia, eastern, central, south-central, and northern part of China (to northern Guangxi province in the southern part of China), and Korea (Fig. 25).

Additional specimens examined: **China.** ANHUI: Huangshan, 28 Jul 1926, *S. S. Chien 1172* (PE, W); Whang Shan, S. Anhwei, 3000 ft, shrub 10 ft, flowers greenish, terminal, 12 Jul 1925, fl, *R. C. Ching 2957* (A, K); Shizhilin, near the Guest House, 30 Jul 1957, *L. K. Fu 0776* (WUK); Huangshan, near the Hot Spring, 14 Jul 1975, floral buds, *K. J. Guan 75598* (PE); Hwangshan, Yunkusze to Shihszelin, 12 Aug 1935, *T. N. Liou & P. C. Tsoong 2616* (KUN, PE, WUK); Huangshan, below Beihai, 1700 m, 14 Aug 1973, fl, *G. S. Zhou et al. 469* (PE, 2 sheets); Huangshan, near Guang-ming-ding, common between 1400-1700 m, in *Picea-Carpinus-Pinus-Acer* forest, 17 Jul 1999, *J. Wen 4885* (US). FUJIAN: Chongan Xian, 700 m, 13 Aug 1979, fl, *Wuyi Expedition Team 00210* (PE); Tongmuguan, 800 m, 16 Aug 1979, fl, *Wuyi Expedition Team 00482* (PE). Wuyishan, on the way from Shangang to Gaoqiao, roadside in sparse forest, 3 m tall, common, 19 Jul 1980, floral buds, *Wuyishan Team 80-0118* (MO, WUK). GANSU: Wen Xian, Baishujiang Nature Preserve, Qiu Jia Ba, Second Work Section, 2400-2700 m, at the edge of forest, in forest, fruits reddish, 5 Sep 2007, fr, *Baishujiang Expedition Team 5728* (PE). GUANGXI: Damiaoshan Xian, Shanfangqu, Pingshixiang, Jiuwangdasha, Yuantoutun, Yangmeijie, 700-1000 m, valley, sparse forest, ca. 0.6 m, 21 Jul 1958, *S. Q. Chen 15792* (KUN, PE, WUK); Yangmeijie, 1300 m, 2 Jul 1957, roadside woods, 1.8 m tall, 2 Jul 1957, floral buds, *D. C. Chen 910* (KUN); Jiuwangdasha, Jiuyang, common, 1280 m, 30 Aug 1958, 0.5 m, *S. Q. Chen 15429* (KUN, WUK). Longsheng, Dadi Xiang, Hongyashan, 1660 m, 29 Jul 1955, fl, *Guang-Fu Forestry District Team 00928* (PE); 1630 m, 19 Oct 1955, fr, *Guang-Fu Forestry District Team 01076* (PE). Xingan, Miaoer-shan, Longtangjiang, 1000 m, 26 Jul 1997, fl, *G. Z. Li 15425* (PE); Mao-Er-Shan, N25°54.492', E110°27.833', 1526 m, 7 May 2010, *J. Wen 11550* (US). Zhiyuan Xian, Wupa, 8 Jul 1959, *D.-A. Huang 61322* (MO). Guangxi, *R. C. Ching 7151* (A, NY, PE); *T. S. Tsoong 83497* (A). HEBEI: Dongling, Jul 1935, fl, *Y. Liu 11808* (PE); Aug 1935, fl, *Y. Liu 11836* (PE); Aug 1930, *H. T. Tsai*

50227 (A, PE); Shangpanpo, Tungling, 25 Aug 1930, fr, *H. F. Chow 40973* (PE); Liulipingshan, Tung-ling, *Yu 222* (PE). Fuping-hsien, 1200 m, 5 Sep 1934, fr, *K. M. Liou 3607* (PE, WUK). Tanghsien, 29 Jul 1934, young fr, *K. M. Liou 3112* (PE, WUK). Tienchiaoshan, Chahar, stream side, 16 Aug 1933, young fr, *C. W. Wang 60812* (PE). Northern Hebei, 10 Sep 1951, fr, *W. C. Wang 2473* (PE). HENAN: Lanchuan Xian, 1959, *Pucha Team 20325* (PE). Lushi Xian, Shizhiping, Nanlianpanshan, in sparse forest, valley, shady area, 1350 m, 22 Aug 1973, fr, *K. J. Fu 17097* (WUK); Lushih-hsien, Laochunshan, 1140 m, 12 Aug 1935, young fr, *K. M. Liou 5019* (PE, WUK). HUBEI: Enshi, Taishanmiao Tree Farm, 31 Aug 1957, young fr, *G. X. Fu & K. S. Zhang 1397* (PE, 3 sheets, WUK). Hefeng Xian, Huping Farm, 1350-1450 m, 21 Aug 1958, fl, *H. J. Li 5744* (MO, PE, WUK). Lichuan Xian, Xiao He, Honghexi, Zhaojiayan, Oct 1956, fr, *X. B. Wan 283* (WUK); Lichuan Shi, Moudao Township, Dazhuang Village, Jingzhulin (Gold Bamboo Forest), N30°29'06", E108°43'22", 1350 m, 1 Sep 2001, at the edge of bamboo woods, *J. Wen 8138* (US). Tongshan Xian, Jiugongshan, 18 Oct 1996, fr, *C. S. Ye 3310* (MO, TNM). Xuanen Xian, Gongshan, in front of the Medicine Factory, in shrubby area, 1.5 m tall, 7 Jul 1958, buds, *H. J. Li 3577* (PE, WUK); Dagongshan, 1300-1400 m, 20 Jul 1958, floral buds, *H. J. Li 5264* (PE, WUK). HUNAN: Jiangyong Xian, Datian, 750 m, *P.-X. Tan 63652* (MO). Shangzhi Xian, Badagongshan, 1989, *Plant Chemistry Voucher 683* (PE, 2 sheets). Xingning Xian, Wanfengshan Tree Farm, Huashijiang, 1200 m, 28 Sep 1996, fr, *Z. C. Luo 1661* (PE, TAIF, 2 sheets); on top of Dayunshan, 1700 m, 29 Jul 1985, floral buds, *Y. B. Luo 2769* (PE); Shun Yao, Tongzhichong, 29 Jun 1985, floral buds, *Y. B. Luo 2487* (PE); Shunhuangshan Tree Farm, Lizhu Village, Luodanjiang Kou, N26°27.505', E110°58.955', 682 m, occurring locally in upper areas, planted near homestead, 5 Aug 2006, fl, *J. Wen 9300* (US); Xinning Xian, Wanfeng Tree Farm, Gaofeng Rd., N26°30.252', E110°37.480', 1316 m, 7 Aug 2006, fl, herb 70-120 cm tall, fls greenish white, *J. Wen 9330* (US). JIANGXI: Jingan Xian, Beigang Tree Farm, Shizhiyan, 1000 m, near stream in forest, 29 Oct 1982, *S. S. Lai et al. 01450* (PE). Jinggangshan, Liangzhushan, Goupazhai, 1100 m, near stream, 2 Oct 1958, fr, fruits purplish black, *J. Xiong 2873* (PE, 2 sheets).

Qianshan Xian, Wuyishan, Tongmuguan, 1400 m, 22 Aug 1958, fl, *S. S. Lai & M. X. Nie 4419* (PE, WUK); Qianshan Xian, Wuyishan Nature Preserve, on the way from the Preserve Headquarter to Zhumukeng, ca. 1500 m, 9 Jul 2001, fl, *J. Wen 5545* (US). Shangyou Xian, Wuguaifeng Commune, Qiyunshan, the First Peak, 20 Aug 1971, fl, *Jiangxi Team 537* (PE). Shuichuan Xian, Dafeng Qu, Linyang, Xiaoshui, in forest, moist area, 1200 m, 24 Sep 1963, fr, fruits purplish black, *J. S. Yue et al. 4253* (KUN, WUK). Tongmuguan, 800 m, 11 Aug 1958, fl, *P. X. Qiu 1873* (PE, 3 sheets). Wuling Xian, Luoxi, 1500 m, in the valley near stream, herb ca. 2 m tall, 28 Jul 2000, fl & young fr, *J.-H. Zhang 1056* (TAIF). Xiushui Xian, Tangpai Xiang, roadside, 1100 m, 0.5-1 m tall, 5 Aug 1996, fl, *C. S. Ye 2002* (TNM). JILIN: Antu Xian, riverside vegetation of left bank of Er Dao Bai He, 930 m, river alluvions, 1 Aug 1986, *D.-Y. Hong et al. 33.318* (RSA); primary but partly degraded broadleaf forests N of Er Dao Bai He, 800 m, moderately moist to drier road side with ditches, dark brown forest soils and clay, 25 Aug 1986 (fr), *D.-Y. Hong et al. 34.433* (RSA); on the way from Naitoushan to Laolangbao, edge of forest, *K. M. Liou 3850* (PE); Antu Xian, Erdao Township, Hanchun Gou, just west of Erdao, 5 Aug 1997, *J. Wen 3129A* (US). Fusong Xian, along the road from Changbai to Songjianghe, in forest SE of the 50 km marker, 18 Jun 2001, *J. Wen 5426* (US). Helong Xian, Shajingou, in mixed forest, 18 Sep 1959, *Yanbian Group II 962* (PE). Journey from Mukden to Kirin, Tang-ho-ko, Sungari River to Hui Fa River, May to Aug 1886, fl, *H. E. M. James s.n.* (K); Changbaishan, 800 m, under woods, 1981, fl, *B. B. Wan & K. S. Chow 81106* (BM, CAS, K, MO, NY); Changbaishan, north slope, 1200 m, at the edge of mixed forest, 24 Aug 1959, *Yanbian Group I 416* (PE, 2 sheets); Changbaishan, 800 m, in forest, 18 Aug 1981, young fr, *G. S. Zhou et al. 106* (PE). LIAONING: Benxi Xian, Chaohezhang Commune, 13 Aug 1965, fl, *C. Q. Lin 961* (PE). Fengcheng Xian, Dongxingbaozhi, in forest on slope, *C. Q. Lin 1048* (PE). Huai ren Xian, Huanggou, in valley near a stream, 14 Aug 1959, *C. S. Wang et al. 3858* (PE), 3859 (WUK). SHAANXI: Fuping Xian, riverside in the valley, 1300 m, herb 1.5 m, 28 Jul 1989, fl, *J.-S. Ying et al. 0135* (MO). Yang Xian, Huayang, Jiuchiba, 1400 m, *J. X. Yang 01603* (PE, WUK, 2 sheets). SHANXI: Hengqu Xian, Tongshan

Commune, southern slope, 1100 m, 13 Jul 1984, floral buds, *Shanxi Team 02243* (Ny, WUK, 2 sheets). SICHUAN: Baoxing Xian, as Pao-hsing-hsien on this specimen, 2400 m, 1 Sep 1936, fl, *K. L. Chu 3780* (BM, PE); as Pao-hsin-hsien, formerly Mupin, 1954, *T.-P. Soong 38937* (KUN, WUK), 39067 (KUN); Shizhishan, slope, grassy area, 2700 m, 16 Aug 1933, fl, *T. T. Yü 2368* (PE, 2 sheets). Emeishan, *Biology Department of Sichuan University Expedition Team 51545* (WUK). Hanyuan Xian, Xianglingshan, 2800 m, 9 Sep 1938, fr, *T. P. Wang 9674* (WUK). Meigu Xian, Liangshan, Houpu, Letuo Qu, 1-1.5 m, 18 Aug 1959, *Sichuan Economic Botany Liangshan Team 1674* (KUN). Mianning Xian, Tuowu Qu, Yele, Shanchahe, in dense forest, 2600 m, 3 m, 20 Jul 1959, *S. G. Wu 2061* (KUN, PE, 2 sheets). Shimian, *X. X. Kong 41889* (WUK); Shimian, *X. X. Kong 42009* (WUK). YUNNAN: Yiliang Xian: Chaotianma Tree Farm, below Doukouzhi, limestone slope, rare, 1 m tall, *Northeast Yunnan Team 677* (KUN, 2 sheets). Manchuria austro-orientalis, 1860, *Maximowicz s.n.* (K, 2 sheets). **Korea.** Korea septentrionalis, 6 Jul 1897, fl, *V. Komarov 1152* (K); Hallaisan, Oct 1907, fl & young fr, *T. Taquet 138* (BM); Hallaisan, 1300 m, 13 Aug 1908, fl, *Taquet 891* (K); Kang Kai, 25 Jul 1911, fl, *R. C. Mills s.n.* (PE, 2 sheets); Kang Kai, 3 Aug 1911, young fr, *R. C. Mills s.n.* (PE). **Russia.** Amur, Primorskaya region, Askold Island, *N. A. Palczewsky s.n.* (A, LE); Primorye Territory, Ussuriisk Town, basin Borisovka river, slope, 16 Aug 1973 (fl), *P. Gorovoy s.n.* (RSA). Far East, Telyakovsky Inlet, Gamov Peninsula, N42°34', E131°12', 290 m, herbaceous perennial to 1.3 x 1.3 m, occasional, growing in dense shade with *Acer pseudosieboldianum* and *Diervilla praecox* in *Quercus mongolica*, *Betula schmidtii*, *Betula davurica*, *Kalopanax pictus*, *Tilia amurensis* woodland, on gentle NW facing slope in rich loamy soil with high organic matter content, 20 Sep 1994, fr, *M. Flanagan & A. Kirkham ESUS 130* (K, 2 sheets); Russian Far East, Peninsula Galiv, dense oak forest, 20 Aug 1931, *V. Petrov s.n.* (MW, 2 sheets); southern Ussuri region, Pos'etckiy, near Harbor Seedema, in oak deciduous forest, 18 Sep 1933, *A. Poretzky 279* (LE); in the mountain of Moetzita, Pos'etckiy region, 11 Aug 1926, *A. Savernin 107* (LE); Primorskaya region, Vladivostoksky District, 4 Aug 1984, fl, *P. U. Zhmylev s.n.* (MW, 3 sheets).

Specimens from cultivated source: **China**. JIANGXI: Lushan Botanical Garden, 4 Sep 1988, fr, *J. Wen 610* (OS).

Kitagawa (1935) cited five specimens (syntypes) in the original description of *Aralia continentalis*. *V. Komarov 1152* is representative of the morphology of the Manchurian "*A. continentalis*" and was distributed to different herbaria (BM, LE, and TI). It is thus selected as the lectotype for *Aralia continentalis*. It is noted that *Komarov 1152* consists of mixed collections which were made in the summer of 1897. The lectotype was collected on August 13, 1897. Two other specimens of *Komarov 1152* were seen, but were not considered as isolectotypes: (Korea, 6 July 1897, *V. Komarov 1152*, K; and China, Jilin, Mu-dan-dsian, 10 Jul 1897, *V. Komarov 1152*, A, W).

8. *Aralia cachemirica* Decne. — Fig. 28.

Aralia cachemirica Decne. in Jacquem. Voy. Inde 4: 72. 1844. TYPE: **India**. Kashmir, Mt. Vestervonne, 3087 m, 12 Jun 1831, *V. Jacquemont 718* (lectotype, P!, here designated).

Aralia macrophylla Lindl., Edward's Bot. Reg. 30: 73. 1844. TYPE: **India**. North part (type not seen).

Robust, spreading, and unarmed perennial herb 1.5-2.3 m tall; stem green to greenish purple. Leaves 1.7-2.3 cm long, 0.8-1.2 cm wide, lower leaves ternately compound, upper leaves pinnate to bipinnate; stipules narrowly triangular, membranaceous, ciliate at margin, pilose; uppermost petioles 4-19 cm long, greenish, puberulent; leaflets (4)-8-21 cm long, (1.5) 3-8.5 (11) cm wide, thick papery, the pair of leaflets below the terminal leaflet narrowly ovate, other leaflets ovate to narrowly so, rarely elliptic, acute to acuminate at apex, rounded to subcordate, rarely cordate at base, commonly oblique on lateral leaflets, serrulate to serrate, sometimes doubly so at margin; lateral veins (8)-10-12-(19) on each side, conspicuous on both surfaces, nearly glabrescent to slightly scabrous on adaxial surface, often with scattered hairs on veins and veinlets, glabrescent to slightly puberulent on abaxial surface, petiolules 0.2-2.2 cm long, glabrescent to

slightly pilose. Inflorescence 15-45 cm long, terminal and axillary, paniculate in overall structure, puberulent, consisting of numerous umbels, primary inflorescence branches 15-30, mostly racemosely or sometimes paniculately arranged, often 3-8 forming a circle on the main inflorescence axis, each primary branch 3-10 cm long, consisting of 1-4 umbels, usually only the terminal umbel of each branch bearing fruits, others becoming aborted; terminal umbels mostly 35-70-(95)-flowered, pedicels 7-11 (-16) mm long, pubescent; lateral umbels 15-25-flowered, pedicels 5-8 mm long; bracts of primary branches 3.5-8 mm long, 0.5-1 mm wide, linear, somewhat pilose, sometimes leafy at the lower part of the inflorescence; bracteoles 1.2-2.2 mm long, linear, more or less ciliate at margin. Sepals 0.3-0.4 mm long, broadly to narrowly triangular, persistent on fruits; petals 1.7-2.2 mm long, ca. 1 mm wide, ovate, greenish white to white, with a conspicuous vascular bundle in the middle; stamens 5, 1.8-2 mm long; ovaries 5-locular, styles ca. 0.5 mm long at anthesis, base of styles conspicuously enlarged, appearing like a stylopodium. Fruits 3-4 mm long, 3.8-4 mm wide, globose, persistent styles ca. 1 mm long, divided to the middle. Seeds 2-2.2 mm long, 1 mm wide, 0.2-0.25 mm thick, kidney-shaped, whitish gray, smooth.

Phenology: flowering in late June to September; fruiting in September and October.

Distribution: Northwestern India, northern Pakistan, and western Nepal, most often collected from the Kashmir region (Fig. 29).

Ecology: river valleys, streamsides, and mixed forests; 2100-3650 m.

Additional specimens examined. **India**. Humid woods above Sendjigam, 2600 m, *V. Jacquemont 913* (P, 2 sheets); *V. Jacquemont s.n.* (P). 8-9000 ft, 1884, *J. F. Duthie 595* (LE); NW India, *J. F. Royle s.n.* (K, LE, 2 sheets); NW India, 1871, *J. L. Stewart s.n.* (LE, 2 sheets). HIMACHAL PRADESH: Chamba, NW India, Aug 1880, young fr, *R. Ellis 428* (K); Panji, Chamba State, Sanch Valley, 9000 ft, 10 Aug 1899, fl, *J. F. Duthie 19618* (K); NW Himalayas, Chamba State, Dharwas, 9,000 ft, 28 Jun 1896, young fr & fl, *J. H. Lace 1476* (E); Simla, 7-8000 ft, 28 Aug 1849, *T. Thomson s.n.* (K); Simla, Matiyana, 9000 ft, Sep 1878, in fl, *H. Collett 6568* (K, 2 sheets);

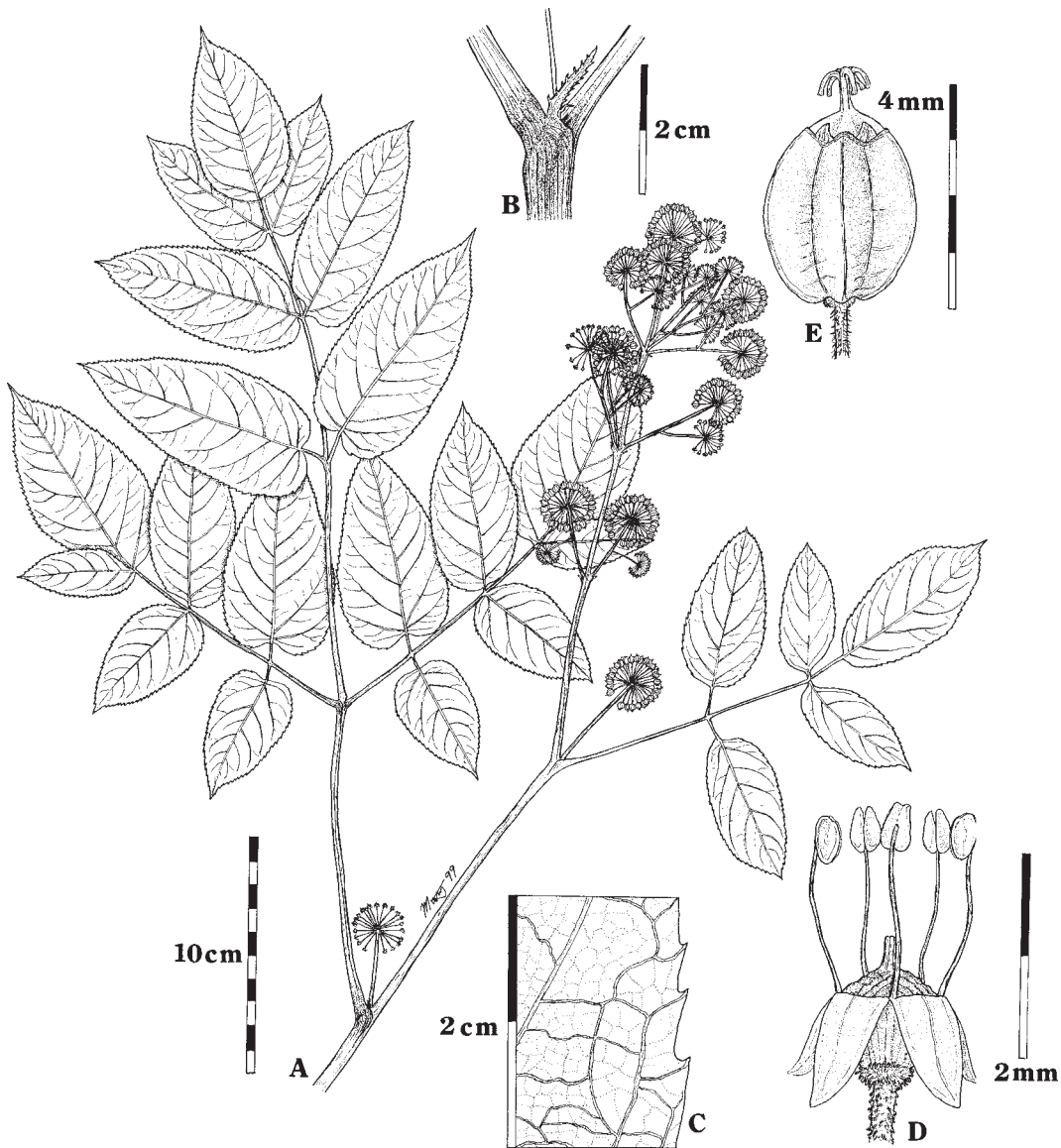


Fig. 28. *Aralia cachemirica* Decne. A. Habit showing leaves and inflorescences. B. Leaf base showing stipule morphology. C. Close-up showing leaflet margin. D. Flower. E. Young fruit.

Theog, 8000 ft, 1 Sep 1886, fl, *H. Collett* 584 (K, 2 sheets). JAMMU & KASHMIR: *V. Jacquemont* 717 (P); Astor Valley near Dashkin, 26 Jul 1892, *J. F. Duthie* 12254 (BM); Erin Valley, near Bandapur, 8,000 ft, 25 Jul 1940, on edge of cultivation, *F. Ludlow & G. Sherriff* 7831 (E); Kulewan, 7750 ft, 22 Jul 1876, *C. B. Clarke* 29470 (LE); Sonamurg, 8500 ft, 1 Sep 1876, fl, *C. B. Clarke* 30906 (BM, K, 2 sheets, LE, WU); 1 Sep

1876, *C. B. Clarke* 30918 (K); Kashmir, 7-9500 ft, 28 Sep 1848, fl., *T. Thomson s.n.* (K, LE, U, W); Gulmarg, Kashmir, 8500 ft., 11 Aug 1919, *H. Rich* 1239 (K, 2 sheets); Rajparyan Sanctuary, 10,500 ft, 24 Aug 1943, floral buds, *F. Ludlow & G. Sherriff* 9366 (BM, E); below Zaiwan, 9,500 ft, 30 Aug 1956, *O. Polunin* 56/606 (BM, 2 sheets, E); Nara Nag, Wanqar Valley, among debris of Nara Nag Ruins, 12 Aug 1840, fl, *P. M. Pinfold* 252

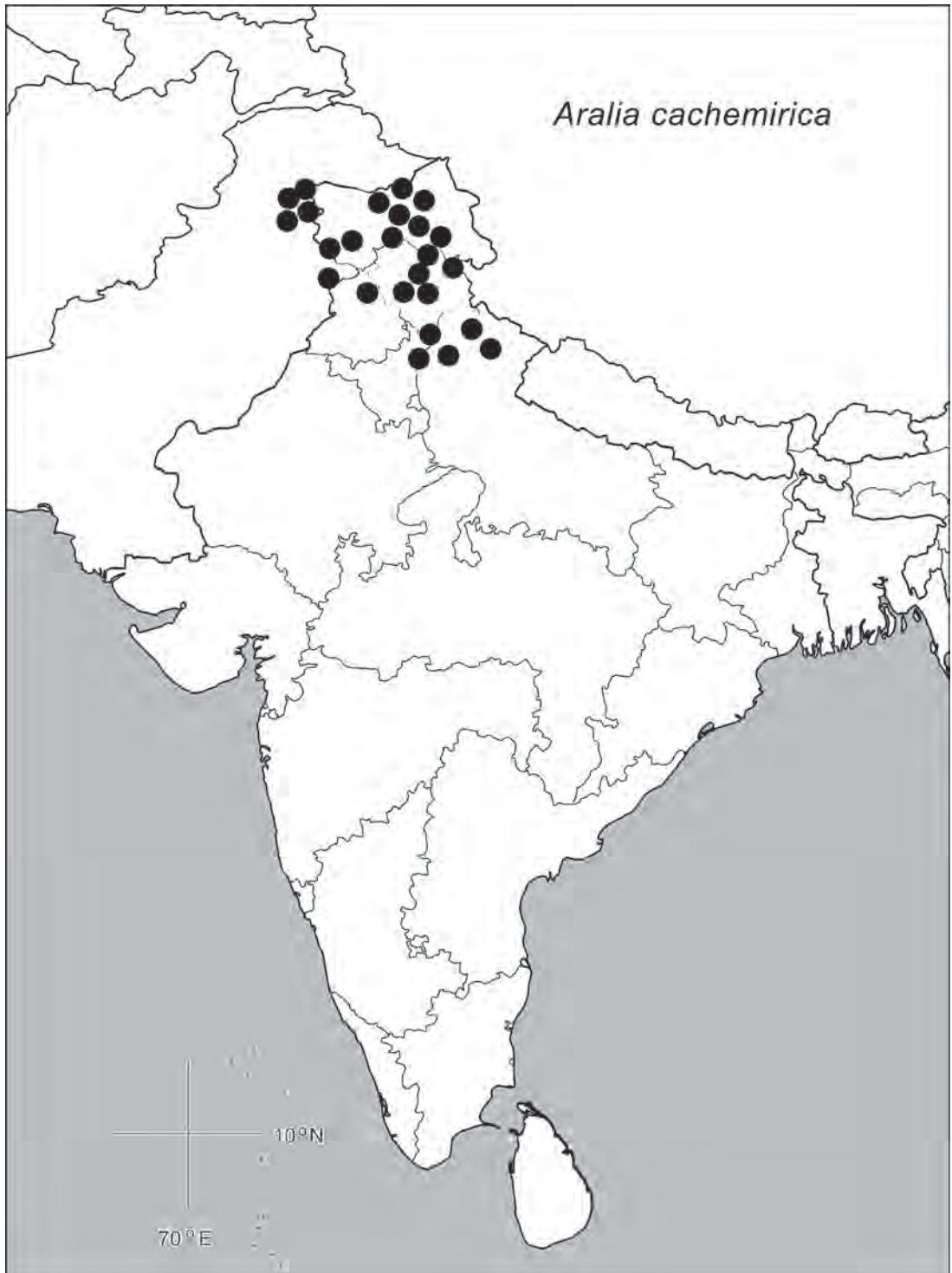


Fig. 29. Map of India, Pakistan and neighboring regions showing the distribution of *Aralia cachemirica* Decne.

(BM); Prov. Kishtvar, Kishtvar to the Pir Patsaski or Kishtvar Pass, 1-4 Aug 1856, *Schlagintweit 3796* (BM, K); Dunga Fali, Aug 1880, *A. P. Young s.n.* (BM, 2 sheets). PUNJAB: *J. R. Drummond 24236* (K). SIKKIM. 10-12000 ft, *J. D. Hooker s.n.* (LE). UTTARANCHAL: Garhwal, 8000 ft, *T. Thomson s.n.* (K, LE); NW India, Tihri - Garhwal, Ganges Valley, 9-10000 ft, Oct 1881, fr, *J. F. Duthie s.n.* (BM, WU). UTTAR PRADESH: Deota, 8000 ft, 17 Jun 1906, *H. H. Haines 2245* (K, 2 sheets); Jaunsar, Hajawa, 8000 ft, Oct 1890, fr, *J. S. Gamble 25231* (K); Jaunsar, Mendali, 7500 ft, Oct 1890, *J. S. Gamble 25054* (K); Mendali, 8000 ft, Sep 1898, fr, *J. S. Gamble 27311* (K); NW Himalayas, Jaunsar, Konain, 19 Sep 1936, young fr, *M. B. Raizada 7263* (E). **Nepal.** Garjigoth, 9500 ft, 9 Aug 1952, *O. Polunin et al. 5045* (BM, 2 sheets, E). **Pakistan.** 7000 ft., Gilgit Expedition, *Giles 544* (K). Hazara Distr., Kaghan, 7500 ft, 3 Oct 1966, *M. A. Giddiqi 4052* (W); Hazara, between Naran and Kaghan, 6 Sep 1988, fl, *S. Omer & M. Qaiser 2748* (K); NW "India", near Dana, Bulsun [now in Pakistan], 8000 ft, Sep 1877, *H. Collett 5542A* (K). PUNJAB: NW Frontier Province, Murree Hills, Hazaza, Aug 1907, in fl., *H. Deane s.n.* (K); Kishtvar, Murree, Mt. Chumbi, 10 Aug 1851, fl., 7-8000 ft., *T. Thomson s.n.* (K). Himalaya, Nagkanda, 7-10000 ft, 1844, *M. P. Edgeworth 187* (K, 2 sheets).

Cultivated material: **Austria.** Botanischen Garten in Wien, 6 Aug 1920, *H. Zerny s.n.* (W). **Germany.** Berlin, Botanischen Garten Berlin-Dahlem, 13 Aug 1976, *Schwerdtfeger 3644* (B, 2 sheets); 18 Jul 1983, *Schwerdtfeger 14783* (B, 3 sheets)

Four specimens of *Aralia cachemirica* are preserved at P, which were collected during Victor Jacquemont's voyage to India [V. Jacquemont 717, 718, 913 (2 sheets), and a specimen without number]. V. Jacquemont 718 bears both leaves and flowers and is representative for the species. It is thus selected as the lectotype.

Two specimens (*J. D. Hooker s.n.*, LE, from Sikkim, 10-12000 ft; and *O. Polunin et al. 5045*, BM, E, from Nepal, below Garjigoth, 9500 ft, 9 Aug 1952) appear to be morphologically intermediate between *A. cachemirica* and *A. tibetana*. They are herein cited as *A. cachemirica* on a tentative basis. Field studies are required in

these areas to ascertain the taxonomic status of the populations represented by these specimens.

The type of *Aralia macrophylla* has not been located at present. Its author, Lindley (1844, p. 73), noted the species as follows: "This is an herbaceous plant from the North of India, looking like *A. racemosa*, but much larger in all its parts. The flowers, which are greenish-yellow, have been produced in the garden of the Horticultural Society, where the plant has been raised from seeds presented by the East India Company."

9. *Aralia tibetana* G. Hoo — Fig. 30; color plate 7: A-F.

Aralia tibetana G. Hoo, Acta Phytotax. Sin., Add. 1: 175. 1965. TYPE: **China.** XIZANG: Tibet [Xizang Prov.], Rung-sa, Mt. Jolmo Lungma, under forests of *Tsuga*, 3100 m, 2 Aug 1959, *Mt. Jolmo Lungma Exped. Team 758* (holotype: PE!).

Panax tripinnatum Wall. ex Don, Gen. Hist. 3: 384. 1834 (non *Aralia tripinnata* Blanco, Fl. Filip. ed. 1: 223). TYPE: Emodi [Himalaya], at Gosain Than [now in Nepal], Aug 1821, fl, *N. Wallich 4934* (holotype: BM!; isotypes: G!, K!, K-W!).

Perennial herb, up to ca. 2 m tall, stem purple to dark purple, nearly glabrous, bearing 4-5 leaves; rhizomes thick. Leaves 50-90 cm long, 40-80 cm wide, tripinnately or bipinnately ternate; uppermost leaves 12-20 cm long, 10-15 cm wide, bipinnate to pinnate, or occasionally tripinnate; stipules of lower leaves 1.5-2.5 cm long, 1-1.2 cm wide, membranaceous, narrowly triangular to ovate, pilose, somewhat divided or toothed at the tip, enclosing the emerging young shoot, stipules of upper leaves 2-3 mm long, triangular in shape; petioles of uppermost leaves 3-7 cm long, pilose; leaflets 3.5-11.5 cm long, 2.3-5.5 cm wide, membranaceous, ovate, or occasionally narrowly so to elliptic, sharply long acuminate or sometimes acuminate at apex, rounded to subcordate at base, doubly serrulate to sometimes doubly serrate at margin, lateral veins 7-9 on each side, sunken on adaxial surface, conspicuous on both surfaces, adaxial surface green, scabrous when young, pilose along veins to glabrescent when mature, abaxial surface whitish green, pilose, or at least along the veins and veinlets, with conspicuously visible fine



Fig. 30. *Aralia tibetana* G. Hoo. A. Leaf with axillary inflorescence. B. Stipule. C. Umbel also showing bracts. D. Inflorescence. E. Floral bud. F. Flower. G. Flower showing anthers and gynoecium after breaking off two petals. H. Fruit. I. Seed, left showing face view, and right showing side view (A, D, H & I - Qinghai-Xizang Team 74-2440, KUN; B, C & E-G - Qinghai-Xizang Team 6340, KUN).

veinlets; petiolules 0.1-2 cm long, slightly pilose. Inflorescence 20-40 cm long, terminal and axillary, consisting of numerous umbels, primary inflorescence branches 12-30, mostly racemously arranged, often 3-7 forming a circle on the main inflorescence axis, each primary branch 4-8.5 cm long, consisting of 1-4 umbels, usually only the terminal umbel of each branch bearing fruits, others becoming aborted; terminal umbels mostly 30-70-flowered, pedicels 6.5-11 mm long, pubescent, enlarged and with tufts of hairs at the tip, the hairs and the enlarged tip forming a somewhat disk-like structure at the base of the flower; lateral umbels 15-25-flowered, pedicels 4.5-9.5 mm long; bracts of primary branches 5-7 mm long, 1-2 mm wide, lanceolate to narrowly triangular, ciliate at margin, sometimes bracts becoming leafy and enlarged; bracteoles 1.6-2.2 mm long, 0.4-0.6 mm wide, lanceolate, glabrous or nearly so. Sepals 0.4-0.6 mm long, 0.4-0.5 mm wide, narrowly triangular, persistent on fruits; petals 1.5-2.0 mm long, 1-1.2 mm wide, ovate, pale purplish, with a conspicuous vascular bundle in the middle; stamens 5, 2.2-2.8 mm long, filaments 2-2.5 mm long, anthers 0.7-0.8 mm long, 0.4-0.5 mm wide, ovate; ovaries 5-locular, styles 0.7-0.8 mm long at anthesis, tip of ovary enlarged and projected. Fruits 2.7-3.5 mm long, 3-3.4 mm wide, globose, purplish black, persistent styles divided to the middle, 1.1-1.3 mm long. Seeds 2-2.5 mm long, 1-1.2 mm wide, 0.6-0.7 mm thick, kidney-shaped, whitish gray, smooth.

Common name: Xizang tu dang gui.

Phenology: flowering in July and August; fruiting in September to October.

Distribution: in the eastern Himalaya, including eastern and central Nepal, Sikkim of India, western Bhutan, and southern Tibet and western Sichuan of China (Fig. 31).

Ecology: in shady forests, edge of woods, grassy slopes, among rocks and shrubs, especially in mixed *Rhododendron* forests; 2400-4250 m (8,000-14,000 ft).

Additional specimens examined: **Bhutan.** Bhutan. Mindook La, 31 Jul 1884, in fl., *Dunghoo* 2 (P). Tilaging Timpu, 8000 ft, 17 Aug 1914, *R. E. Cooper & A. K. Bulley* 2567 (BM); Dotura + Timpu, 1 Oct 1914, fr, 10,000 ft, *R. E. Cooper* 2983 (BM); west Bhutan, Damthaug, 30 Sep 1933, *F.*

Ludlow & G. Sherriff 535 (BM); Beliere Deucheng, 7000 ft, 20 Jul 1949, fl, in bamboo and *Tsuga* forest, 3-4 ft high, *F. Ludlow et al.* 21302 (BM). **China.** SICHUAN: Kangding, 11 Aug 1930, young fr, *Z. P. Huang et al.* 1743 (WUK); Kangding, 8 Aug 1930, young fr, *Z. P. Huang et al.* 1854 (PE, WUK). XIZANG: Chola Xian, Jiba Xiang, at the edge of secondary forest, 3500 m, 1-2 m tall, 19 Jul 1975, fl, *C. Y. Wu et al.* 75-1043 (KUN, 2 sheets, PE, 2 sheets); Lebu Qu, 3200 m, 25 Aug 1975, young fr, *Qinghai-Xizang Additional Collections Team* 751563 (KUN, PE); Lebu Qu, Deyinggou, shrubby area, roadside, 3200 m, 1-1.5 m tall, 8 Sep 1975, fr, *Qinghai-Xizang Additional Collections Team* 751842 (KUN, 2 sheets, PE, 2 sheets); Tibet, Cuona, Mama Xiang, 3062 m, 19 Sep 2009, *Z.-L. Nie et al.* 788 (KUN). Jinong Xian, Jinong zhen, Rukacun 4277 m, 28 Sep 2009, *Z.-L. Nie et al.* 1023 (KUN); Jinong Qu, Luka, 2960 m, 13 Oct 1975, fr, plant 2.5 m, fruit black, *Qinghai-Xizang Team* 75-34 (PE); Tuodan, 3450 m, 5 Jul 1975, *Zhong Kao Hui* 75-512 (PE, 3 sheets); from Jinong to Bangxing, in *Pinus* forest on slopes, 2850 m, herb 1.5 m tall, 13 Jul 1975, floral buds, *Qinghai-Xizang Team* 6340 (KUN); Tuodang, Dongshan, in *Abies-Quercus* mixed forest, at the edge, 3300-3400 m, plant 0.5-0.8 m, *C. Y. Wu et al.* 75-531 (KUN, 2 sheets). Medog Xian, Kanongla Mountain, South side, edge of forest, common, 50-60 cm tall, 20 Aug 1982, fl, *S. Z. Chen & B. S. Li* 00296 (PE, 2 sheets). Yadong Xian, Yadong, Xiaoyadong xiang, Lilasha, 3187 m, 23 Sep 2009, *Z.-L. Nie et al.* 938 (KUN); Qinbeigou, in mixed forests, 3350 m, *Zhong Kao Hui* 75-896 (PE, 3 sheets); Nanguolashan, in *Tsuga* forest, 14 Aug 1975, young fr, *Zhong Kao Hui* 75-1051 (PE, 3 sheets); Kailingang, shrubby area near fields, 3200 m, 24 Jul 1960, fl, *G. X. Fu* 403 (PE); Hongqingang Qu, at the edge of *Pinus* forest, 2800 m, 9 Sep 1974, fr, *Qinghai-Xizang Team* 74-2149 (PE); near Xiashimazheng, shrubby area on slopes, 2900 m, 13 Sep 1974, fr, *Qinghai-Xizang Team* 74-2440 (KUN, PE, 2 sheets); near Yadong, 23 Jul 1953, fl, in forest, *B. Q. Zhong* 5929 (PE, 2 sheets). Tibet, Chumbi, 9 Jul 1913, *R. E. Cooper & A. K. Bulley* 270 (BM, E); Chumbi, 8,000 ft, 25 Aug 1913, *R. E. Cooper* 650 (BM); Chumbi, 10 Aug 1857, *A. Fleming* 331 (E); Yatung, 27°51'N, 88°35'E, *H. E. Hobson s.n.* (K). Sikong, Nan Yuen, near Chang Lou-pine, Ta-hsiang lin, 2200 m, 28 Aug 1939, fr, *C. Y. Chiao* 2069 (A). **India.**



Fig. 31. Map of eastern Asia showing the distribution of *Aralia tibetana* G. Hoo.

SIKKIM: Lachung, 9500 ft, 10 Aug 1892, *G. A. Gammie* 712 (P); Ichu Zeu, 8 Aug 1877, fl, *G. King* 4436 (BM); East District, Karponong, 8 Aug 1980, *P. K. Hajra* 525 (BSHC); Changu, rare, *B. Krishna* 2238 (BSHC); East Sikkim, Karponang – Chhangu, 4 Aug 1985, *D. C. S. Raju* 4128 (BSHC, 2 sheets); North District, on way from Lachen to Thangu, 3500 m, ca. 1.5 m tall, 26 Aug 1982, *P. Chakraborty* 2397 (BSHC, 2 sheets); North Sikkim, Lachung – Zakophyak, 3000 m, 25 Jul 1990, *S. Kumar & P. Singh* 9562 (BSHC, 3 sheets); North Sikkim, Lachung to Dambergang, shrubs to 2 m, flowers in umbel, greenish, 27 Jul 1998, *S. S. Dash & A. Maih* 18555 (BSHC, 3 sheets); North Sikkim, between Phuni and Yakche, 3230 m, 14 Jul 1996, *G. P. Singh & D. G. Long* 17851 (BSHC). **Nepal.** C Nepal, Bagmati Zone, Rasuwa Distr., Chyauche Kharka (3600 m) – a bridge (2010 m) – Lingju (2040 m), 28°14'N, 85°07'E, 12 Aug 1994, fl, *F. Miyamoto et al.* 10271 (BM); C Nepal, Bagmati Zone, Rasuwa Distr., Pati Kharka (3760 m) – cross a river (2800 m) – a Kharka (near Pabil Kharka, 2860 m), 28°14'N, 85°09'E, 5 Aug 1994, fl, *F. Miyamoto et al.* 20169 (BM), 10207 (BM, 2 sheets); Kasuwa Khola, 11,000 ft, mixed *Rhododendron* forest, 19 Aug 1975, *L. W. Beer*

25333 (BM); East Nepal, Baroya Khimty-Thakma Khola, 16 Nov 1963, sterile, *H. Hara et al.* 6301046 (BM, K); Langtang forest area, 1 Aug 1949, *O. Polunin* 1639 (BM, 2 sheets, E); near Dhorpatan, 9,500 ft, 12 Jul 1954, *Stainton et al.* 3474 (BM, E); central Nepal, Langtang, 28°15'N, 85°30'E, 8000 ft, 22 Sep 1965, *J. D. A. Stainton* 5147 (BM); Lete, S of Tukucha, Kali Gandaki, among shrubs and tall herbs on grass slopes, height 5 ft, berries black, 10,000 ft, 17 Sep 1954, *Stainton et al.* 7904 (BM); Simbua Khola, 27°30'N, 87°57'E, 10,000 ft, 24 Jun 1969, floral buds, *L. H. J. Williams* 903 (BM); Toketey, 13,000-14,000 ft, *L. Dhevoj* 0493 (BM, 2 sheets, E).

Panax decompositum Wall. ex DC. (de Candolle 1830) was previously treated as a synonym of *Aralia cachemirica* by Clarke (1879). Wen et al. (2002) placed it as the synonym of *Aralia tibetana*. My recent examination of *N. Wallich* 4935 at K-W has shown that this specimen belongs to *Aralia armata* (Wall. ex G. Don) Seem.

I noted a few specimens from Sichuan, China which are similar to *Aralia tibetana*. But they differ from the latter that the lateral leaflets immediately

below the terminal leaflets have relatively long petiolules (14-18 mm long); and that the teeth at the leaflet margin are short and triangular with a slightly glandular tip. These specimens are cited as below: **China**. SICHUAN: Baoxin: Bao-Hsin (Moupin), in shadow or damp places, creeping thick roots used as asprine, Jul-Aug 1939, young fr, *S. Y. Hu 1242* (A, 2 sheets). Dujiangyan Shi, west of Kuan Hsien, woodlands, Pan-lan-shan, 8000 ft, Oct 1910, fr, *E. H. Wilson 4285* (A, 2 sheets). Heishui, Wabo, 2750 m, 8 Jun 1959, floral buds, *Chuan-Jing-A (Sichuan Economic Plants Aba) 1333* (KUN). Hongqi, Lema, herb 1 m tall, 31 Jul 1959, fl, *Sichuan Economic Plants Liangshan Team 1510* (KUN). Leibo Xian, Shanlingang, Dagudui Xiang, Huangmaolang, 2700 m, herb 20-30 cm, 19 Jun 1959, *Sichuan Economic Plants Liangshan Team 0801* (KUN). Lieng Ho Kou, Aug 1938, *Wang & Wen 694* (A). Western China, locality unknown, 8500 ft., 2-3 ft, Jul 1903, in fl., *E. H. Wilson 3710* (A, BM, K, P).

Further collections and field studies are required to determine whether these collections represent a new species or just *Aralia tibetana*.

10. *Aralia fargesii* Franch. — Color plate 8: A-F.

Aralia fargesii Franch., *J. Bot. (Morot)* 10: 302. 1896. TYPE: **China**. CHONGQING: Sutchuen oriental [now Chongqing Shi], District of Tchen-keou-tin [Chengkou], *R. P. Farges s.n.* (holotype: P!, photo [A]!; isotypes: P(4)! photo [A]!, leaves only).

Aralia kansuensis G. Hoo, *Acta Phytotax. Sin.*, Addit. 1: 174. 1965. TYPE: **China**. GANSU: Xigu (now Zhouqu Xian), Heiyugou, Shanshengyeliang, on a *Quercus* tree, 3100 m, 19 Jul 1951, young fr, *Z. B. Wang 14444* (holotype: WUK!; isotype: PE!).

Perennial spreading herb 0.7-1.5 m tall. Stem purple to purplish green; rhizomes thick and horizontal in older plants, younger ones well developed tap roots. Leaves 27-45 cm long, 20-35 cm wide, 3-4 on each plant, tripinnately or bipinnately ternate; stipules 8-10 mm long, 2-3 mm wide, narrowly triangular, membranaceous; petioles of uppermost leaves 7-12.5 cm long, pilose; leaflets (3-) 5.5-11 cm long, (1.5-) 3-8.5 cm wide, membranaceous to chartaceous, ovate to broadly or narrowly so, acuminate to sharply so at

apex, cordate, subcordate, to rarely truncate at base, doubly serrate at margin, lateral veins 7-9 on each side, conspicuous on both surfaces, adaxial surface green, sparsely scabrous, abaxial surface light green, pilose along the veins and veinlets, petiolules 4-20 mm long, pilose. Inflorescence 15-43 cm long, terminal and axillary, a loose panicle consisting of an umbellate structure at the top and 2-3 branches below, pilose, the top umbellate structure with 4-6 primary branches, each primary inflorescence branch 7-14 cm long, mostly with 1-6 umbels; terminal umbels 15-25-flowered, pedicels 5-6 mm long, pubescent; lateral umbels 7-15-flowered, pedicels 4-5 mm long; bracts of primary branches leafy to lanceolate, variously sized; bracteoles 1.3-1.5 mm long, 0.1-0.2 mm wide, linear to lanceolate. Sepals 0.5-0.6 mm long, 0.6-0.7 mm wide, triangular, persistent on fruits; petals 1.6-1.8 mm long, 1-1.1 mm wide, ovate, with a conspicuous vascular bundle in the middle; stamens 5, filaments 1.9-2.1 mm long, anthers ca. 1 mm long, ovate; ovaries 5-3-locular, styles 5-3 lobed to the middle. Fruits 4-5 mm in diameter, globose, persistent styles divided to the middle. Seeds 3-3.2 mm long, 1.3-1.4 mm wide, ca. 0.2 mm thick, kidney-shaped, whitish, smooth.

Common name: long yan du he.

Uses: roots as blood-regulating medicine, also for arthritis.

Phenology: flowering in July; fruiting in August to September.

Distribution: Hubei, Chongqing, Gansu, Sichuan, Shaanxi and Qinghai provinces of China (Fig. 32).

Ecology: in forests or thickets, relatively rich habitats; 1750-3400 m.

Additional specimens examined: **China**. CHONGQING: Western China, Wu Shan (Mt. Wu), 9000 ft., 5 Jul 1903, in fl., *E. H. Wilson 3698* (BM, K, 2 sheets, P, 2 sheets, PE). GANSU: Tianshui, Pianlegou, 2300 m, 8 Jul 1963, fl, *Q. X. Li 422* (PE). Xigu (now Zhouqu Xian), Shatan, Dahaigou, 2500 m, 29 Jul 1951, fl, *Z. B. Wang 14625* (WUK). Zhouqu Xian, Boyu, Qumagou, in gully mixed forest, 2600 m, 11 Aug 1993, fr, *Y. S. Lian et al. 93-339* (MO). HUBEI: Fang, A. *Henry 6785* (K, 2 sheets, NY). Shennongjia Forest Dist., Xiao Nong Tan, J. Wen 1442 (US); Xiao Nong Tan, in *Abies* forest, N31°28.73',

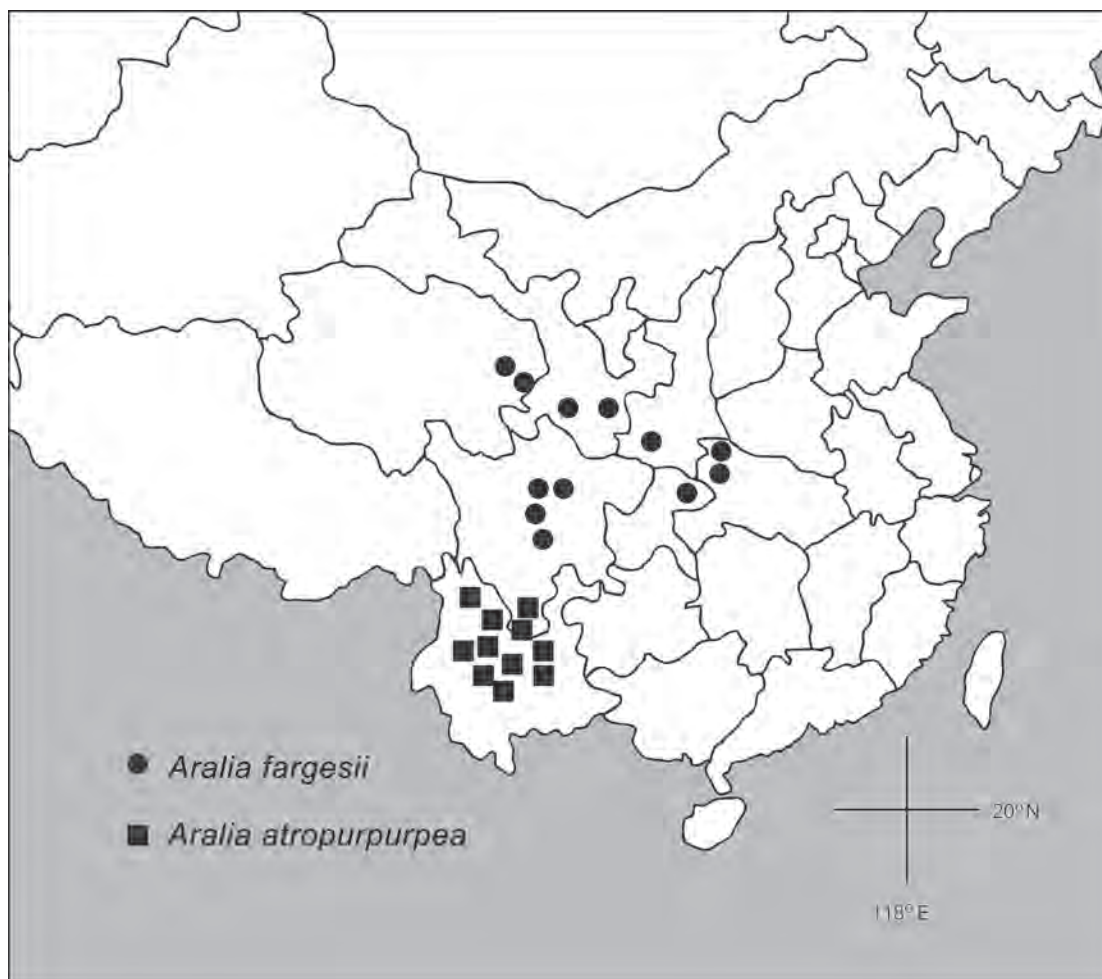


Fig. 32. Map of China showing the distributions of *Aralia fargesii* Franch. and *A. atropurpurea* Franch.

E110°18.11', 2180 m, 28 Jun 2001, *J. Wen* 5446 (US); Shennongjia Forest Dist., on the road to Xiao Nong Tan, N31°29.91', E110°22.27', 1640 m, 28 Jun 2001, *J. Wen* 5455 (US). QINGHAI: Xunhua, Tianchi, shrubby area on slope, 4 Aug 1985, *Huang Tu Team* 5939 (WUK, 2 sheets); Xunhua, Mengda, Muchangou, in forest, 2900 m, 29 Jun 1964, fl, *Z. F. Wei* 390 (WUK). SHAANXI: Mei Xian, Taibeishan, Tangyu, Ketianguan, forests, *Zhu et al.* 2435 (PE). Xitaibaishan, near Wafangzhi, 1750 m, slope, 7 Jul 1959, fl, *J. X. Yang* 681 (WUK); Taibaishan, ravine to the east of Ta-T'ien, 15 Jul 1938, fl, *T. N. Liou & P. C. Tsoong* 2175 (PE). SICHUAN: Baoxing Xian, Pao-hsing-hsien, 25 Jul 1936, young fr, *K. L. Chu* 3300 (BM, PE); Pao-hsin-hsien, formerly known as Mupin, Dachangpeng, near the 52th Peng, 7 Aug 1954, young fr, *T.-P. Soong* 38957 (KUN, PE, WUK). Dajing Xian, Wanli Xiang, Wanlicheng Gou, in

forest near the stream, 3400 m, 19 Jul 1958, young fr, *Q. Li* 78132 (PE, WUK). Emei Shan, Baiyunshi, 30 Jul 1952, fl, *W. P. Fang et al.* 31839 (PE); Emei Shan, Baiyunshi, *T. Y. Zhou & G. J. Xu* 466 (PE); Emei Shan, Luohanpo, 2200 m, 8 Jul 1996, young fr, *Y.-L. Xu* 960329 (MO); Emei Shan, Leidongping, 2900 m, 29 Jul 1997, *J. Wen* 3079 (US). Ganle, Haitang, Yue-er-gou, 22 Jul 1959, 2200 m, *Sichuan Economic Plants* 4304 (PE, 2 sheets). Heishui, Luhua, 2850 m, 31 Jul 1957, young fr, *Q. Li* 73940 (PE); Guwanshi, Muozhigou, 15 Aug 1957, fr, 2750 m, *Q. Li* 73998 (PE). Lifan, Mung-twin-ko, Aug 1941, young fr, *S. Y. Hu* 1933 (A), 2075 (A). Mou Xian & Li Xian (formerly Lifan Xian), 1952, *Z. He & Z. L. Zhou* 12948 (PE). Wenchuan Co., Ts'ao Po, Yin-Chang-Kao, 5 Aug 1942, fr, *S. Y. Hu* 2591 (A, 2 sheets). Sichuan, location unknown, 1930, *T. Tang* 23346a (PE).

Aralia fargesii differs from *A. atropurpurea* in its styles connate to the middle (vs. completely distinct in *A. atropurpurea*), well developed thick rhizomes (vs. well developed tap roots) in older plants, inflorescence a loose panicle with an umbellate structure on top and 2-3 additional primary branches below (vs. an umbellate inflorescence in *A. atropurpurea*), and shorter pedicels (5-6 mm vs. 8-12 mm in terminal umbels). In general, *Aralia fargesii* is a bigger and a more robust plant ca. 1-1.5 m tall,

Aralia kansuensis G. Hoo is now treated as the synonym of *A. fargesii*. The type of *Aralia kansuensis* bears smaller leaflets which are 3-5 cm long and 1-2.5 cm wide. There are two inflorescences on the type specimen; one is an umbellate structure with 7 primary branches, and the other bears two whorls of primary branches (6-7 branches each). The type resembles closely *A. fargesii* except that the leaflets are smaller. I interpret the morphotype in "*A. kansuensis*" as the extreme condition at the higher altitudes and its westernmost distribution. Another specimen (Z. B. Wang 14625) was also collected in Xigu of Gansu, but at a lower altitude (2500 m). This specimen shows the typical morphology of *A. fargesii*. Huang Tu Team 5939 was collected from Xunhua of Qinghai province at the altitude of 2800 m. One of the two sheets has smaller leaflets (3-5 cm long, 1.5-2 cm wide), closely resembling the type specimen of *A. kansuensis*, and the other sheet has much larger leaflets (7-8.5 cm long, 3-4.7 cm wide).

11. *Aralia atropurpurea* Franch. — Fig. 33.; color plate 9: A-H.

Aralia atropurpurea Franch., J. Bot. (Morot) 10:301. 1896. *Panax atropurpureus* (Franch.) Hand.-Mazz., Vegetationsbilder 22 (8): 9. 1932. TYPE: **China**. YUNNAN: in woods of Ta-long-tan near Tapin-tze, 10 Jul 1888, P. J. M. Delavay 4530 (holotype: P!; isotypes: P, 2 sheets!).

Aralia yunnanensis Franch., J. Bot. (Morot) 10: 303. 1896. *Aralia fargesii* Franch. var. *yunnanensis* (Franch.) H. L. Li, Sargentia 2: 103. 1942. TYPE: **China**. YUNNAN: [Dali Shi], Kichan [Jizhushan or Jishan], Tapintze,

21 Aug 1889, P. J. M. Delavay 4027 (lectotype, designated by Li, 1942, P!; isolectotype: P!).

Aralia melanocarpa (H. Lévl.) Lauener, Notes Roy. Bot. Gard. Edinburgh 32: 94. 1972. *Eleutherococcus melanocarpus* H. Lévl., Bull. Acad. Int. Géogr. Bot. 24: 282. 1914. TYPE: **China**. YUNNAN: near Ma-li-ouan, 2550 m, Oct 1913, E. E. Maire s.n. (holotype: P!; isotypes: E, cited in Lauener 1972, P!, W!). *Aralia dumetorum* Hand.-Mazz., Symb. Sin. 7: 701. 1933. TYPE: **China**. YUNNAN: near Ma-li-ouan, 2600 m, Jul 1913, E. E. Maire s.n. (holotype: W!).

Perennial herb 0.5-1 m tall, andromonoecious. Main roots 15-40 cm long, deep, forked often unequally. Stem purplish green, with 2-4 leaves. Lower leaves 60-75 cm long, 50-70 cm wide, tripinnately ternately compound; upper leaves 17-25 cm long, 13-22 cm wide, bipinnately ternate to pinnate or sometimes trifoliate; stipules 3-4 mm long, 2-3 mm wide, narrowly triangular, more or less ciliate at margin; petioles 2.3-14.5 cm long, slightly pilose to glabrescent, occasionally more densely pilose, especially in Muli area of Sichuan province; leaflets 2.5-7.8 cm long, 1.5-5 cm wide, 1-5 per pinnule, chartaceous to sometimes membranaceous, ovate to narrowly ovate, or sometimes broadly so, acuminate to sharply so at apex, cordate, obliquely cordate, subcordate, truncate to rounded at base, finely doubly serrate at margin, lateral veins 7-9, conspicuous on both sides, adaxial surface green, scabrid, abaxial surface grayish green, pilose along the veins and veinlets, petiolules more or less pilose, those of lateral leaflets (0) 0.3-2 cm long, gradually becoming shorter toward the tip of the pinnae, those of terminal leaflets 1.2-3.5 cm long. Inflorescence 10-25 cm long, loose, terminal and axillary, more or less umbellate in outline, sometimes with one or two umbels below the primary umbellate structure, glabrous, primary branches 2-4, each with 1-5 umbels, each primary branch 8-20 cm long, subtended by a leafy bract or a lanceolate bract, sizes of bracts varied greatly, terminal umbels 15-25-flowered, pedicels 8-12 mm long, pilose to nearly glabrous, lateral umbels 8-14-flowered, pedicels 5-11 mm long, pilose to nearly glabrous, bracteoles 1.5-1.8 mm long, 0.2-0.35 mm wide, lanceolate. Flowers dark purple,

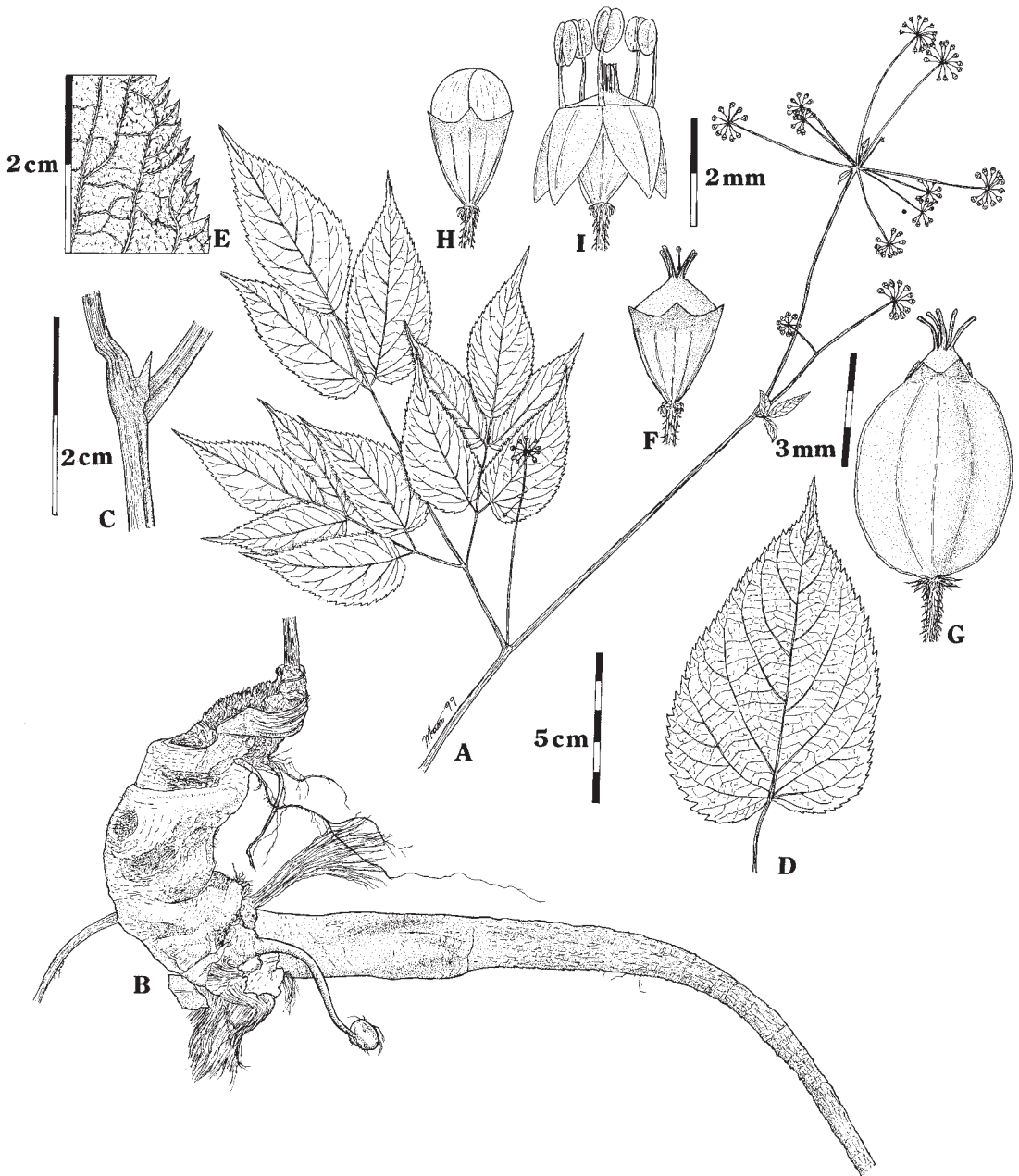


Fig. 33. *Aralia atropurpurea* Franch. A. Habit showing a leaf and inflorescences. B. Rhizome and root. C. Base of petiole showing stipule morphology. D. Leaf on a leaf on the lower part of the stem. E. Close-up showing leaflet margin and pubescence on lower surface. F. Flower after anthesis. G. Young fruit. H. Floral bud. I. Flower (A-I - Wen 3057, US).

floral buds globose, with several flowers aborted, perhaps functionally male, on each terminal umbel, more so on lateral umbels at fruiting stage; sepals minute, 0.5-0.6 mm long, 0.4-0.6 mm wide, triangular or narrowly so, spreading at anthesis, recurved afterwards, persistent into fruiting stage; petals 1.5-2.0 mm long, 1.2-1.3 mm wide, ovate; stamens 1.5-1.7 mm long, filaments 1.2-1.5 mm long, anthers 0.4-0.5 mm long, 0.3-0.4 mm wide, oblong; gynoecium conical at base, styles 5, 0.7-0.9 mm long, completely divided after anthesis, the apical portion of the ovary somewhat projected. Fruits 5-6 mm in diameter, globose, 5-ridged when dry, with 5 persistent recurved styles. Seeds 3.5-3.7 mm long, 2.1-2.2 mm wide, ca. 0.2 mm thick, kidney-shaped, whitish.

Common name: nong zhi long yan du he.

Uses: roots used as blood-regulating medicine and for correcting irregular menstrual period.

Phenology: flowering in June to September; fruiting from July to October.

Distribution: Sichuan and Yunnan of China (Fig. 32).

Ecology: in broadleaf or mixed conifer and evergreen broadleaf forests; 1800-3300 m.

Additional specimens examined: **China.** SICHUAN: Huidong, Baisha Xiang, 3100 m, 19 Jun 1959, fl, *S. G. Wu 771* (KUN). Muli Xian, Muli, Consinliang near Ngerya, on the border of Chungtien, 2400 m, in woods near stream, 24 Aug 1939, fl, *K. M. Feng 2791* (KUN, 3 sheets); Muli, near Benxi, 2600 m, *T. T. Yü 14050* (A, KUN, 2 sheets, PE); Muli Xian, Xiamaidi Xiang, Mianbu Village, 41 Km S of Muli along rt S216, between km markers 495 & 496, N27°44'53.6", E101°12'46.3", 2560 m, 6 Aug 2007, fr, *J. Wen et al. (Tibet-MacArthur Expedition) 1917* (F, KUN, US). YUNNAN: locality unknown, specimen received on 10 Aug 1921, *R. P. Maire s.n.* (P); woods of Ta Long Tan near Ta Pin Tze, 10 Jul 1888, *P. J. M. Delavay 4536* (P, 2 sheets); woods near Che Tcho Tze of Ta pin Tze, 2000 m, 27 Aug 1885, in late fl., *M. Delavay s.n.* (P); Ta Pin Tze, 22 Aug 1885, *P. J. M. Delavay s.n.* (P); Ta Long Tan, Ta Pin Tze, 26 Jul 1885, in fl., *P. J. M. Delavay s.n.* (P). Gorges near San Ictrang Kiou (Ho Kin, = Heqin), 6 Aug 1885, *P. J. M. Delavay s.n.* (P). Woods in the mountains near Ma-li-ouan, 2600 m, flowers green and fruits black, August, *R.-P. Maire*

s.n. (P); woods near Ma-li-ouan, 2600 m, Aug, *E. Maire s.n.* (P, 2 sheets). Tchong-chan, 23 Aug 1905, in fl & young fr., *F. Ducloux 3941* (P, 3 sheets). Bingchuan Xian, Jizhushan, Zhushengshi, near the creek in front of the temple, 2280 m, plant 70 cm tall, 26 Jul 1988, young fr, *J. Wen 518* (OS); Jizhushan, on the way from Zhushengshi to Jingdian, plant 50-65 cm tall, petals dark purple, anther white at first, turning purple, young fruits green, turning purple, common, 27 Jul 1988, young fr & fl, *J. Wen 522* (OS); Bingchuan Xian, Jizhushan, 2500 m, 24 Jul 1997, *J. Wen 3048* (US). Dali Xian, between km marker 12 and 13 on road from Xiaoguan to Dacang, 2400-2500 m, 25°31'N, 100°12'E, 9 Jul 1984, floral buds, *1984 Sino-Amer. Bot. Exped. 928* (A, CAS, KUN, PE, US). Dayao Xian, Shantai Qu, Shantai, 2000 m, herb 0.6 m, 9 Jul 1965, fl, *Woody Oil Plants Team 65-0329* (KUN); Shantai Qu, Bakou Chun, Duodihe, Buzha, Yangwozhi, in pine forest, 12 Jul 1965, fl, *Woody Oil Plants Team 65-0429* (KUN, 2 sheets). Deqin Xian, near Chang Jiang, on the way from Chizhong to Xila, 2600 m, in broadleaf forest, herb ca. 1 m tall, 5 Oct 1959, fl & fr, *Kunming Work Station 23918* (KUN, 3 sheets). Eshan Xian, Shi Qu, NW of the Qu Office, 1800 m, 1 Oct 1958, *S. G. Wu 151* (KUN, 2 sheets). Fumin Xian, Yongding, Tuodan, Gangkuanggou, 2600 m, in pine forest, herb 80 cm tall, *B.-Y. Qiu 596355* (KUN). Heqin Xian, Huangping Qu, Jundeng Commune, Upper Dapingzhi, 2450 m, 16 Aug 1963, *Northwest Yunnan Jingshajiang Team 6546* (KUN); Heqin, Lianping, Beitouqin, 7 Aug 1940, *R. C. Ching 23567* (KUN, 2 sheets); Heqin, Baiyan, Shaxi, 2700 m, in woods, 8 Sep 1940, fr, *R. C. Ching 24437* (KUN, 3 sheets). Jingdong Xian, Chingtung, Ta-Mai-Ti Hou Shan, 1900 m, in mixed forest, 19 Oct 1939, fl & fr, *M. K. Li 0720* (KUN, WUK, 2 sheets). Kunming, Xishan, Huatingshi, 2000 m, in sparse forest, herb 0.8 m, 21 Aug 1953, fr, *B. Y. Qiu 50212* (KUN); Xishan, Taihuashi, 5 Nov 1938, *K. M. Feng 116* (KUN); Xishan, behind Taihuashi, at the edge of pine forest, plant 60 cm tall, 27 Aug 1988, fr, *J. Wen & X. P. Li 599* (OS); Xishan, just behind Taihuashi, in mixed pine and evergreen broadleaf forest, associated with *Pinus*, *Castanopsis*, *Rhododendron*, wild ginger, *Metapanax delavayi*, and *Smilax*, 2250 m, plant 35-60 cm tall, stem purple and zigzag, 14 Jun 1992, fl, *J. Wen 1216* (A, F, US). Lanping Xian, Jingding Qu, Gaoping, 29 Jul 1965, fl, *J.-S. Yang 5042*

(KUN). Lijiang Xian, Yulong, Dahuoshan, 24 Aug 1961, fl, *Y.-F. Qi 612694* (KUN); Lidjiang [Lijiang Xian], 3000-3300 m, 11 Jul 1915, *H. F. Handel-Mazzetti 7025* (W, WU); Li-Kiang-Hsien, 2800 m, woods, Jun 1935, floral buds, *C. W. Wang 71583* (PE); Yuhu Xiang, Xuesongchun, on the way from Xuesong to Wenhai, Halagu area, 0.5-1.2 m tall, 7 Aug 1988, fr, *J. Wen 548* (OS); Lijiang Xian, Baisha Xiang, Yuhu Village, in mountainous forest near Shanchahe (three river junction) of the Yulong Snow Mountain, 26 Jul 1997, *J. Wen 3057* (US) Yuhu Xiang, Xue Song Village, N27°01'27.5", E100°12'12.5", 2952 m, 20 Jul 2007, young fr & fl, *J. Wen et al. (Tibet-MacArthur Expedition) 926* (F, KUN, US). Luquan Xian, Lu-Chieh, Tien Wei, 2600 m, rocky place, 25 Oct 1940, fr, *Y. P. Chang 346* (KUN). Songming Xian, Guodong, 22 Aug 1957, young fr, 2380 m, *B. Y. Qiu 54837* (KUN, 2 sheets); 24 Aug 1957, fl, *B. Y. Qiu 54965* (KUN); Songming, Shaodian Qu, Queying Chun, 1800 m, streamside, in bushes, herb 0.5 m, 14 Oct 1953, fr, *B. Y. Qiu 50428* (KUN, 2 sheets); Guodong, Laojishan, 2200 m, 8 Jul 1960, fl, *B. Y. Qiu 57877* (WUK); Kan-Ho, 2200 m, in a valley, 13 Oct 1950, fr, *P. I. Mao 207* (KUN, PE). Tuodian Xian (formerly in Shuangbai Xian), Chayeqing, 5 Oct 1958, fr, *Z. Q. Huang 164* (KUN, 2 sheets). Weixi Xian, Pantiang Xiang, Zhigezi Village, ca 3.7 km from the junction of the road to Pantiang with Rt Shangrila-Weixi, N27°20'43.8", E99°15'31.7", 2767 m, 30 Jul 2007, fr, *J. Wen et al. (Tibet-MacArthur Expedition) 1487* (F, KUN, US). Wuding Xian, Shi Shan, 2200 m, in *Quercus* forest, moist habitat, 1 m, 15 Oct 1960, fl, *Yunnan Tropical Biological Resources Team 60-160* (KUN, 2 sheets, WUK). Zhongdian, Baidi, 2500-2700 m, 1-1.5 m, 18 Aug 1962, fl, *Zhongdian Team 1018* (KUN, 2 sheets); Baidi, 18 Aug 1962, fl, 2500 m, limestone, 0.8 tall, *Zhongdian Team 2289* (KUN); Haba, Zhazhamu, Longwang, Shaba, 2650 m, herb 0.8 m, *Zhongdian Team 63-3193* (KUN). Yunnan, *S. Ten s.n.* (WU). Western China, 1914, *E. E. Maire 294* (BM).

When describing *Aralia yunnanensis*, Franchet (1896) cited two specimens (*Delavay 4027* and *Delavay 4581*). The two specimens are different in habits (*Delavay 4027* herbaceous, and *Delavay 4581* woody) and they apparently represent two distinct species. Li (1942) typified *Aralia yunnanensis* with the herbaceous *Delavay 4027*,

then treated it as a variety of *A. fargesii*. Li's definition of *Aralia fargesii* was broad. The type of *Aralia fargesii* was collected near Chengkou of the now Chongqing Shi. *Aralia fargesii* has connate styles to the middle and much larger leaves, and more robust inflorescences with more flowers in each umbel.

Aralia yunnanensis is herein treated as a synonym of *Aralia atropurpurea*. At the type locality of *A. yunnanensis* in Jishan or also known as Jizhushan, typical *A. atropurpurea* also occurs. Many intermediates were found between the two "species." In general, plants of "*A. yunnanensis*" grow at somewhat higher altitudes. Both "species" can co-occur and there is a lack of consistent differences between the two. I thus recognize them as one species. Both names were published in the same paper by Franchet in 1896, with *A. atropurpurea* on p. 301, and *A. yunnanensis* on p. 303. Also *A. yunnanensis* was associated with a species in *Aralia* sect. *Pentapanax*. I thus prefer the use of *Aralia atropurpurea*, which describes the often purple stem of the species.

The holotype of *Aralia dumetorum* Hand.-Mazz. from W bears the handwriting of Handel-Mazzetti "*Aralia dumetorum* Hand.-Mazz., sp. n." This specimen was collected by E. E. Maire in July 1913. Interestingly, the herbarium label said "fl. gries - fruits noirs" (flowers greyish and fruits black). The specimen had flowers, which appears to be collected in July, but no fruits were seen on the specimen.

Examination of the types of *Aralia dumetorum* and *A. melanocarpa* suggests that these two "taxa" are identical. The type localities of both *Eleutherococcus melanocarpa* H. Lév. [= *Aralia melanocarpa* (H. Lév.) Lauener] and *A. dumetorum* were Ma-li-ouan of Yunnan. But the type of *Eleutherococcus melanocarpa* was collected in October in the same year by E. E. Maire when the plants were bearing fruits, whereas that of *Aralia dumetorum* was collected in July. Furthermore, some E. E. Maire (Edward Ernest Maire) specimens from Yunnan at P were labeled with the collector R.-P. Maire. "R.-P. Maire" represented Révérend Père Maire because Edward Ernest Maire was a missionary priest in Yunnan then.

I herein treat both *Aralia melanocarpa* and *A. dumetorum* as synonyms of *A. atropurpurea*. Li (1942) cited *Wilson 4185* (A) as *A. dumetorum*, and noted that *A. dumetorum* possessed terminal

paniculate inflorescence. Apparently Li did not have access to the holotype of *A. dumetorum* during WWII, when his treatment of Araliaceae of China was completed. Handel-Mazzetti (1933) described the inflorescence of *A. dumetorum* as a terminal panicle, and this taxon was described based on one specimen (the type). The holotype of *A. dumetorum* actually bears an inflorescence with three main branches originating from one point, two of them having two umbels and one with a single umbel. This is here interpreted as an umbellate structure, just like that in *A. atropurpurea*, which usually has 2-4 primary branches originating from one point.

E. E. Maire noted on the label of the type specimens of *Aralia melanocarpa* that the flowers were greenish white and fruits black. The holotype has fruits with purple tints. All *Aralia atropurpurea* has dark purple fruits.

12. *Aralia apioides* Hand.-Mazz. — Fig. 34; color plate 10: A-G.

Aralia apioides Hand.-Mazz., Symb. Sin. 7: 701. 1933. TYPE: **China.** YUNNAN: in region of Landsang-djiang (Mekong) and Lu-djiang (Salween) divide, Saoa-lumba, 28°, 3500-3600 m, 18 Jun 1916, *H. Handel-Mazzetti* 8979 (holotype: W!; isotypes: WU!, 3 sheets).

Perennial herb ca. 1 m tall. Rhizomes thick and horizontally oriented. Tap roots forked. Leaves 40-55 cm long, 30-40 cm wide, ternately compound; stipules 0.5-1.5 cm long, 0.4-1.2 cm wide, triangular to narrowly so; petioles 15-18 cm long, glabrescent; leaflets 2-4.5 cm long, 1.2-2.2 cm wide, 3-5 per pinnule, membranaceous, ovate, acuminate at apex, obliquely truncate to sometimes acute or slightly subcordate at base, irregularly doubly serrate at margin with relatively deep teeth, sometimes lobed, lateral veins 6-8, conspicuous on both sides, adaxial surface green, scabrid, abaxial surface grayish green, pilose along the veins and veinlets, petiolules 2-11 mm long, gradually becoming shorter toward the tip of the pinnae, more or less pilose. Inflorescence 28-40 cm long, with a long stalk 19-30 cm long, with 6-14 primary branches umbellately arranged at the upper part, sometimes with one or two branches below the top umbellate structure, slightly pilose, each primary branch subtended by a lanceolate to

linear bract or a reduced simple leaf or a trifoliolate structure, variously sized, each branch with 1-5 umbels, 7-9 cm long, terminal umbels 9-15-flowered, pedicels 7.5-13 mm long, pilose, lateral umbels 7-10-flowered, pedicels 5-7 mm long, pilose, bracteoles 1.3-1.5 mm long, 0.4-0.7 mm wide, lanceolate to narrowly triangular. Floral buds somewhat globose. Sepals minute, 0.6-0.7 mm long, 0.4-0.5 mm wide, narrowly triangular to triangular; petals 1.3-1.5 mm long, 0.7-1 mm wide, ovate; stamens 1.3-1.6 mm long, filaments 1.1-1.3 mm long, anthers 0.5-0.6 mm long and wide, broadly ovate; gynoecium conical at base, styles 5, 0.8-1 mm long, completely divided after anthesis, the apical portion of the ovary slightly projected. Fruits 4.5-5.5 mm long, 4-5 mm wide, globose, styles 1.2-1.5 mm long, distinct and persistent, purple.

Common name: qing ye long yan du he.

Phenology: flowering in June-July; fruiting in July-August.

Distribution: in northwestern Yunnan, southeastern Tibet, and western Sichuan, China (Fig. 35).

Ecology: common in *Picea* forests, or mixed conifer and broadleaf forests, shady and moist habitats; 3000-3600 m.

Additional specimens examined: **China.** SICHUAN: Baoxin Xian, formerly Mupin, 1954, *T.-P. Soong s.n.* (KUN, no. 0563335). Miyaluo, Xiamuozhigou, 2900 m, 8 Aug 1956, fr, *D. P. He 45641* (WUK). Western Szechuan, woods around Tachiew-lu [Kangting], 8-9,000 ft, *E. H. Wilson 982* (BM). Eastern Tibet, Fsukou, *R. P. Soulié 1143* (P). YUNNAN: Deqin Xian, Shi-mian-chang, 1981, *Picea-Quercus* forest, 3200 m, *Kunming Institute of Botany Team 130* (KUN); Deqin, Benzhilan, Yongluobu, in *Picea* forest, streamside, common, 3300 m, 6 Jul 1981, *Kunming Vegetation Team s.n.* (KUN); Deqin, Qianlelong, 3240 m, 29 Aug 1937, fr, *T. T. Yü 9913* (KUN); Dokerla, A-tun-tze, 3000 m, ravine, streamside, 3 May 1935, fl, *C. W. Wang 64935* (PE, 2 sheets); Deqin, divide of Chang-Lu rivers, i.e., Lanchangjiang (Mekong) and Lujiang (Salween) divide, near Dokerla, 3000-3300 m, frequent, herb 3-4 ft, fr black, mixed forest near stream, 3 Aug 1940, fr, *K. M. Feng 5909* (KUN, 3 sheets); Deqin, Benzhilan Commune, Yongle Teng, 3200 m, in *Picea* forest, herb 30-50

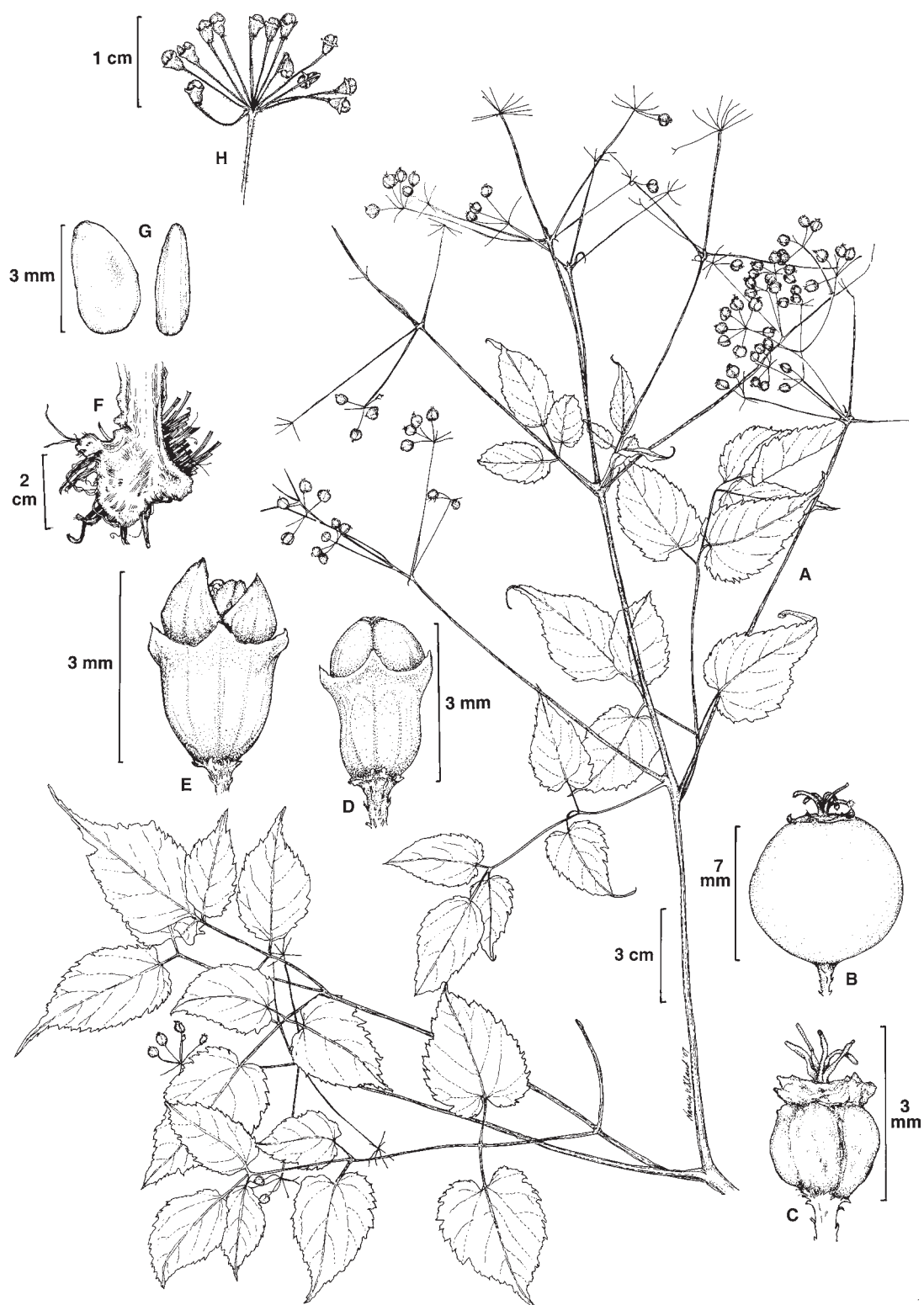


Fig. 34. *Aralia apioides* Hand.-Mazz. A. Habit with leaves and inflorescence. B. Fruit. C. Flower after anthesis. D. Floral bud. E. Flower. F. Upper part of rhizome. G. Seed. H. Umbel (A&F – Yü 22458, A; B & G – Wilson 4158, A; C, D, E & H – Wang 63870, A).



Fig. 35. Map of China showing the distribution of *Aralia apioides* Hand.-Mazz.

cm, 3 Jul 1981, fl, *Qinghai-Xizang Team 1850* (KUN); on the way from Deqin to Benzhilan, near 122 Daoban, 3700 m, near the edge of *Picea* forest on slopes, herb 80-100 cm tall, rare, 12 Jul 1981, fl, *Qinghai-Xizang Team 2663* (KUN); Deqin Xian, Meili Snow Mountains, on the way from Xidan Hot Spring to the pass, near Bayi, N28°24'06.4", E98°49'22.8", 3581 m, 28 Jul 2007, fr, *J. Wen et al. (Tibet-MacArthur Expedition) 1446* (F, KUN, US). Gongshan Xian, Sewalongba (type locality of *Aralia apioides*), 3400 m, on grassy slope, 25 Aug 1938, fr, *T. T. Yü 22458* (KUN, 2 sheets); divide of Chang-Lu rivers, i.e., Lanchangjiang (Mekong) and Lujiang (Salween) divide, near Cizhong, on the way to Sila, 3000-3300 m, herb 1 m, mixed forests, 17 Jul 1940, young fr, *K. M. Feng 5534* (KUN, 2 sheets); on the way from Gongshan to Dulongjiang, between the 12th Bridge to Dongshaofang, in *Abies* forest on slope, herb 1-

1.5 m, 25 Jul 1982, young fr, *Qinghai-Xizang Team 8574* (KUN, 2 sheets); Binzhongle, Yongshongta, in *Tsuga* forest on slopes, 3200 m, herb 1.5 m, 25 Jun 1982, fl & young fr, *Qinghai-Xizang Team 7597* (KUN, 2 sheets); First District, on the way from Alulaka to Dengzhong, 2880 m, in valley under mixed forest, 0.8 m tall, 5 Jun 1960, floral buds, *Nan Shui Bei Diao Team 9245* (PE). Lanping Xian, Hexi Qu, 1965, *Lanping Herbal Medicine Co. s.n.* (KUN). Weixi Xian, 3000 m, Jun 1935, floral buds, *C. W. Wang 63731* (KUN); Weixi, 3500 m, near ravine, Jun 1935, fl, *C. W. Wang 63870* (PE, 2 sheets); Weixi, Weideng Commune, from Xinghua to Haizhi, on slopes in mixed forest, herb 1.5 m, 26 May 1982, floral buds, *Qinghai-Xizang Team 6856* (KUN). Zhongdian Xian [= Shangrila Xian], Xiao Zhongdian, Jisha, in *Picea* forest, common, 14 Jun 1981, *Kunming Vegetation Team s.n.* (KUN); Zhongdian, Xundong, 3200 m, 17 Jun

1963, fl, in *Picea* forest, *Yunnan Tropical Biological Resources Team s.n.* (KUN); N flank of Haba Snow Range, plant 3 ft, by stream in wooded valley in slopes, 22 Jun 1939, fl, *K. M. Feng 1351* (KUN, 2 sheets); Shigao Snow Mountain, near Dege Cow Farm, in forest, 8 Jul 1939, fl, *K. M. Feng 1566* (KUN, 2 sheets, PE); Wuchun, Lanong, Shita, 3200 m, in *Picea* forests near stream, 6 Sep 1959, fr, fruit black, rare, *K. M. Feng 23499* (KUN); Zhongdian, 3200 m, in *Picea* forest, 17 Jun 1963, fl, *Zhongdian Team 632539* (KUN); Tianbao Snow Range, in forest, 3300 m, herb 1 m tall, 14 Jun 1981, fl, *Qinghai-Xizang Team 1071A* (KUN); Xiao Zhongdian, on the way to Tianchi Lake, N27°29'04.5", E99°41'44", 3700 m, 24 Jul 2007, fr, herb 1-1.5 m, *J. Wen et al. (Tibet-MacArthur Expedition) 1241* (F, KUN, US); Xiao Zhongdian, on the road to Tianchi Lake, N27°36'52.6", E99°42'45.6", 3354 m, 16 Jun 2009, fl, *J. Wen et al. (Tibet-MacArthur Expedition) 2283* (F, KUN, US); Xiao Zhongdian, on the road to Tianchi Lake, N27°36'52.6", E99°42'45.6", 3450 m, 17 Jun 2009, fl, *J. Wen et al. (Tibet-MacArthur Expedition) 2382* (F, KUN, US). XIZANG: Bomi Xian, on the way from Bomi to Gawalong Lake, N29°50.984', E95°43.476', 3046 m, 23 Jun 2009, young fr, *J. Wen et al. (Tibet-MacArthur Expedition) 2680* (F, KUN, US). Chayu [Tsayu] Xian, Ridong Xiang, in *Picea* forest on slopes, 3500 m, 18 Sep 1982, fr, black, *Qinghai-Xizang Team 10555* (KUN).

The type specimens of *Aralia apioides* have young leaves with unopened floral buds. One of the isotypes has somewhat more mature leaves, with leaflets up to 3.5 cm long and 2.3 cm wide, and margin irregularly doubly serrate.

This species differs from *Aralia atropurpurea* by its irregularly doubly serrate leaflet margin with relatively deep teeth or sometimes lobed (vs. finely doubly serrate at margin in *A. atropurpurea*).

13. *Aralia glabra* Matsum. — Fig. 36.

Aralia glabra Matsum., Bot. Mag. (Tokyo) 12: 17. 1899. TYPE: **Japan**. Nikko, 4 Oct 1895, fl & immature fr, *Matsumura s.n.* (holotype: TI!).
Aralia glabra Matsum., Bot. Mag. (Tokyo) 11: 441. 1897. nom. nud.

Glabrous perennial herb 0.6-0.9 m tall. Stem

purplish green. Rhizome thick. Lower leaves 45-75 cm long, 30-65 cm wide, tripinnately ternate; upper leaves 17-31 cm long, 13-22 cm wide, bi- or tripinnately ternate; stipules 7-10 mm long, 4-5 mm wide, narrowly triangular, membranaceous, ciliate at the upper margin; petioles 3-9 cm long; leaflets 3.5-11 cm long, 2-6.5 cm wide, (2) 3-5 (6) per pinnule, membranaceous, ovate to narrowly ovate, occasionally broadly so, acuminate to long acuminate at apex, cordate, obliquely so or rounded at base, doubly serrate at margin, lateral veins 7-9 on each side, conspicuous on both sides, adaxial surface green, sparsely scabrid, abaxial surface grayish green, slightly pilose along the veins and veinlets, petiolules 0-2.5 (-4) cm long, gradually becoming shorter toward the tip of the pinnae, glabrous. Inflorescence 30-48 cm long, loose, more or less umbellate in outline, glabrous, primary branches 4-8, with 3-5 primary branches umbellately arranged at the top, 1-3 scattered along the main axis, each primary branch 8-25 cm long, with 1-5 umbels; terminal umbels 15-42-flowered, pedicels 12-33 mm long, glabrous or nearly so; lateral umbels 8-14-flowered, pedicels 6-11 mm long, glabrous or nearly so; bracts subtending the primary branches 7-9 mm long, 0.9-1.3 mm wide, lanceolate to linear; bracteoles 1.2-1.7 mm long, 0.8-1.2 mm wide, lanceolate to narrowly triangular. Flowers dark purple, floral buds somewhat globose, with several flowers aborted on each terminal umbel, more so on lateral umbels at fruiting stage; sepals minute, 0.4-0.6 mm long, 0.5-0.7 mm wide, triangular to broadly so, spreading at anthesis, recurved afterwards, persistent into fruiting stage; petals 1.8-2.0 mm long, 1.2-1.3 mm wide, ovate, sometimes forming a calyptra and falling off at anthesis as a unit; stamens ca. 1.8 mm long, filaments ca. 1.5 mm long; gynoecium conical at base, styles 5, completely divided after anthesis, ca. 0.8 mm long, the apical portion of the ovary somewhat projected. Fruits 4.1-4.5 mm long, 4.2-4.5 mm wide, globose, 5-ridged when dry. Seeds 3.2-3.5 mm long, 1.5-1.6 mm wide, 0.4-0.5 mm thick, kidney-shaped.

Common name: Miyama-udo.

Phenology: flowering in July to October; fruiting in August to October.

Distribution: in central Honshu, Japan (Fig. 37).

Ecology: in *Abies* or *Tsuga* forests, shady

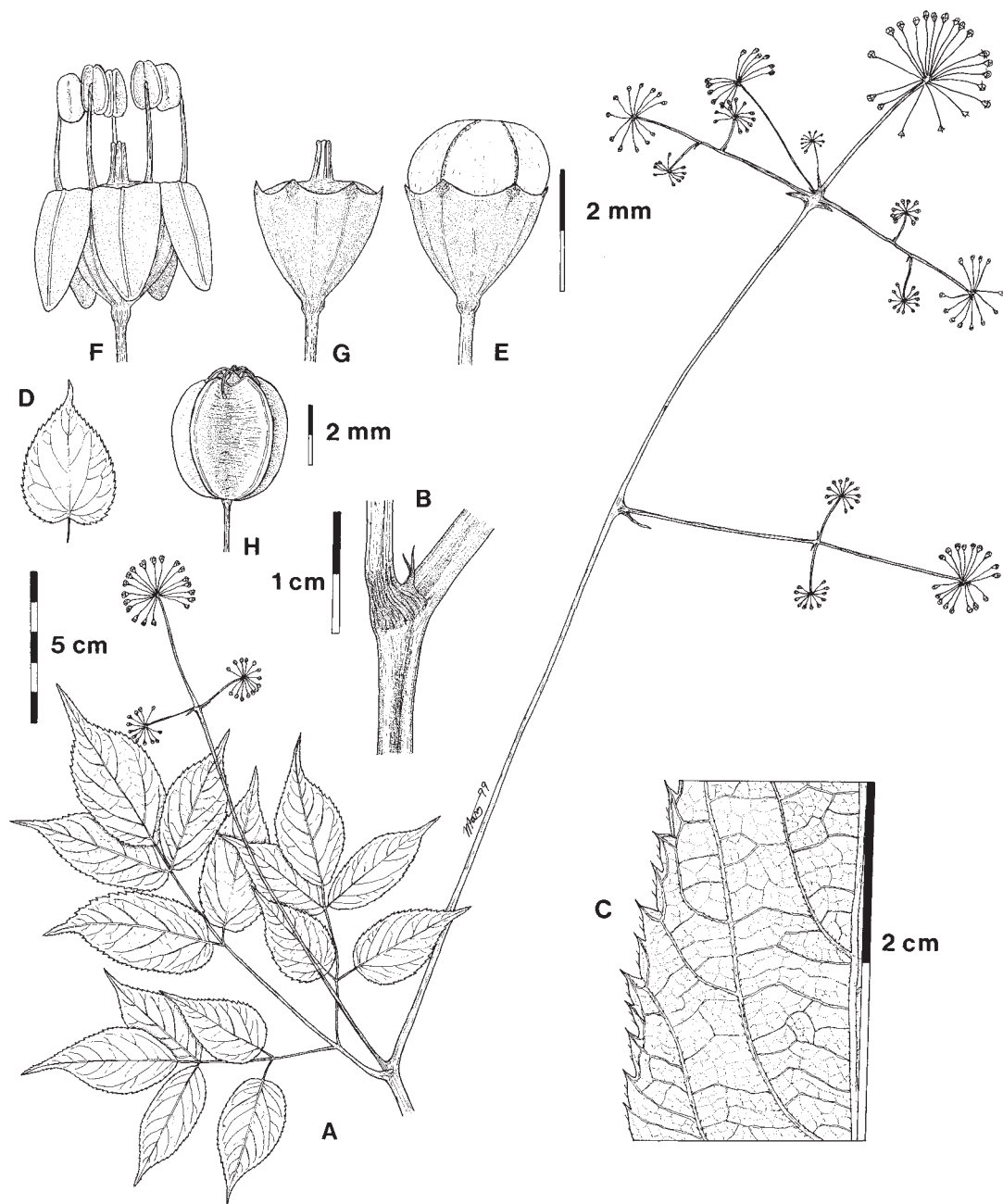


Fig. 36. *Aralia glabra* Matrum. A. Habit showing a leaf and inflorescences. B. Base of petiole showing stipule morphology. C. Close-up of leaflet margin. D. Leaflet of a lower leaf. E. Floral bud. F. Flower. G. Flower after anthesis. H. Fruit (A-G – Murata 16727, US; H – Asano 5060, TI).

habitats; 1430-1810 m.

Additional specimens examined: **Japan.**
Honshu. Pref. Nagano, Owiki to Denge, 1430-1470 m, 25 Aug 1961, *Chien-Chang Hsu* 3190 (TI); Azumi-mura, Minamiazumi-gun, Abo Pass, 1810

m, in *Tsuga diversifolia* forest, flowers dark purple, 27 Jul 1964, in fl., *Kana & T. Yamashita* 8963 (MSC, TI). Shinano Prov. Sanpuku Pass, the South Alps, 6 Aug 1964, *K. Asano* 5060 (TI). Yamanashi Pref., Prov. Kai, Seitetsu-machi Nirazaki-shi, Mt. Hoowoo, half way up from the foot, 1800 m, forest,

20 Aug 1949, young fr, *M. Furuse* 21403 (K, 2 sheets); Prov. Kai, en route from Sakeishi to Mt. Daibosatsu, 1800 m, 15 Jul 1962, *G. Murata* 16727 (US); Mt. Hoozan, 1700 m, 27 Jul 1956, *T. Yamazaki* 3740 (A).

Aralia glabra is a close relative of *A. fargesii*

in central China. It differs from the latter by its longer pedicels and its glabrous stems and inflorescences. The two species have similar inflorescence architecture, with most primary branches umbellately arranged on the upper part of the main axis, and 1-3 additional primary branches at the lower part.



Fig. 37. Map of Japan showing the distribution of *Aralia glabra* Matrum.

14. *Aralia henryi* Harms — Fig. 38; color plate 16: A-B.

Aralia henryi Harms, Bot. Jahrb. Syst. 23: 12. 1896 (15 Sep). TYPE: **China**. HUBEI: Hupeh, 1885-88, in fr, *A. Henry 6655* (lectotype, here designated, K!, isoelectotypes: BM!, E!, G!, 3 sheets, GH!, 2 sheets, photo of one GH isoelectotype at P, NY!, also its photo with a packet containing a leaflet at A!, P!, US!, 2 sheets, US Herb. #s 801790 & 801791).

Aralia pilosa Franch., J. Bot. (Morot) 10: 302. 1896 (16 Sep). TYPE: **China**. CHONGQING: Su-tchuen oriental [now Chongqing Shi], Tchen-keou-tin [Chengkou], *R. P. Farges s.n.* (lectotype: P!, here designated; isoelectotypes: P!, 5 sheets).

Perennial herb 0.25-1 m tall. Rhizomes horizontal, elongated, with or without internodes. Stem purplish green, glabrous to pubescent with long hairs. Leaves ternately compound, decreasing in size upwards, lower leaves 20-45 cm long, 18-32 cm wide, upper leaves 6-12 cm long, 6-8 cm wide, ternately palmately compound; stipules 7-23 mm long, 1.5-4 mm wide, membranaceous, glabrous, lanceolate, adnate to the base of petiole; petioles 2-13 cm long, gradually becoming shorter toward the tip of the stem, sparsely pubescent with long hairs; leaflets 3.5-10 cm long, 2-6 cm wide, 1-3 per pinnule, membranaceous, elliptic or broadly so, sometimes ovate, acuminate at apex, cordate, acute or occasionally rounded at base, doubly serrate at the upper 2/3 of the margin, the lower 1/3 of margin mostly serrate, lateral veins 8-10 on each side, conspicuous on both surfaces, adaxial surface green, sparsely pubescent with long soft hairs along the veins or glabrescent, abaxial surface light green, pubescent along the veins and veinlets, hairs 0.5-2 mm long, petiolules 0-20 mm long, pilose. Inflorescence 5-20 cm long, terminal and axillary, relatively small, loose paniculate in outline, glabrous or nearly so, primary branches 1-3, scattered along the main axis, each primary branch subtended by a triangular bract, with 1 umbel, 1-3-flowered, pedicels 3-5.5 mm long, glabrous; bracts subtending primary branches 1.5-2 mm long, 0.9-1.3 mm wide, narrowly triangular to lanceolate, glabrous; bracteoles 1.5-1.8 mm long, 0.5-0.8 mm wide, narrowly triangular, glabrous. Sepals 0.4-0.5 mm long, 0.35-0.45 mm

wide, rounded, spreading at anthesis; petals 1.2-1.4 mm long, 0.8-1.0 mm wide, ovate; stamens ca. 1.3 mm long; gynoecium 3-5-locular, styles 3-5, ca. 0.5 mm long, almost divided to the base. Fruits 4.5-5 mm long, 4-4.5 mm wide, red, globose, 5-seeded. Seeds 3.6-4.3 mm long, 2-2.2 mm wide, 0.3-0.4 mm thick, kidney-shaped.

Common name: rou mao long yan du he.

Phenology: flowering in June to July; fruiting in July to late August.

Distribution: in Anhui, Chongqing, Gansu, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, and Yunnan provinces of China (Fig. 39).

Ecology: in mesic forests, shady and moist habitats; 1000-2300 m.

Additional specimens examined: **China**. ANHUI: in ravine below Mt. Shu Shin, 1500 m, 18 Jul 1936, *P. G. Tsoong 3538* (PE, 2 sheets, WUK). CHONGQING: Nanchuan, Jishanming, 1750 m, 23 Jul 1957, fl, *J. H. Xiong et al. 42236* (WUK); Jingfushan, Mafanzhi, 1500 m, 13 Jul 1986, *Jing Fu Shan Team 1741* (PE); Jingfushan, Dayan, 2000 m, 21 Jul 1957, *J. H. Xiong & Z. L. Zhou 92161* (PE); Jingfushan, Fenghuangshi, 1600 m, 20 Jul 1957, fr, *G. F. Li 62967* (PE); Nanchuan, Jingfushan, below the cable line, along the old trail toward the north entrance of Gufodong, N29°01'56", E107°11'06", 2085 m, 4 Sep 2004, herbs 35-50 cm tall, in bamboo thickets, *J. Wen 8196* (US). Wushan, *A. Henry 6655A* (K). Wulong Xian, Baimashan, Huangying, 1460 m, 4 Jun 2005, fl, *S.-R. Yi et al. 0234* (PE). Wuxi Xian, 6 Aug 1958, *G. H. Yang 59114* (PE, WUK). GANSU: Bikou Xian, Heidonggou Shui Songpingshan, 1000 m, on the slope in forest, 9 Jul 2006, young fr, *Baishuijiang Expedition 1661* (PE). Wen Xian, Liujiaping, Qixinggou, Toudaotaizi, in forest, 1756 m, 21 Aug 2006, young fr, *Baishuijiang Expedition 2477* (PE). GUIZHOU: Dafang Xian, Baila Qu, Jiulongshan, 1950 m, 16 Aug 1959, *Bi Jie Team 873* (KUN, PE, 2 sheets); Jiulongshan, 1950 m, 16 Aug 1959, fr, *Bi Jie Team 862* (PE). HUBEI: *A. Henry 6088* (CAL, K). Badagongshan, near the Medicine Factory, 5th branch, moist soil, 1400 m, herb 80-100 cm, 8 Jul 1958, *H. J. Li 3446* (WUK). Hefeng Xian, Huping Farm, Huangbaipeng, in forest near streamside, 1300-1400 m, 21 Aug 1958, fr, purple, common, *H. J. Li 5754* (PE, WUK). Shennongjia Forestry Dist., near Gangqianyan, in

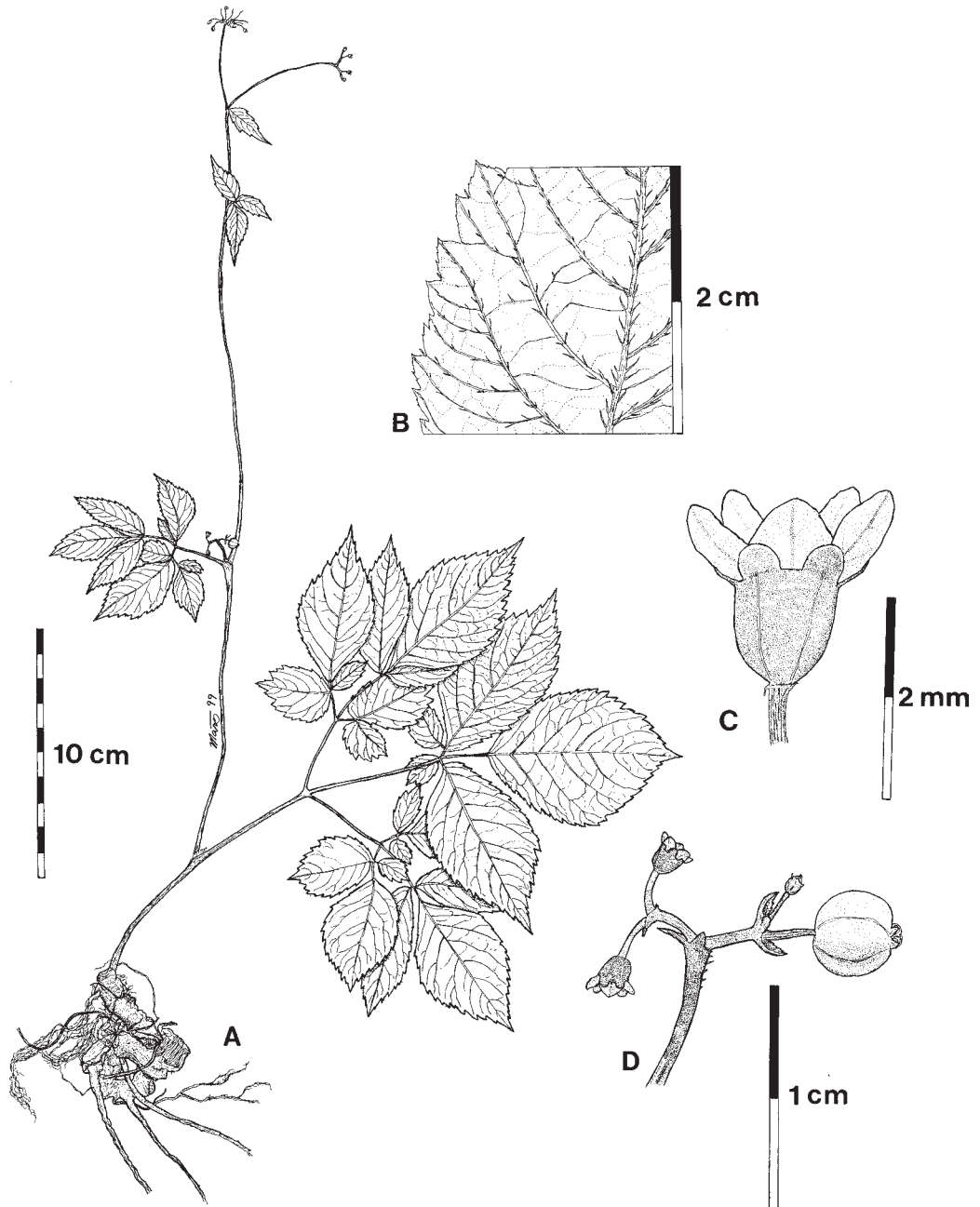


Fig. 38. *Aralia henryi* Harms. A. Entire plant. B. Close-up to show leaflet margin and pubescence on lower leaf surface. C. Flower. D. Fruit and flowers on two umbels (Henry 6655, E).

dense broadleaf forest, associated with *Dryopteris*, *Phellodendron chinense*, *Chloranthus chinense*, *Phoebe*, *Veratrum*, *Pilea*, and *Lindera*, 1260 m, 14 Jul 1992, young fr, *J. Wen 1362* (A, F, OS, US). HUNAN: Shangzhi Xian, Bamaoxi Commune, Tianpingshan, Xiaozhuangping, 1650 m, 10 Jul 1975, fr, fruits bright red, *B. G. Li & S. B. Wan 750219* (PE). Shunwangshan, 22 Jul 1982, fr, *Z. C. Luo 07* (PE). Xingning Xian, Zhi-yun-shan, Sep 1984, fr, *Zhi Yun Shan Team 360* (PE, 2 sheets), 388 (PE), 920 (PE), 929 (PE), 931 (PE, 2 sheets), 931A (PE), 933 (PE), 962 (PE, 2 sheets). SHAANXI: Eryang Xian, Guan-shan-liang-gou, 1600 m, 20 Jul 1952, young fr, *K. J. Fu 5140* (PE). Ningshan Xian, Chaizhiping, Banyanggou, 22 Jul 1987, *Z. H. Wu 90-808* (WUK). SICHUAN: Emeishan, 14 Jun 1955, fl, *China-Soviet Union*

Expedition Team 2039 (PE). Hongqi, Lewu, 31 Jul 1959, fr, 2300 m, herb 1 m, *Sichuan Economic Plants Liangshan 1526* (KUN, PE). Leibo, 1934, *T. T. Yü 3977* (PE). YUNNAN: Malipo Xian, Jinchang, Zhongzhai, Yanyang Cave, herb 0.6 m high, fruit red, 1800 m, 23 Aug 2004, fr, *Y.-M. Shui et al. 43014* (KUN, US); Malipo Xian, Xiajingchang Xiang, Zhongzhai Chun, Hongshuibai, Yanyang Cave (Ram Cave), N23°10'18.1", E104°47'47.9", 1895 m, 25 Sep 2008, perennial ca 60-90 cm tall, *J. Wen 10640* (US).

The type specimens of *A. henryi* bear flowers, young fruits, and mature fruits on the same plant. The reproductive biology of the species is poorly known. The flowers appear to be bisexual.

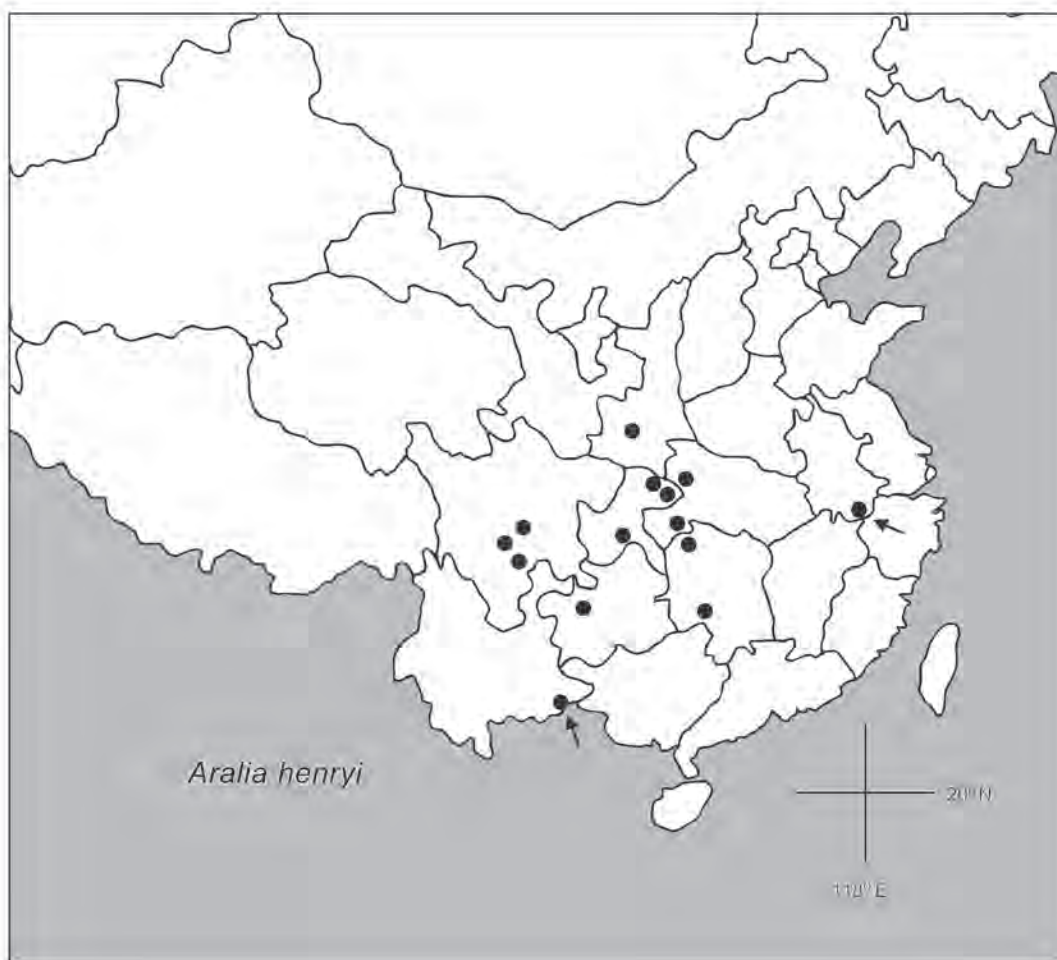


Fig. 39. Map of China showing the distribution of *Aralia henryi* Harms.

Aralia henryi is highly distinctive in *Aralia* in that it bears red fruits. Other *Aralia* species have dark purple fruits. Furthermore, its ovaries are 3-5 locular, rather than 5-locular in the section. I

considered the option of recognizing it as a distinct section. Nevertheless, it seems most closely allied with members of *Aralia* sect. *Aralia*, and I herein place it in this section.

ARALIA SECT. NANAE HARMS

Aralia sect. *Nanae* Harms, Bot. Jahrb. 23: 12, 1896.

Dioecious herb with long horizontal rhizomes, acaulescent, with one ternately compound leaf and one inflorescence arising from the base, trichome simple and slender, occasionally branching at the tip. Umbels (2) 3 (7) in a cluster with a long scape (1018 cm). Flowers 5merous, styles 5, free. Fruits blackish purple.

One species widely distributed in North America, especially common in eastern North America.

15. *Aralia nudicaulis* L. — Fig. 40; color plate 11: A-G.

Aralia nudicaulis L., Sp. Pl.: 274. 1753. TYPE: Clifford herbarium, sheet 113, *Aralia* No. 2 (lectotype: BM!, designated by Wen and Reveal 1992).

Aralia nudicaulis var. *prolifera* Apgar, Bull. Torrey Bot. Club 14: 166. 1887. *Aralia nudicaulis* f. *prolifera* (Apgar) Britton, Bull. Torrey Bot. Club 17: 124. 1890. TYPE: U.S.A. NEW JERSEY: near Lambertville, 1887, A. G. Apgar s.n. (holotype: NY!).

Aralia nudicaulis var. *elongata* Nash, Bull. Torrey Bot. Club 20: 374. 1893. TYPE: U.S.A. NEW YORK: Greene Co., in the Catskill Mountains, on the top of Cairo Round Top, ca. 2 miles from Cairo, rocky woods, 11 Jul 1893, fr, with collector's notes "several sterile plants seen, but only one in fruit," 2000 ft, G. V. Nash s.n. (holotype, NY!).

Aralia nudicaulis f. *depauperata* Marie-Vict., Nat. Canad. 71: 206. 1944. TYPE: Canada. QUÉBEC: Longueuil, comté de Chambly, bois, 11 Jun 1941, F. F. Marie-Victorin & Rolland-Germain 56602 (holotype: MT!; isotypes: GH!, NY!, US!, all three isotypes are vegetative).

Acaulescent perennial herb, 0.35-0.7 m tall,

highly clonal, dioecious. Rhizome long, branched and horizontal; upright stem 3-10 cm long, depending upon the age of the individual. Leaves 30-60 cm long and wide, ternately compound, usually single or occasionally two arising from the tip of the upright stem (rhizome in essence), purplish at nodes; stipules absent; petiole 10-45 cm long; leaves usually with 3 (-4) primary segments, each segment with 4-7 leaflets when leaves are bipinnately ternate, sometimes leaves tripinnately ternate; leaflets 6-13 cm long, 4-7.5 cm wide, papery, ovate to oblong, acute to acuminate at apex, acute to broadly so at base, commonly oblique on lateral leaflets, doubly serrate at margin; lateral veins 8-9 on each side, conspicuous on both surfaces, leaflets green, glabrous to nearly glabrescent on upper surface, glabrous to slightly pilose on lower surface, petiolule 0-1.8 cm long, pilose with long hairs when young, becoming glabrescent to nearly so. Inflorescence acaulescent, glabrous, appearing at the same time as the young leaves, purplish initially, then becoming green, usually with 3 or variously 2-7 umbels at the apex of a long stalk, occasionally the peduncle of 1-2 umbels shortened drastically with the flowers clustering at the base of the peduncle of the well-developed umbel; inflorescence stalk 15-30 cm long, glabrous, peduncle of the umbels 2.5-9 cm long, glabrous; each umbel 25-100-flowered, male umbels usually having more flowers per umbel; pedicels 9-18 mm long, slightly pilose with long hairs to glabrous, tip slightly enlarged at anthesis; bracts at the base of the inflorescence stalk 7-25 mm long, 7-11 mm wide, usually 3-5 embracing the tip of the stem to protect the buds, ovate to oblong, glabrous; bracts at the base of the peduncle 3-5 mm long, 0.8-1 mm wide, lanceolate, glabrous; bracteoles 0.4-0.8 mm long, 0.25-0.4 mm wide, narrowly triangular, glabrous and caducous. Sepals 0.5-0.6 mm long

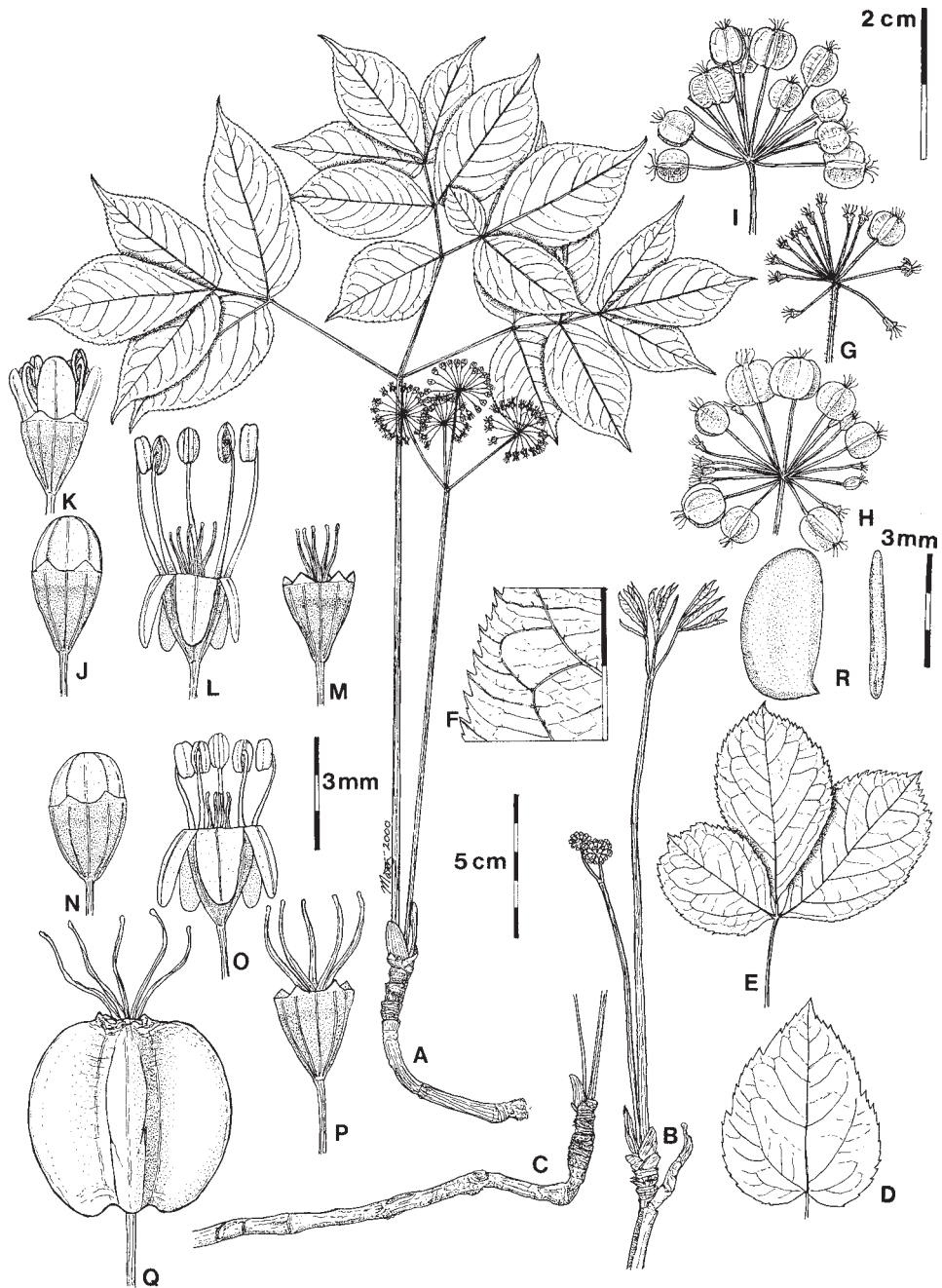


Fig. 40. *Aralia nudicaulis* L. A. Habit with leaf, inflorescence and rhizome. B. Young inflorescence appearing at the same time as the leaf opens. C. Horizontal rhizome, upright rhizome, bract at the base of leaf and inflorescence. D. Leaflet. E. Leaf segment. F. Leaflet margin. G. Female umbel. H&I. Umbels with fruits. J. Male floral bud. K. Opening male flower. L. Male flower. M. Male flower after anthesis. N. Female floral bud. O. Female flower. P. Female flower after anthesis. Q. Fruit.

and wide, triangular, glabrous, persistent on fruits; petals 2.2-2.8 mm long, 1.1-1.2 mm wide, ovate, white to purplish white, with a conspicuous vascular bundle in the middle, spreading to recurved at anthesis; stamens 5, erect at anthesis, filaments 2.5-3.5 mm long; anthers 1-1.2 mm long, 0.7-0.8 mm wide, oblong, whitish yellow; ovaries 5- or occasionally 6-locular; styles 1.2-1.3 mm long at anthesis, completely distinct to the base, base not projected. Fruits 6-8 mm long, 5-7 mm wide, globose, purplish black, persistent styles 3-3.5 mm long, completely distinct to the base. Seeds 4.5-5.5 mm long, 2.5-3 mm wide, 0.9-1.1 mm thick, kidney-shaped, whitish gray, smooth.

Common names: wild sarsaparilla, aralia, false sarsaparilla, American sarsaparilla, shotbush, small spikenard, wild licorice, rabbitroot, and salsepareille (Quebec).

Uses: roots and rhizomes used as an alterative, tonic, or antisyphilitic, often used by the American Indians in decoction.

Phenology: flowering from May to July; fruiting in June to August.

Distribution: widely distributed in North America from Newfoundland to northern Alberta and north-central British Columbia, southward to northern Georgia in the eastern range and Colorado and eastern Washington in the western range (Fig. 41).

Ecology: moist or dry woods, thickets, riparian areas, margins of prairies, or bog edges; 50-2700 m.

Representative specimens examined: **Canada.** ALBERTA: Stettler District, N of Battle River, woods, 3 Jun 1926, fl, *A. H. Brinkman 2072* (US). Rosedale, vicinity of Calgary, 30 May & 5 Jun 1914, fl, *M. E. Moodie 2* (F); Rosedale, wooded hill, 30 May 1914, fl, *M. E. Moodie 36* (US); vicinity of Rosedale, 2200-2500 ft, 1 Jun 1915, fl, *M. E. Moodie 930* (F, NY, US). Sand Pt., north shore of Lake Athabaska, about 58°56'N, 110°42'W, 700 ft, 4 Sep 1932, fr, *H. M. Raup & E. C. Abbe 4561* (NY). District de Jasper-Edson, a l'ouest du lac Iosegun, Piceetum, 16 Jul 1958, fl, *B. Boivin & J.-M. Perron 12535* (NY). Near Rockie River, Athabaska Delta, rich woods, 29 Jun 1920, fl, *H. M. Laing 102* (US). Jasper, 3472 ft, Jasper National Park, Aug 1943, sterile, *E. Scamman 3082* (US). Athabasca River, Athabasca

(Long Rapid), [on the herbarium sheet, this specimen was labeled from Northwest Territories, but the locality is in the present-day Alberta], 17 Aug 1903, fr, *A. E. Preble & M. Cary 127* (US). BRITISH COLUMBIA: Liard Hot Springs, woods, 21 Jun 1946, young fr, *J. P. Anderson & R. G. Brown 9881* (US). Vicinity of Field, Burgess Trail, 5000-6000 ft, 29 Jun 1906, fl, *S. Brown 357* (US). 12 miles east southeast of New Hazelton along road to Smithers, occasional in open, rocky slope, 1100 ft, 15 Jul 1954, young fr, *J. A. Calder et al. 13026* (US). About 6 miles SSE of Savona along road to Tunkwa Lake, common in deciduous woods by creek, flowers white, 2500 ft, 30 May 1956, fl, *J. A. Calder et al. 16828* (US). Along Deadman River about 18 miles NNW of Savona, common in deciduous woods by river, 2400 ft, 31 May 1956, fl, *J. A. Calder et al. 16865* (US). 5.5 miles on road from Bridge Lake to Littlefort, common on grassy slope in open, mixed woods at edge of lake, 4700 ft, 13 Jun 1956, fl, *J. A. Calder et al. 17415* (NY). Alaska Highway, Mile 270 Alaska Highway south of Ft. Nelson, 58°31'N, 122°48'W, 15 Jun 1960, fl, *J. A. Calder & J. M. Gillett 25404* (US). Mackenzie District, Fort Simpson, disturbed ground along road through woods, in shade, 61°52'N, 121°22'W, 15 Jun 1955, fl, *W. J. Cody & J. M. Matte 8242* (NY). Southeastern British Columbia, underbrush growth in larch and alder forest 5 miles north of Kingsgate, 14 Jul 1948, fr, *E. Y. Dawson 4991* (RSA). Glacier National Park, Bald Mountain Trail to Grizzly Creek, 51°21'N, 117°26'W, mossy woods beside bulldozed trail, 3250 ft, 27 Jul 1972, fl, *E. Haber & M. J. Shechpanek 1613* (NY). Vicinity of Alaska Highway, Mile 300, Fort Nelson, 58°48'N, 122°43'W, common in a *Populus tremuloides-Rosa acicularis* forest on hill about 0.5 km north of the Highway, along the Simpson Trail, 458 m, 26 Jun 1959, fl, *S. G. Shetler & K. J. Stone 3061* (US). At mile 497 on the Alaskan Highway at Laird Hot Springs, north side of river, 6 Jun 1975, fl, *J. & C. Taylor 18659* (NY). Alpine slopes of Green Mt., near Haylmore, mostly 7000 ft, 28 Jul 1938, *J. W. & E. M. Thompson 661* (F, NY). MANITOBA: District de MacDonald, Coteau de Prairie, Montagne Pembina, entre Saint-Lupicin et Roseisle, Reviere la Graisse, bois d'alluvions, 29 Aug 1960, fr, *B. Boivin 13927* (NY). NEW BRUNSWICK: Campobello Island, Jul-Aug 1888, fl, *J. Donnell Smith 779* (US). Grand Manan, *J. T.*

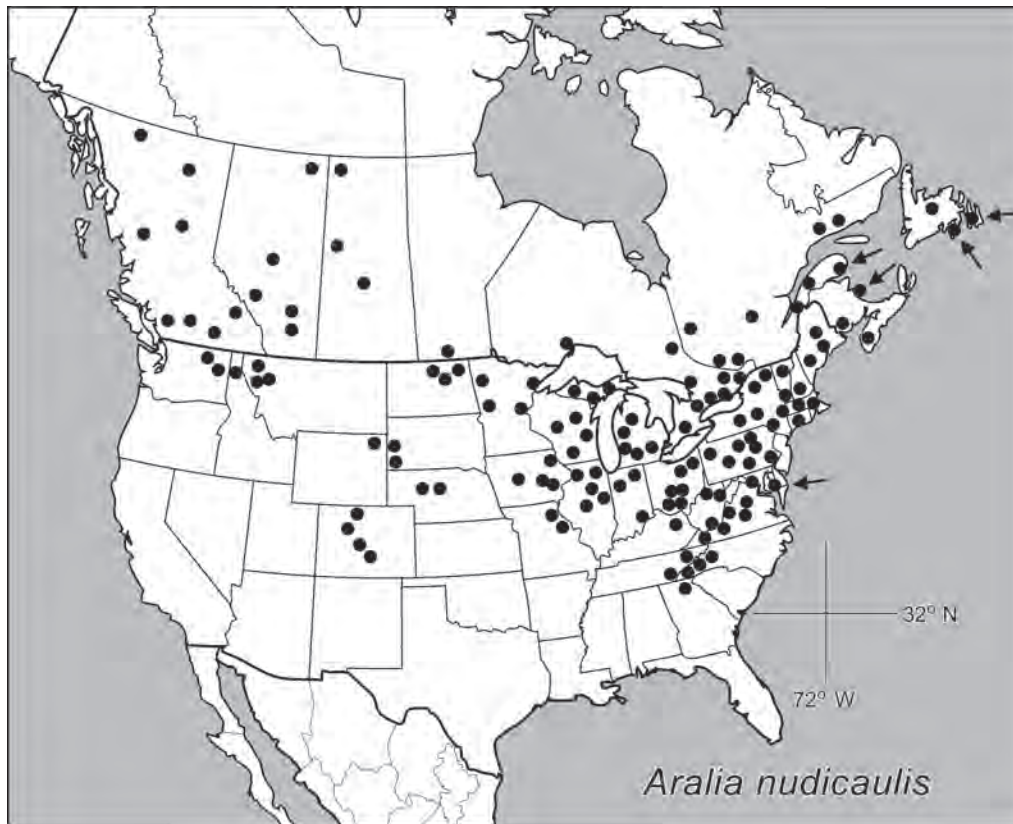


Fig. 41. Map of North America showing the distribution of *Aralia nudicaulis* L.

Rothrock s.n. (F). NEWFOUNDLAND: Valley of Exploits River, Grand Falls, dry rocky clearings, 10 Jul 1911, fl, *M. L. Fernald & K. M. Wiegand 5948* (US). Near Topsail, Conception Bay, 12-19 Aug 1901, damp woods, *C. D. Howe & W. F. Lang 1307* (NY); Topsail, dry rocky soil, hillside, 19 Aug 1901, *C. D. Howe 1338* (F, NY). Frenchman's Cove, 19 Jul 1921, fr, *K. K. Mackenzie s.n.* (NY). NOVA SCOTIA: Picton Co., Bay View, 6 Aug 1906, fr, *C. B. Robinson 221* (NY). ONTARIO: Vicinity of Sandy Lake, 21 Jul 1957, common and widespread through aspen and coniferous forest of the area, E end of lake, *D. R. Moir 4221* (F). Parry Sound Dist., the Georgian Bay Islands opposite Shawanaga Township, Hemlock Island, 6 Jul 1942, young fr, *E. D. McDonald Jr. 18* (US).

Hemlock-white pine-*Thuja occidentalis*-tamarack-*Betula lutea* swamp along SE side of highway 2, NE of Wardsville, 8 Sep 1952, sterile, *J. A. Steyermark 74610* (F). In river bottom woods under birch and balsam, densely shaded, near mouth of Wolf River, 2 mi NE of Dorion P. O., Dorion Twp., 29 Jul 1963, fr, *C. E. Garton 9786* (F). Carleton Co., Ottawa District, Wright's Cove, Prescott Hwy, Nepean Twp., *W. H. Minshall 106* (NY). Frontenac Co., Kingston, 1897, *A. Boyd s.n.* (F); Kingston, Sharbot Lake, 16 Jul 1898, fr, *J. Fowler s.n.* (US). Leeds Co., Rideau Park, Oliver's Ferry, 19 Jun 1898, young fr, *T. W. Edmondson s.n.* (NY). Timiskaming Co., 15 mi NW of Kirkland Lake, in mixed second growth forest, 4-11 Aug 1935, fr, *E. C. & T. G. Yuncker 5440* (F,

NY). PRINCE EDWARD ISLAND: Kings Co., about 2 miles north of Souris, in maple – beech woods with ferns, 16 Jun 1953, fl, *A. J. Smith 80* (NY). QUEBEC: Matamek River Dist., North Shore, 28 Jun 1927, fl, *P. W. Bowman 70* (US). Longue Pointe de Mingan, 50°18'N, 64°01'W, roadsides and forests, abundant, 15 Jun 1950, fl, *J. M. Gillett 4985* (US). Woods by Lac Chicobi, NW of Amos, fruits purplish black, 6 Aug 1959, fr, *C. V. Morton 11608* (US). Lac Mistassini, Territoire de Mistassini, pres de la Baie Yawatagami (dans la Baie Abatagouche), dans le bois, 73°47'W, 50°32'N, 365-415 m, 11 Jul 1944, fl, *J. Rousseau & E. Rouleau 5* (US). Archipel de Mingan, Ile a la Proie, dans les bois, *F. F. Marie-Victorin & Rolland-Germain 18507* (NY). Comté D'Argenteuil, Saint-Adolphe, forêt d'arbres à feuilles décidues, Lac Vingt-Sous, 19 Jul 1942, *F. F. Marie-Victorin & Rolland-Germain 55285* (NY, US). Bonaventure Co., Port-Daniel Prov. Preserve, in woods near river, under *Picea-Betula-Populus* forest, abundant with variable leaf and inflorescence architecture, 1 Jul 1999, *J. Wen 4735* (CS, F, US). Gatineau Co., Wakefield, 1 Jun 1939, fl, *H. A. Senn 1385* (NY). La Haute-Gaspésie Regional County Municipality, Parc (Quebec) de la Gaspésie, Mont-Albert, on the way from the visitor's center to the top of Mont-Albert, N48°56.198', W66°10.376', 250-1000 m, abundant, 8 Aug 2007, fl, plant 30-45 cm tall, rhizomatous perennial, *J. Wen 10440* (US). St.-Jean-Chrysostôme, Comté Lévis, 7 Jun 1966, *G. Lemieux 9837* (BKF). Rimouski Co., Bic, Parc du Bic, near the Farm House, on hillside woods near the ocean, in forests of *Populus-Acer-Abies*, 2 Jul 1999, *J. Wen 4739* (F, US); Rimouski area, Bic, Parc du Bic, near Ferme Rioux, in *Populus tremuloides* (aspen) forest, N48°21.420', W68°47.808', 10 m, 9 Aug 2008, fr, herb ca 30-40 cm tall, fruits globose, blackish purple, *J. Wen 10466* (US). Sainte-Rose-du-Déglé, Comté Témiscouata, 22 Jun 1964, *J. L. Blouin et al. 7198* (BKF). Pontiac Co., Onslow Twp., 24 May 1941, fl, *H. A. Senn 1786* (F). Oka, SW of Montreal, Parc d'Oka, in *Acer-Quercus-Populus* forests, fruit dark purple to blackish, globose mostly with 5 persistent styles, 5-8 mm in diameter, with persistent narrowly triangular calyx lobes ca. 1 mm long, 2 Jul 1999, *J. Wen 4743* (F, US). SASKATCHEWAN: Lake Athabaska, Charlot Pt., 59°36'N, 109°13'W, 15 Jun 1935, *H. M. Raup 6142* (F). La Loche, mile 64.5 N Buffalo Narrows – La Loche Road, 56°27'N, 109°22'W, under *Populus tremuloides* woods with scattered smaller *Picea glauca*, common understory herb, 29 Jun 1971, fr, *V. L. Harms 17640* (NY). District de Melfort, Lac La Ronge, 35 miles au sud, Pinède sablonneuse et ouverte, 20 Jul 1954, young fr, *B. Boivin & D. Dunbar 10360* (NY). U.S.A. COLORADO: Boulder Co., N St. Vrain Creek, Rocky Mountain National Park, 3 Sep 1937, sterile, 8600 ft, *R. A. Schneider 758* (F). Douglas Co., Pike National Forest, S of Sedalia on road to Devil's Head campground, 7500 ft, ponderosa pine forest with some Douglas fir, locally common along stream, 13-14 Aug 1983, fr, *D. Keil 17760* (TEX); occasional in steep wooded ravine of West Plum Creek near the Haystack Ranch (Perry Park South Ranch), 2 Jul 1981, fl, *G. J. Goodman & C. A. Lawson 8672* (NY); Platte Canõn, *H. N. Patterson 37* (F). El Paso Co., vicinity of Pikes Peak, 8000 ft, 23 Jun 1896, fl, *Bilmore 1301* (US); shaded spot, Ute Pass Trail, Pike National Forest, foothills, 15 Jun 1980, fl, *L. J. Dorr 1604* (TEX); Colorado Springs, Engelmann's Canyon, 31 May 1878, fl, noted as new to Colorado, *M. E. Jones 139* (NY, US). Jefferson Co., Pike National Forest, Tarryall Mts., Lost Creek Wildness Area, along Goose Creek in mixed forest of *Pseudotsuga menziesii* and *Pinus ponderosa* with *Alnus*, *Betula*, *Acer* and *Cornus* along stream, 8200 ft, 5 Jun 2002, fl, *T. Hogan 3835* (NY). Larimer Co., mountains, 20 Aug 1895, fr, *C. S. Crandall s.n.* (NY); Young's Gulch, 8 miles NW of Poudre Park, 6500 ft, 15 Jun 1996, *J. Wen 2487* (CS, US). Jack Brook, 2700 m, 26 Jun 1901, fr, *F. E. & E. S. G. Clements 230* (US). CONNECTICUT: Hartford Co., mixed mesic woods, junction of the new Int. 291 & 84 (between Hartford and New Britain), 31 May 1967, fl, *H. E. Ahles 66006* (US). Litchfield Co., moist woods near Deer Island, Bantam Lake, Morris, 29 Aug 1919, *G. E. Nichols s.n.* (YU); Meriden, 2 Jun 1843, fl, *B. Livingston s.n.* (YU); Middlesex Co., Chester, 22 May 1932, fl, *R. H. Burton s.n.* (YU). New Haven Co., New Haven, Jun 1856, fl, *D. C. Eaton s.n.* (YU); Milford, 26 May 1906, fl, *Eames & Godfrey s.n.* (YU); New Haven, 30 May 1884, fl, *W. E. Safford 94* (US); Orange, Maltby Lakes, 21 May 1884, fl, *A. L. Winton, Jr. s.n.* (YU). DELAWARE: Nordlands, Jun 1880, *W. M. Canby s.n.* (F). DISTRICT OF COLUMBIA: Jun 1893, *E. S. Burgess s.n.* (NY); Windy Gap, 17 May 1888,

fl, *E. S. Burgess s.n.* (NY). GEORGIA: Rabun Co., on north slopes of Rabun Bald NW of its summit, in rich loam soil of deciduous woods, 3850 ft, 18 May 1947, fl, *W. H. Duncan 7560* (NY, US). IDAHO: Bonner Co., Colburn, in alder swamp, 14 Aug 1941, fr, *J. H. Christ 12837* (NY). Kootenai Co., Lake Peud d'Orville, 28 Jul 1892, fr, *J. H. Sandberg 772* (US). Hope, in rock slide, 5 May 1914, fl, *M. B. Dunkle 402* (NY). Upper Priest River, 3000 ft, 8 Jul 1925, young fr, *C. Epling 7179* (F). ILLINOIS: Glencoe, 30 May 1905, fl, *F. C. Gates 344* (F). Roger's Park, 20 May 1898, fl, *L. M. Umbach s.n.* (F). Chicago, north branch Chicago River, open woods, *M. Bradley 7877* (F). Cook Co., Jurgensen's Woods, 183rd and Cottage Grove, mixed deciduous forest, 1 Jul 1967, fr, *S. F. Glassman 8380* (F). Kankakee Co., in shaded ground near Rock Creek in Kankakee River State Park south of Deselm, 31 May 1953, fl, *F. A. Swink 2083* (F). La Salle Co., wooded hillside, Starved Rock, 1-7 Jun 1909, fl, *J. M. Greenman et al. 32* (F). Ogle Co., Castle Rock, 4 miles SW of Oregon, shaded sand at base of sandstone bluff, 21 Jul 1940, sterile, *R. A. Schneider 1648* (F). Peoria Co., Springdale Cemetery, 1866, *J. T. Stewart s.n.* (F). INDIANA: Clarke, open woods, 4 Jun 1900, young fr, *O. E. Lansing Jr. 891* (F). Kosciusko Co., Mineral Springs, 21 Jul 1928, fr, mixed woods, *N. V. Hayne 958* (F). Lake Co., North Clark Road, Gary, mesophytic woods, 22 May 1954, fl, *R. M. Eiseman 21* (F). Porter Co., rich acid soil in white oak - *Cornus florida* - red maple forest on hills of Valparaiso Moraine, along hwy 6, about 1 mi E of Woodville junction, 23 May 1946, fl, *J. A. Steyermark 63558* (F). Steuben Co., in low border of Graveyard Lake among tamarack, 28 May 1905, fl, *C. C. Deam s.n.* (US). Warren Co., Pine, 15 May 1880, fl, *M. Bross s.n.* (F). IOWA: Boone Co., Ledges, 17 Aug 1897, fl, *L. H. Pammel & C. R. Ball 740* (US). Clayton Co., upland woods, McGregor Heights, 21 Aug 1920, *B. Shimek s.n.* (NY). Fayette Co., 15 Jun 1894, fl, *B. Fink s.n.* (US). Johnson Co., 4 May 1895, fl, woods, frequent, *T. J. Fitzpatrick s.n.* (F). Louisa Co., along runs in richly wooded bluff overlooking south part of Lake Odessa, Jefferson Twp., 15 May 1954, fl, *R. A. Davidson 1978* (TEX, US). KENTUCKY: 1840, *C. W. Short s.n.* (NY). Lewis Co., Big Sulphur Creek, mesophytic woods, 9 May 1942, fl, *E. L. Braun 4508* (US). Rowan Co., Perry Branch, 21 May 1939, sterile, *E. L. Braun 2494* (US). MAINE: Cumberland Co., Cape Elizabeth, May 1895, young fr, *E. E. Gayle 714* (US). Knox Co., Camden Hills State Park, Mt. Battie, 1.5 mi N of Camden, 069 04.27W, 044 13.58N, granite outcrop, exposed, with *Arctostaphylos*, *Quercus*, *Prunus*, *Myrica*, *Vaccinium*, *Juniperus*, 14 Jul 1999, fr, *W. Hess et al. 8809* (F, 2 sheets, NY). Penobscot Co., valley of Wassataquoik River, from McLeod's to City Camp, 16 Jul 1900, young fr, *M. L. Fernald s.n.* (US). Washington Co., bank along Narraguagus River, Cherryfield, 5 Jul 1912, young fr, *S. F. Blake 4041* (LL). MARYLAND: Allegany Co., dry woods with clearings on Dan's Rock area on Conemaugh formation, about 2 miles east-southeast of Midland, 12 Sep 1969, sterile, *R. M. Downs 8765* (NCU). Baltimore Co., Gunpowder Falls State Park, area between end of Schroeder Ave. and Perry Hall Rd., Perry Hall, north-facing slope, shaded rocky habitat, near a river, locally rare, 22 May 1991, *J. Wen 818* (A). Frederick Co., Catocin Mountain Park, moist rocky area near stream, with *Tsuga canadensis*, and *Kalmia latifolia*, 5 May 1973, fl, *C. J. Hickey II 276* (NCU). Garrett Co., Backbone Mountain, 23 Jun 1931, fr, *E. L. Core s.n.* (NY); rich damp woods, Garrett Co., 3 Jul 1882, fl, *J. Donnell Smith 194* (US). MASSACHUSETTS: Bristol Co., South Dartmouth, Salters Point, 15 Jun 1917, fl, *A. King 22* (F). Franklin Co., Northfield Twp., Lachang Brook just upstream from jct of rts. 63 and 10 in N part of town, 65 m in elevation, 1 May 1991, *J. Wen et al. 787* (A). Hampshire Co., Haydenville (Williamsburg), pine woods, Mountain Street Reservoir, 1 Jun 1975, *H. E. Ahles 79975* (BKF, 2 sheets); South Amherst, 26 May 1881, fl, *P. Blatchford s.n.* (F); Amherst, 25 May 1880, *C. W. Minott s.n.* (US); Mt. Holyoke, 20 Jul 1895, sterile, *A. F. Storms s.n.* (US). Plymouth Co., edge of dry woods, Plymouth, 22 Jun 1912, fruits off, *S. F. Blake 3827* (LL). MICHIGAN: Baraga Co., near Otter Lake area, at the Access site of DNR of the Otter River Dam, in maple-*Tilia-Fraxinus* mixed deciduous forest, associated with *Tilia americana*, *Acer* sp., *Aralia racemosa*, *Corylus cornuta*, *Prunus serotina*, *Prunus* sp., *Fraxinus* sp., *Osmorhiza claytonii*, *O. longistylis*, *Parthenocissus quinquefolia*, *Trillium* sp., and *Cornus* sp., 27 Jun 1999, *J. Wen 4717* (F, US). Clinton Co., Essex Twp., 2.5 miles SE of Maple Rapids, slight north-facing slope, 20 Jun 1952, sterile, *G. W. Parmelee & P. A. Hyypio 155* (MSC). Crawford Co., SE

side of K P Lake, west facing slope, 10 m from shoreline, mesic northern forest, mixed hardwood forest, shade, dry loamy sand, common, perennial herb to 4 dm, flowers white with fragrance of honey, mostly vegetative, assoc. with *Acer saccharum*, *Quercus rubra*, *Pteridium*, *Vaccinium* spp., *Maianthemum*, 1 Jun 1992, in fl., *E. M. Chittenden & A. J. Peil 481* (MSC). Delta Co., 1.3 miles E of Isabella, in conifer-mixed hardwood forest on sand, pine needle litter, 19 Jun 1959, in young fr., *W. T. Gillis 2964* (MSC). Houghton Co., moist shaded edge of logging trail on Limestone Mountain, 13 Jun 1957, in young fr., *P. A. Hyypio 596* (MSC). Ingham Co., thicket along railroad tracks, white flowers, 6 Jun 1953, in fl. & young fr., *D. H. Norris 72* (MSC). Keweenaw Co., in the upper peninsula, dry coniferous forest, in Agate Harbor, 8 Jul 1936, fr., *F. J. Hermann 7879* (US). Mackinac Co., Hiawatha National Forest, near Three Lakes Campground, in pine-maple-birch mixed forest, 26 Jun 1999, *J. Wen 4704* (CS, F, US). Mason Co., Grant Twp., southern end of vegetation island, berries black, 6 Aug 1979, in mature fr., *B. T. Hazlett 712* (MSC); 3/4 mile SW of Rock Harbor Lodge, Isle Royle National Park, moist woods, 22 Jun 1960, in fl., *R. A. Janke 3815* (MSC). Oceana Co., in cedar swamp on Roscommon mucky sand, 2 mi E of Crystal Valley, infrequent in cedar swamps of the Manistee National Forest, assoc. with *Adiantum pedatum*, 14 May 1977, fl., *T. S. Mustard 319* (MSC). MINNESOTA: Becker Co., about 2.5 miles E of White Earth, 47°5'23"N, 95°46'54"W, 19 May 1993, fl., *W. R. Smith 22148* (F). Clearwater Co., Itasca Park, NE of campus, 13 Jul 1929, young fr., *M. L. Grant 2769* (US); west shore of Lake Mary, wooded area, 17 Jun 1973, young fr., *D. J. Kitz 6* (F). Lake Co., Two Harbors, Jun 1893, fl., *E. P. Sheldon s.n.* (US). Lake of the Woods Co., mixed forest, one mile up from the mouth of Pine Creek, Angle Inlet 3/4 of a mile west of the creek, 21 Jul 1939, fr., *J. W. & M. F. Moore 11032* (TEX). Saint Louis Co., Duluth, 11 Jun 1936, fl., *O. Lakela 1407* (F, NY, US). MISSOURI: Clark Co., NE-facing slope along Des Moines River, 0.5-1.5 miles NW of Athens, 30 May 1941, fl., *J. A. Steyermark 28689* (F). Pike Co., 0.75-1.5 miles SE of Ashburn, wooded slopes just at base of Limestone Bluffs, 13 May 1939, *J. A. Steyermark 22371* (F). MONTANA: Bigfork, 12 Aug 1902, fr, conifer woods, 3100 ft, *H. N. Whitford 210* (F). Flathead Lake and vicinity, Yellow Bay, 11 Aug 1908, fr., *J. Clemens s.n.* (F). Flathead Co., E bank of South Fork of Kootenai River, 0.5 mi south of Hwy #2, in rich moist woods, 11 Jul 1965, fr., *C. L. Hitchcock 24019* (NY). Glacier National Park, 13 Jul 1914, young fr., *A. S. Hitchcock 12017* (US); Glacier National Park, vicinity of Glacier Hotel ("Lewis's"), at the head of Lake McDonald, 960-1050 m, 27 Aug 1919, *P. C. Standley 18277* (US); Glacier National Park, on rich forest floor along trail to Avalanche Lake, 3500-3800 ft, 7 Jul 1937, fl., *T. G. & E. C. Yuncker 6709* (F, NY). Lake McDonald, 28 Aug 1903, *L. M. Umbach 776* (F, US). Lake Co., East Shore of Flathead Lake, 1 mile south of Yellow Bay, in fairly deep woods, 27 Jun 1948, fr., *C. L. Hitchcock 17716* (US); small tributary of Goat Creek, birch and poplar, 12 Jun 1968, fl., *M. Mooar 8003* (NY). NEBRASKA: Brown Co., Fairfield Creek, 3 May 1890, fl., *C. Rutter s.n.* (US). Cheery Co., 9.5 miles east of Valentine on gravel hwy 12, plant common at edge of woods along trail at base of north-facing *Quercus-Betula* bluff, along Niobrara River, 9 Jun 1975, fl., *S. P. Churchill 5625* (NY). NEW HAMPSHIRE: Cheshire Co., along SR 123, 1.2 miles S of jct with SR 9, hemlock woods, 10 Aug 1986, *J. Wen et al. 136* (OS). NEW YORK: Clinton Co., Clintonville Sandplain, wooded hillside, 16 Jun 1953, young fr., *V. E. Rudd 802* (US), *807* (US). Dutchess Co., vicinity of Clove, rich woods, 18 Aug 1915, *P. C. Standley & H. C. Bollman 11875* (US). Madison Co., Pecksport, 9 Jun 1916, fl., *W. R. Maxon 6181* (US). Orange Co., vicinity of Highland Falls, in the Hudson Highlands, altitudes ca. 50 m, 7 Jul 1910, fr., *E. A. Mearns 23* (US). St. Lawrence Co., Waddington, 5 Jun 1914, fl., *O. P. Phelps 721* (US). Sullivan Co., 3.5 mi NE of Westbrookville, Bashakill State Wildlife Area, off NY 209, 074 30.65W, 041 32.25N, 5 Jul 1999, sterile, *W. Hess et al. 8684* (F). Tompkins Co., Danby, 6 Aug 1885, fr., *F. V. Coville s.n.* (US); woodland 6-mile creek gorge, near Ithaca, 15 May 1941, fl., *D. Iseley 1262* (F); Ithaca, path by Baher Laboratory of Chemistry, 4 May 1942, late fl., *E. D. McDonald Jr. s.n.* (US). NORTH CAROLINA: Avery Co., rich woods on slope, just W of jct. NC 105 & 185, common, 22 May 1968, *J. W. Hardin 13220* (NCSC). Ashe Co., Bluff Mtn., oak-heath dominated by *Quercus borealis*, *Q. alba*, *Rhododendron*, *Menziesia*, *Vaccinium* and *Gaylussacia*, 25 May 1974, in fl., *R. L. Kologiski*

& C. H. Perino 190 (NCSC). Buncombe Co., slopes of Craggy Mountain, 25 May 1897, fl, *Biltmore 28a* (US). Haywood Co., roadside, some 20 mi from Lake Junaluska, on Max Patch Rd, 17 Jun 1934, fl, *H. J. Oosting 34303* (F); near summit of Cold Mtn, 27 Jun 1958, *G. S. Ramseur 4655* (NY). Macon Co., moist hemlock forest, Chestnut Ridge, E of Highlands, 4 Aug 1951, *R. K. Godfrey et al. 51656* (NCSC); along Rt US 28, ca 7 miles SE of jct with Rt 441, 29 Apr 2002, fl, *J. Wen 6269* (US). Orange Co., wooded slope, 2 miles SW of Hillsboro, 20 May 1961, fl, *H. E. Ahles 53987* (NCU). Swain Co., wooded slope, 0.3 miles south and 2.7 miles east of Alarka, 6 Jun 1956, young fr, *H. E. Ahles 14228* (NCU). Transylvania Co., Devil's Courthouse on the Blue Ridge Parkway northeast of NC 215, heath bald and rock outcrop, 14 Jun 1974, fl, *D. E. Boufford et al. 14256* (NCU); near and on rocky summit of Devil's Courthouse, S of Sunburst (Lake Logan), 5750 ft, 12 Jun 1955, fl, *J. W. Hardin 712a* (US). Watauga Co., Rich Mountain N of Boone, 27 May 1991, *J. Wen 849* (A); Rich Mountain area, along Rich Mountain Rd., 4 miles E of jct with Rt 421, 1 Jun 1994, *J. Wen 1526* (US); Rich Mountain area, along Rich Mountain Rd, 5.5 miles from jct with Rt 460, on the E side of Rt 709, near a ravine, 1 Jun 1994, *J. Wen 1535* (US). NORTH DAKOTA: Neche, 23 Jul 1892, *Lee 284* (NY). Benson Co., in woods, Devil's Lake, 1 Jul 1905, fl, *J. Lundell s.n.* (US). Bottineau Co., in woods near Lake Metigoshe, Turtle Mts., 9 Jun 1949, fl, *V. E. Rudd 685* (US). Ramsey Co., Devils Lake, 1 Jul 1905, fl, in shaded forests, *J. Lunell s.n.* (NY). OHIO: Ashtabula Co., along Rt 45, near Rock Creek, in *Quercus-Acer-Fraxinus* forest, on a dead tree, 26 Jul 1986, *J. Wen 100* (OS). Fairfield Co., Sugar Grove, 20 May 1916, sterile, *E. C. Leonard 3973* (US); Sugar Grove, 25 May 1901, fl, *C. S. Mead 2628* (F); Ohio State University Property, Clear Creek, 10 May 1986, fl, *J. Wen 83* (OS), 85 (OS); Clear Creek, 25 Sep 1988, *J. Wen 626* (OS, US). Highland Co., Fort Hill, mesic woods, 31 Aug 1955, *E. L. Braun s.n.* (US). Lawrence Co., woods, head of Rock Hollow, 30 Jul 1951, sterile, *F. Bartley 1377* (US). Portage Co., frequent, marshy woods on E side of Twp. Rd. 272, 500 ft N of the intersection with Twp. Rd. 275, Hiran Twp., 26 May 1978, fl, *B. A. Andreas 1827* (US). PENNSYLVANIA: vicinity of Philadelphia, 24 May 1892, fl, without leaves, *W. S. Hall s.n.* (F). Bradford Co., Kellogg

Mountain, 1.5 mile W of Kellogg, open rocky oak woods, near fire tower at 2200 ft, 19 Jun 1942, young fr, *R. W. Bohl 4193* (NY). Clearfield Co., Burnside Twp., along Solley Rd., 1.4 miles E of its jct with US Hwy 219, 1.4 miles S of Burnside, common on dry rocky slope with mixed hemlock-pine woods, 7 Jun 1997, fl, *T. G. Lammers & M. A. Vincint 9927* (F). Crawford Co., moist woods, Blair Bridge Rd., near Linesville, 3 May 1943, fl, *H. H. Harrison s.n.* (F). Lackawanna Co., on west slope, of Moosic Mts, 1 mi SE of Dunmore, 22 May 1946, fl, *S. L. Glowenke 5192* (NY). Lancaster Co., vicinity of Smithville, 21 May 1890, fl, *J. K. Small s.n.* (F). Lycoming Co., Deer Hole Mountain, South Williamsport to summit, 200-400 m, 21 Sep 1928, sterile, *W. W. Eggelston & J. W. Kelly 22752* (US). Snyder Co., Selinsgrove, in thicket along Middle Creek, 16 May 1925, *H. N. Moldenke 2395* (NY). Sullivan Co., Hillsgrove and vicinity, Hoagland Branch, affluent of Elk Creek, 18 Jun 1981, fr, *T. Plowman 10536* (F). Warren Co., Sheffield, in deep woods, 19 Jun 1948, fl, *H. N. Moldenke 19455* (WU). York Co., vicinity of McCalls Ferry, 5-7 Jul 1904, sterile, *J. N. Rose & J. H. Painter 8145* (US). SOUTH DAKOTA: Deadwood, Rocky hillside, 28 Jul 1913, fr, *W. P. Carr 131* (F, US); Black Hills, Rapid Creek & Dark Canyon, *H. E. Hayward 840* (F); Custer State Park, head of French Creek, 1927, *H. E. Hayward 868* (F); canyon W of Whitewood, N-facing slope, *H. E. Hayward 1203* (F); Black Hills, Spearfish Canyon, 1927, *H. E. Hayward 1348* (F), *1439* (F); Black Hills, Harney Peak, E-facing slope, 1927, *H. E. Hayward 1716* (F); Black Hills, Mystic, 23 Aug 1908, fr, *S. S. Visher s.n.* (F); Savoy, mesophytic canyon, associated with yellow pine, spruce, 8 Aug 1926, fr, *H. E. Hayward 290* (F); Savoy, limestone, 5300 ft, 23 Jun 1910, fl, *J. Murdoch Jr. 4143* (F); Terry Peak, *H. E. Hayward 1922* (F). Deadwood, near Pincrest, mesophytic valley, 5 Aug 1926, *H. E. Hayward 240* (F, 2 sheets); *1131* (F); Black Hills, in dense woods, 22 Jul 1910, young fr, *A. Nelson 9456* (US); Piedmont and Little Elk Creek, 28 Jun 1892, fl, 4000 ft, *P. A. Rydberg 732* (US); Piedmont and Little Elk Creek, 28 Jun 1892, 4000 ft, *P. A. Rydberg 733* (US). Custer Co., Mayo, shady slope, 13 Jun 1914, young fr, *W. H. Over 1790* (US). Lawrence Co., 5 mi W of US 385, Black Hills National Forest, 103 44.09W, 44 14.65N, 2000 m, locally common, 14 Jul 1998, sterile, *W. Hess et al. 8260* (F); Spearfish

Canyon, ca. 10 mi SW of Spearfish along hwy 14-A on canyon floor, 4 Aug 1965, fr, *J. M. Kane 2481* (LL). VERMONT: Bennington Co., Manchester, 29 Jun 1898, fr, *M. A. Day 78* (F, US, 2 sheets); along SR 9, opposite to the entrance to Woodford State Park, moist woods, a large population of over 1000 individuals, 9 Aug 1986, *J. Wen et al. 131* (OS); Woodford State Park, at the edge of *Quercus-Larix* forest, 9 Aug 1986, *J. Wen et al. 133* (OS). Caledonia Co., Peacham, 7 Jun 1892, fl, *A. F. Stevens s.n.* (F). Windham Co., on rocky cliff on mountainside, Jamaica, 16 May 1937, fl, *H. N. Moldenke 9558* (NY). VIRGINIA: Amherst Co., Bluff Mt., 21 Aug 1964, *R. S. Freer 2782* (SRSC). Augusta Co., St. Marys River, upper valley, 30 May 1966, young fr, *Freer & Hooks 3856* (NCU). Bath Co., Flag Rock, in woods, 9 Jun 1930, fl, *C. V. Morton 1903* (US). Botetourt Co., ca 10 miles NE Catawba in rich bluff woods, 17 May 1960, fl, *R. Kral 10274* (NCU). Floyd Co., Blue Ridge Parkway, 2.5 mi N jct US 58, E of road, 30 Jun 1978, *M. J. Warnock 926* (TEX). Giles Co., Salt Pond Mt, 2 Jun 1890, fl, *H. A. Brown et al. s.n.* (NY); near Mountain Lake along Rt 700, 9 Sep 1986, *J. Wen et al. 179* (OS); near Mountain Lake Biological Station, 9 Sep 1986, *J. Wen et al. 186* (OS); 5.3 miles from jct. of Rt 460 and Rt 700 on Rt 700 toward Mountain Lake, rocky slope, in oak and maple forest, 25 May 1991, *J. Wen 833* (A); Mountain Lake area, along Rt 613, ca 3.2 miles SE of jct with Rt 668, 27 Apr 2002, *J. Wen 6234* (US). Grant Co., mixed mesophytic woods with clearing on northwest slope facing north branch of Potomac River on sandy and carbonaceous shales and sandstones, ca. 1 mile northeast of Bayard, 27 Aug 1969, sterile, *R. M. Downs 7243* (NCU). Greene Co., Shenandoah National Park, near Pocosin Shelter, in open light woods or bushy area, 18 May 1940, fl, *E. H. Walker 2746* (US). Rappahannock Co., Shenandoah National Park, by stump in wet woods, 15 May 1938, fl, *E. H. Walker 2301* (US). Roanoke Co., 2.2 mi S of jct Co. 696 & US 221, 30 May 1968, young fr, *F. C. James 10196* (NCU). Rockingham Co., on US 33 in the George Washington National Forest about 5 miles W of West Virginia and Virginia State line, 22 Jun 1968, young fr, *F. C. James 11071* (NCU). Smyth Co., Pond Mountain, E Marion, 3000 ft, 25 May 1892, *J. K. Small s.n.* (F, 2 sheets). Warren Co., along Skyline Dr. in Shenandoah National Park, ca 1 mile N of Hoagwallow Flats Overlook,

N38°48'07.1", W78°10'40.6", 756 m, 4 Jul 2007, fr, herb ca 0.5 m tall, fruits dark purple, *J. Wen 9840* (US). WASHINGTON: Pend Orielle Co., wooded slope of Z* Canyon, 25 Jun 1933, young fr, *J. W. Thompson 9207* (NY, US). Stevens Co., in dense woods on South Fork of Sheep Creek, near Frontier, 28 May 1939, fl, *C. W. Sharsmith 4038* (NY, US). WEST VIRGINIA: Preston Co., Masontown, 7 Jun 1940, fl, *M. Maysilles 10* (US). Wetzel Co., Fish Creek, near Littleton, 2 Jun 1931, young fr, *E. L. Core 2666* (NY). WISCONSIN: Columbia Co., Wisconsin Bells, 31 May 1961, *G. N. Jones 32369* (F). Door Co., Ephraim, rocky places, Jul 1909, fl, *C. F. Millsbaugh 3552* (F, 2 sheets). Douglas Co., at the Lower Falls of the Amnicon Falls, N46°36.660', W91°53.451', 240 m, 5 Sep 2007, perennial ca 40-50 cm tall, clonal, *J. Wen 9940* (US). Marathon Co., along 5th Ave., 0.9 mi S of jct. with North Lane or 1.9 mi S of jct with County Rt A, associated with *Fraxinus americana*, *Onoclea sensibilis*, *Tilia americana*, *Quercus rubra*, *Acer rubrum*, *Impatiens* sp., *Rubus* sp., *Hydrophyllum virginicum*, and *Ulmus americana*, roadside, 14 Sep 1994, *J. Wen 1810* (US). Oconto Co., E side of US Hwy 41, 1.5 miles N of its junction with County Hwy J, scattered in swampy coniferous forest, 10 Jun 1994, young fr, *T. G. Lammers & M. A. Vincent 9018* (F). WYOMING: Crook Co., Black Hills, 9.5 air miles E of Sundance, ponderosa pine slopes, stream bottom, and meadows, wooded slopes, 9 Jul 1984, young fr, 4600 ft, *R. L. Hartman 17576* (NY). Sundance Mt, 3 Jul 1896, fl, *A. Nelson 2140* (NY, US).

This is the most widely distributed species of *Aralia* in North America. Although it has been treated as herbaceous (e.g., Smith 1944), it is woody in essence, because it has a woody horizontal rhizome and a short upright woody stem. Flanagan and Bain (1988) remarked that the plant behaves like an "underground or buried shrub." Most woody species of *Aralia* are distributed in warmer areas. *Aralia nudicaulis* is the northernmost species of the entire genus. Scoggan and Cody (1979) also recorded the species in the southern Yukon Territory, although the author has not examined collections there yet. The herbaceous habit is apparently secondary or derived in the genus.

The generic name "*Aralia*" initially coined by Tournefort (1700) is thought to have derived from

the Indian common name “aralie” for *Aralia nudicaulis* (Marie-Victorin 1964; Wen and Reveal 1992).

Aralia nudicaulis is the only species so far well documented to be dioecious in *Aralia*. Other species are primarily andromonoecious. Barrett and Helenurm (1981) and Bawa et al. (1982) also noted that in rare cases inflorescences of the species

may contain perfect flowers or both male and female flowers. The male and female flowers are dimorphic. The female flowers have five long styles and five short stamens with non-functional and smaller anthers. The male flowers bear five long stamens and five short styles (also see Flanagan and Bain 1988).

ARALIA SECT. HUMILES HARMS

Aralia sect. *Humiles* Harms, Bot. Jahrb. 23: 13. 1896.

Unarmed branched shrub. Leaves pinnate to bipinnate, stipulate; trichomes usually branched when present into dendroids, stomates on both abaxial and adaxial leaf surfaces. Umbels 5-15, loosely clustered into panicles, inflorescence

terminal. Flowers 5 (-6)-merous. Fruits dark purple.

This section consists of three species distributed in Central and southwestern North America.

Key to species of *Aralia* sect. *Humiles*

1. Leaves and leaflets pubescent *A. humilis*
 1. Leaves and leaflets glabrous 2
2. Leaves bipinnate; inflorescence glabrous *A. regeliana*
 2. Leaves pinnate; inflorescence pilose; endemic to Baja California *A. scopulorum*

16. *Aralia humilis* Cav. — Figs. 42-44; color plate 12: A-G.

Aralia humilis Cav., Icon. 4: 7, t. 313. 1797. TYPE: cultivated in the Madrid Botanical Garden from seeds originally collected from Mexico during the Sessé and Mociño Expedition, yet the type specimen not found in the Sessé and Mociño herbarium, plate 313 in *Icones et descriptions plantarum* of Cavanilles (1797) (lectotype, here designated).

Aralia pubescens DC., Cat. Pl. Horti Monsp.: 80. 1813. Type: Herb. J. Gay, donne par M.e Dunal (en hort Monsp.) en Juin 1817 (lectotype: K!, here designated) [with the hand of de Candolle, “*Aralia pubescens* Decand.”]

Aralia scabra C. Presl ex DC., Prodr. 4: 258. 1830. TYPE: **Mexico**. *Presl s.n.* in Herb. Haukearis (holotype: G; isotype: BM!).

Aralia brevifolia Marchal, Bull. Acad. Roy. Sci. Belgique, II, 47: 74. 1879. TYPE: **Mexico**. Merattan, San Andres, *Liebmann 33* (holotype: C, photo at US).

Aralia chilapensis Sessé & Moç., Pl. Nov. Hisp.: 48. 1888. TYPE: **Mexico**. GUERRERO: Chilapa, Sessé & Mocino watercolor plate of “*Aralia chilapensis* Sp. N.”, accession number 6331.0246 in the Torner Collection, Hunt Institute for Botanical Documentation, Pittsburgh (lectotype, here designated).

Aralia pinnata Sessé & Moç., Pl. Nov. Hisp.: 48. 1888. TYPE: **Mexico**. JALISCO, Ahuijullo, flowering in December, type not seen in the Sessé & Moçino herbarium.

Pentapanax mexicanus C. B. Shang & X. P. Li, in Y. W. Yuan & al. (eds.), Proc. Intern. Symp. Bot. Gard. 1990: 628, t. 2. 1990. *Aralia mexicana* (C. B. Shang & X. P. Li) Frodin in

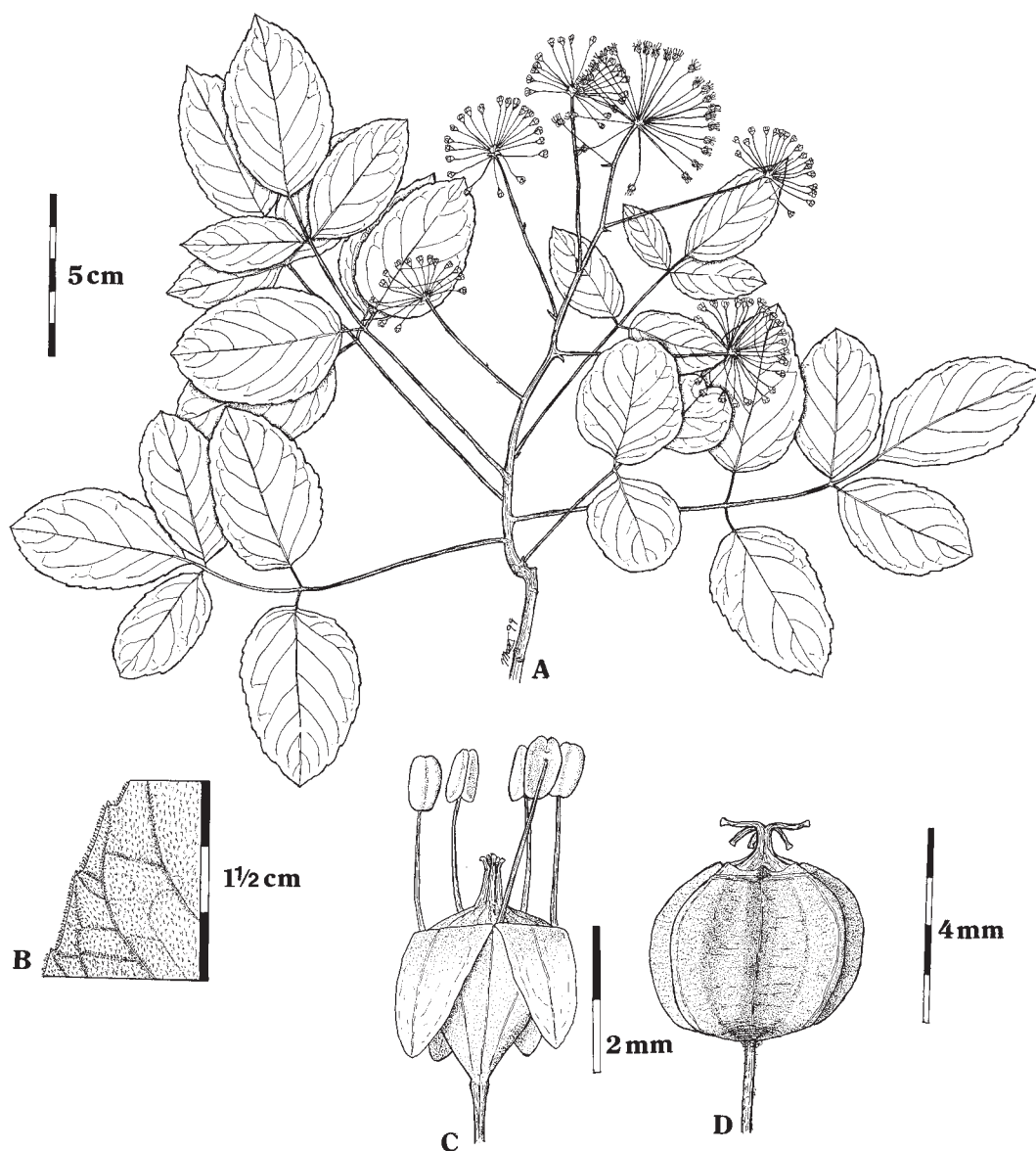


Fig. 42. *Aralia humilis* Cav. A. Habit with leaves and inflorescence. B. Close-up of lower leaflet surface showing pubescence and teeth at margin. C. Flower. D. Fruit.

D. Frodin & R. Govaerts, World Checklist Bibliog. Araliaceae 72. 2003. TYPE: **Mexico**. JALISCO: lava beds near Zapotlan, a small tree, 15-20 ft, 13 May 1893, in fr., *C. G. Pringle* 4366 (holotype: P!; isotypes: BM!, F!, G!, LE!, MEXU!, MSC!, P[2]!, US!, WU!).

Shrub to small tree 0.5-10 m tall. Stem grayish

to dark brown, branchlet terete. Stipule 1.5-2.5 mm long, 0.9-1.5 mm wide, adnate to petiole base, the free portion triangular to narrowly so, pilose; Leaves 9-27 cm long, 6-16 cm wide, usually pinnate in architecture, sometimes bipinnate, pinnate leaves with (3-) 5-9 leaflets, accessory leaflets often present, especially on bipinnate leaves; petioles 5-9 cm long, pubescent with many

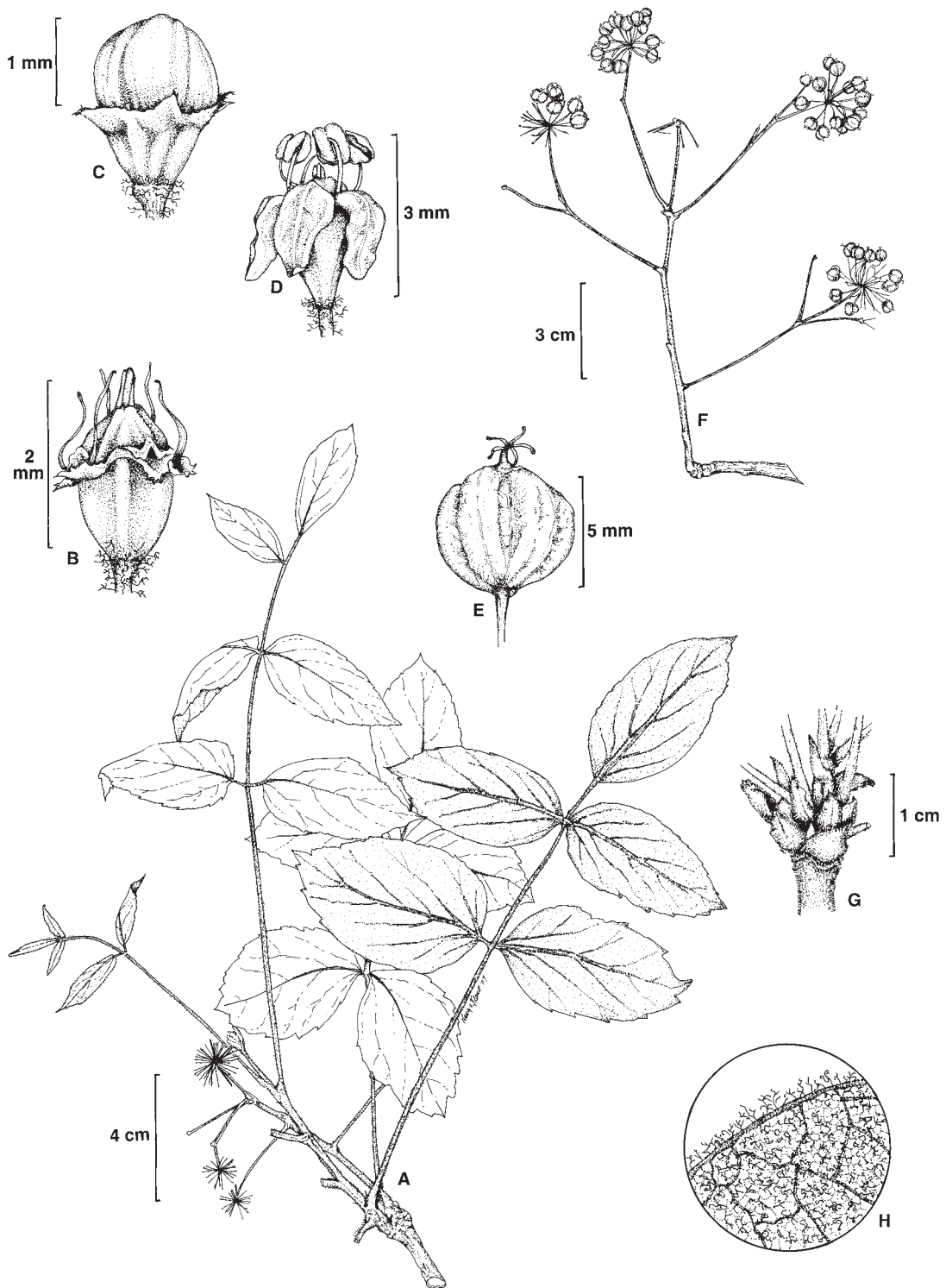


Fig. 43. *Aralia humilis* Cav. A. Habit with leaves and infructescence. B. Older flower after falling off of petals and anthers. C. Flower. D. Floral buds. E. Fruit. F. Infructescence. G. Base of leaves and inflorescence showing bracts. H. Lower leaflet surface showing pubescence with dendroid hairs (A & H – Chiang *et al.* F-2594, F; B-D & G – Carlson 4076, F; E & F – Pringle 4366, F).

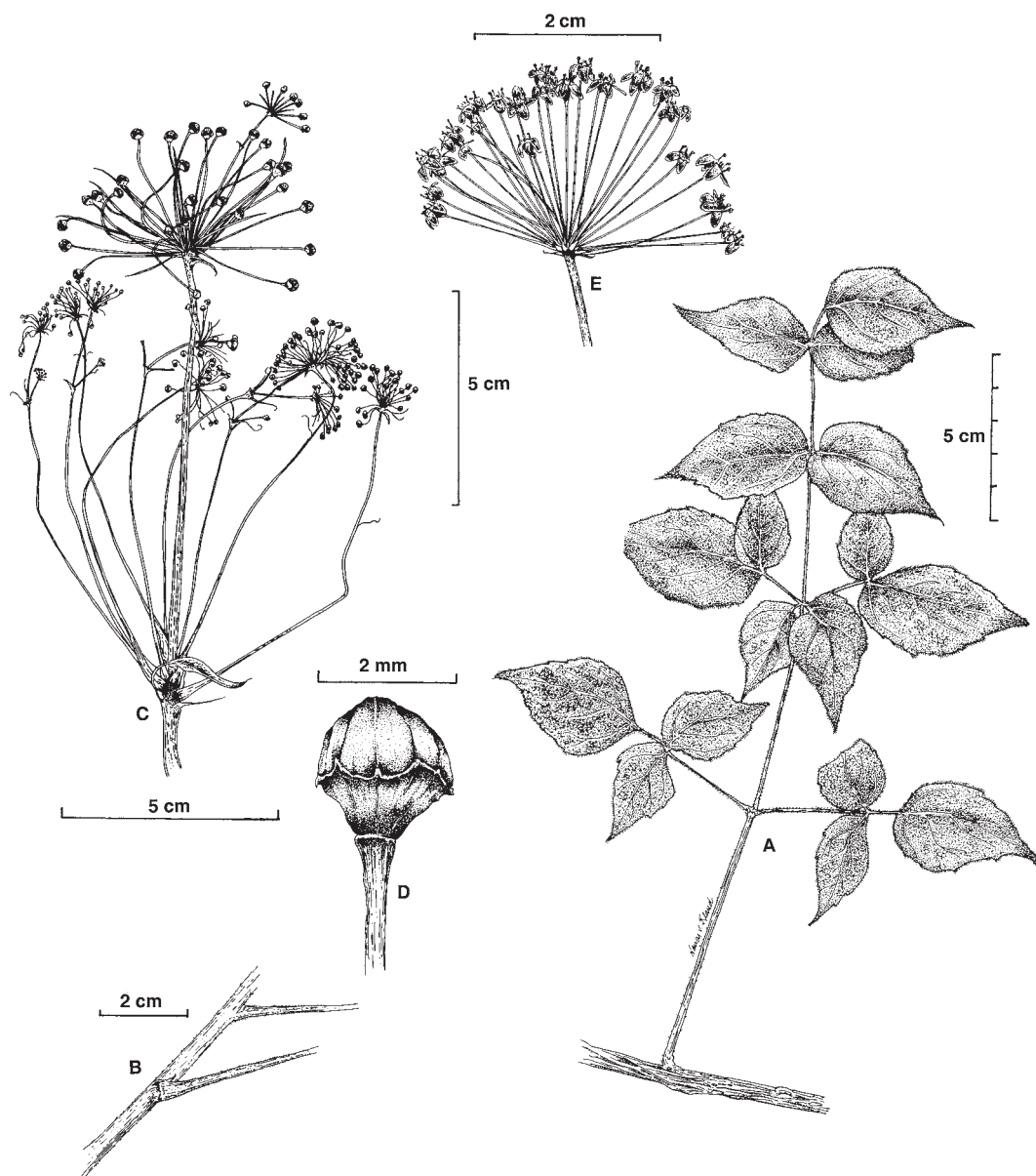


Fig. 44. *Aralia humilis* Cav. A. Stem with a bipinnate leaf. B. Stem and lower part of petiole showing stipules. C. Inflorescence. D. Floral buds. E. Umbel with flowers at anthesis.

curved white hairs; leaflets 2.8-7.5 cm long, 1.6-6.5 cm wide, papery, ovate to broadly or narrowly ovate, acute to acuminate at apex, rounded, broadly acute to slightly subcordate at base, symmetrical or sometimes oblique, serrulate to serrate at margin, tip of teeth glandular, lateral veins 5-6, conspicuous above and below, adaxial surface pilose with white

soft dendroid or branched hairs, green to dark green, abaxial surface usually densely pilose with branched hairs, light green, petiolule 1.5-16 mm long, pilose with often branched hairs. Inflorescence 12-30 cm long, 8-20 cm wide, terminal at the branch apex, more or less pubescent with branched soft hairs, green to purplish green,

consisting of 5-10 primary branches paniculately arranged on a main axis; inflorescence bracts 5-7 arranged in several whorls at the base of inflorescence, 3-4 mm long, 4-5 mm wide, semi-persistent, triangular to broadly so in shape, dark brown in color, glabrous or glabrescent; each primary branch consisting of 1-3 umbels, terminal umbels with 25-45 flowers, lateral umbels 15-20 flowered, with peduncles 3-10 cm long; pedicels glabrous to pubescent, slightly enlarged at the tip, pedicels of terminal umbels 12-23 mm long, those of lateral umbels 5-8 mm long; bracts of primary branches 2-3.5 mm long, 1-2 mm wide, narrowly triangular to lanceolate, pilose, often caducous; bracteoles 1.8-3.5 mm long, 0.7-1.2 mm wide, lanceolate, more or less pilose. Sepals 0.4-0.5 mm long and wide, triangular; petals 2-2.2 mm long, 1.3-1.5 mm wide, ovate, greenish white; stamens 5, filaments 2.2-2.5 mm long, anthers 0.8-1 mm long, 0.6-0.7 mm wide, oblong; styles 0.9-1.1 mm long at anthesis, divided; floral disk slightly projected. Fruits 5-6.5 in diameter, globose, dark purplish black, bloomy, persistent styles 1.5-2 mm long, divided up to the base and recurved, with the base of the style projected and exposed between the persistent sepals and the divided part of the styles. Seeds 4-5 mm long, 2-2.2 mm wide, 1.5-1.8 mm thick, kidney-shaped.

Common names: candelilla (Durango, Mexico); cuajilotillo (Sinaloa, Mexico); tacamajaca (Jalapa, Guatemala).

Uses: in Chihuahua, flowers, leaves and bark used as tea for fever, wood for making rattles and violin (see *R. A. Bye 5996*, MEXU).

Phenology: flowering in August to September, December, January, and February; fruiting in August, late September, October, December, February, March, May and June.

Distribution: widely distributed in Mexico, Guatemala, Honduras, south to Nicaragua, and north to Arizona of U.S.A. (Fig. 45).

Ecology: thickets, pine forests, mixed forests, rocky outcrops, lava beds, scrub woodland, rocky hill, and selva baja caducifolia; (100) 750-2655 m.

Additional specimens examined: **Guatemala.** BAJA VERAPAZ: Mun. San Jeronimo Km 137 Carretera La Cumbre-Salama, 1030 m, 24 Jul 1988, fl, *P. Tenorio L. 14778* (BM). CHIQUIMULA:

llanos around Ipala, 900 m, dry slopes, 23 Oct 1939, fr, *J. A. Steyermark 30322* (F); along Rio Taco, between Chiquimula and Montana Barriol, 3-15 miles northwest of Chiquimula, 500-1200 m, pine slopes, shrub 5-8 ft tall, fruit wine-colored, 26 Oct 1939, fr, *J. A. Steyermark 30647* (F). HUEHUETENANGO: 23 Aug 1896, fl, *C. & E. Seler 3030* (US); along road between San Rafael Pétzal and Colotenango, 1700-1900 m, 14 Aug 1942, fl, shrub 5 ft tall, *J. A. Steyermark 50543* (F); along road 13 km west of Huehuetenango, near Puente de Xinaxó, 1800 m, dry steep oak forest, shrub 1.5-2 m tall, 30 Dec 1940, fr, *P. C. Standley 81503* (F); near crossing of Río San Juan Ixtán, east of San Fafael Petzal, 1730 m, dry bushy limestone slope, naked shrub 2 m, fruit black, shining, 9 Jan 1941, fr, *P. C. Standley 82862* (F); between Nentón and Las Palmas, via Yalisjao, Rincón Chiquite, Chiaquial, Guaxacaná, in Sierra de los Cuchumatanes, 800-1200 m, 30 Aug 1942, fl, *J. A. Steyermark 51650* (F); thickets and forest in deep canyon of a tributary of Río Blanco, about 5 km W of Aguacatán, 2000 m, 4 Dec 1962, fl, *L. O. Williams et al. 22369* (F, G, US). JALAPA: vicinity of Jalapa, 1360 m, damp thicket, shrub 2 m, 7-18 Nov 1940, fr, *P. C. Standley 76513* (F); rocky scrub-oak forest on hills northeast of Jalapa, 1400-1600 m, shrub 1-3 m, occasional, fruit black-purple, 10 Nov 1940, fr, *P. C. Standley 76837* (F); mountains along road between Jalapa and Monjas, 1500 m, oak forest, shrub or small tree, fruit blackish purple, "tacamajaca," 11 Nov 1940, fr, *P. C. Standley 76887* (F); west of San Pedro Oinula, 1000 m, brushy hillside, shrub 1 m tall, 12 Nov 1940, sterile, *P. C. Standley 77119* (F). JUTIAPA: Lago Retana, between Ovejero and Progreso, 600 m, dry rocky slopes of escarpment bordering lake, 26 Nov 1939, fr, *J. A. Steyermark 32024* (F). QUÍCHÉ: 1942, *J. I. Aquilar 1421* (F). ZACAPA: lower slopes of Sierra de las Minas, along trail above Río Hondo, 250-900 m, shrub 10 ft tall, berries green, turning into wine color, leaves light green, grassy area, 11 Oct 1939, fr, *J. A. Steyermark 29555* (F). **Honduras.** CHULUTECA: fls verdes, arbusto 4 m, sobre rocas, bosque de Pinos 2 kms arriba de San Marcos de Colon, 6 Aug 1955, fl, 1100 m, *A. Molina R. 5414* (US); San Marcos, in pine forest area, 1000 m, 16 Nov 1946, fr, *L. O. Williams & A. Molina R. 10889* (F). COMAYAGUA: pineland 13 mi SE of Siguatepeque, 3100 ft, bushy shrub 1.5-2.5 m high,

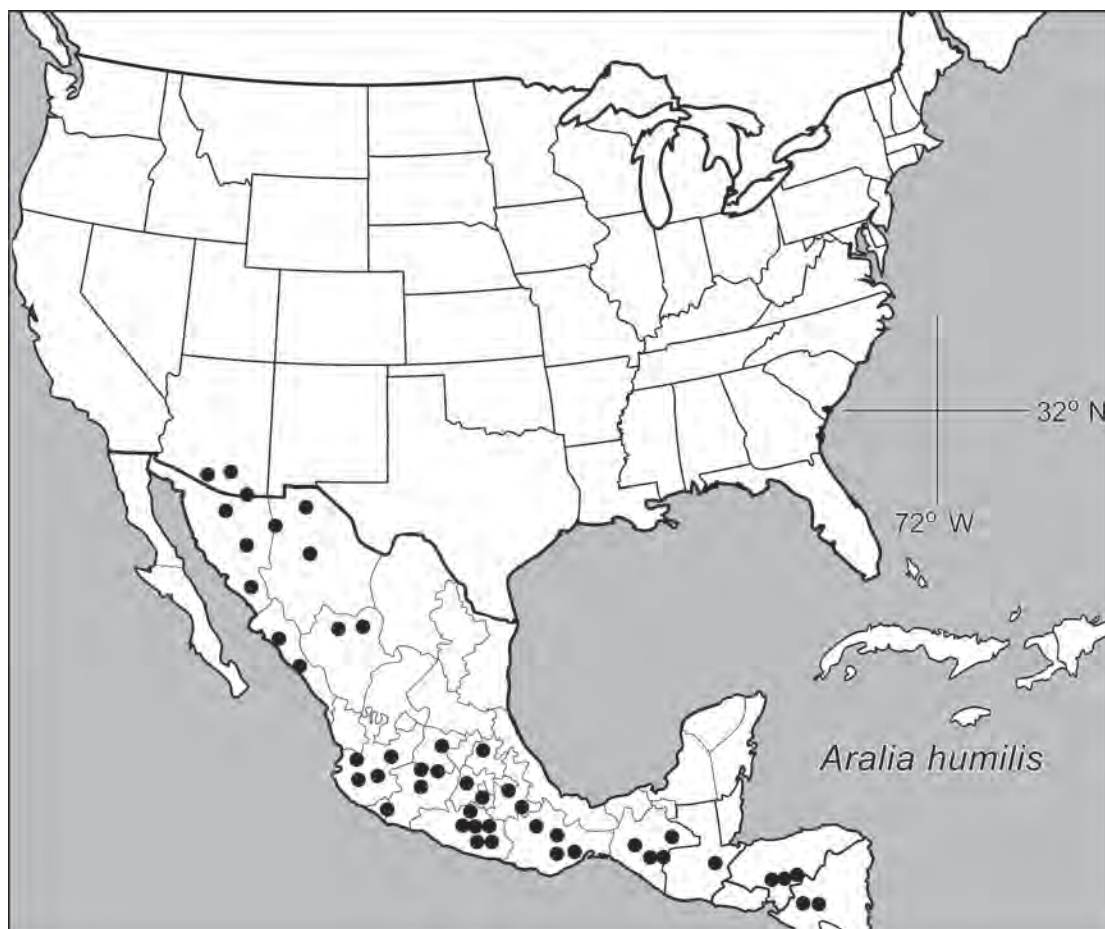


Fig. 45. Map of Central America and U.S.A. showing distribution of *Aralia humilis* Cav.

locally common, buds purplish, flowers greenish, 1 Aug 1962, fl, *G. L. Webster et al. 12725* (F, US); Siguatepeque, 1050 m, rocky hillside, shrub ca. 6 ft tall, 11 Jul 1936, floral buds, *T. G. Yuncker et al. 5800* (F, G). COPÁN: shrub 1.5 m, occasional in thickets along Yaragua creek, 1 mile west of Copán Ruinas, 500 m, 29 Aug 1975, fl, *A. Molina R. & A. R. Molina 30843* (F). EL PARAÍSO: Colectado en Guinope, 100 m. de altura, 18 Apr 1981, *E. Izaguirre 131* (BM); open savannah, Las Mesas region near Yuscaran, shrub to 10 ft, Aug 1960, fl, *H. W. Pfeifer 1531* (US, 2 sheets); near Las Casitas, in pine-oak forest, 900 m, 10 Aug 1947, fl, *P. C. Standley 12067* (F); Quebrada de El Bosque, east

of Danlí, wet forested quebrada, about 840 m, shrub 2 m, 18 Feb 1949, sterile, *P. C. Standley 16765* (F); tree 6 m, in barranco 8 kms west of Ojo de Agua, 900 m, 19 Oct 1946, fr, *L. O. Williams & A. Molina R. 10659* (F); Las Casitas, 900 m, in oak-pine forest, 10 Aug 1947, fl, *L. O. Williams & A. Mollina R. 13236* (F). FRANCISCO MORAZÁN: 20 km N of Talanga along the road to Cedros, 800-1000 m, *Pinus - Quercus* forest on hills, 4 Oct 1986, *G. Davidse & G. E. Pilz 31617* (BM); fls verdes, planta 0.5-1 m, Matorrales húmedos de Quebrada Terragra, entre Tatascán y Maraita, Drainage of the Rio Yeguaré, at about 87°W and 14°N, 27 Jul 1951, fl, 1200 m, *A. Molina R. 4077*

(F, US); fls cremas, árbol 2-5 m, frecuente, Barranco en el pinar abierto entre los Kms 11-12 carretera Suyapa a La Montañita, 11 Sep 1963, fl, A. Molina R. 12849 (F); fls verdes, arbusto 1-1.5 m, poco frecuente, bosque mixto pino-roble entre Kms 9 y 13 carretera La Montañita y El Zamorano, 11 Sep 1965, fl, 1300 m, A. Molina R. 15228 (F, US); fls yellowish, weak shrub 2 m tall, common in pine forest and thickets on way to San Antonio de Oriente, 900 m, 26 Sep 1973, fr, A. Molina R. & A. R. Molina 27963 (F, US); flowers yellowish, weak shrub 3 m, in thickets near San Antonio de Oriente cemetery, 1300 m, 25 Jul 1979, fl, A. Molina R. 31748 (F); Cerro Grande, bosque seco subtropical, 1000 m, 8 Oct 1983, fl, F. José Padilla 16 (BM); along ridge, 1500 m, by trail to San Antonio de Oriente, shrub to 10 ft in rocks, Aug 1960, H. W. Pfeifer 1753 (RSA, US); Region of Agua Amarilla, above El Zamorano, in pine-oak forest, 780 m, shrub 1 m, fr purple-black, 22-30 Nov 1946, fr, P. C. Standley & L. O. Williams 435 (F); above El Zamorano, road from Jicarito toward El Pedregal, in pine-oak-region, 875 m, shrub 2 m, scarce, 14 Aug 1947, early floral buds, P. C. Standley 12252 (F); along Río Caparrosa, above El Zamorano, 900 m, Sep-Oct 1943, fl, P. C. Standley 12621 (F); Región of Río de la Orilla, southeast of El Zamorano, rocky hillside oak thicket, shrub 2 m, 900-950 m, 11 Aug 1949, floral buds, P. C. Standley 22409 (F); Santa Lucia, 10 km al NE de Tegucigalpa, 24 Sep 1983, J. Torres 45 (BM); Santa Inés, 850 m, Aug 1943, fl & young fr, J. Valerio Rodriguez 480 (F); Santa Inés, 850 m, 4 Nov 1943, fr, J. Valerio Rodriguez 1531 (F); Jicarito, in pine-oak forest, shrub to 4 m tall, 1000 m, 21 Oct 1946, fr, L. O. Williams & A. Molina R. 10712 (F); drainage of the Río Yeguaré, at about longitude 87°W and latitude 14°N, 1250 m, near Tatumbra, rocky hillside, shrub 2 m, 19 Aug 1947, floral buds, L. O. Williams & A. Molina R. 13291 (F). OCOOTEPEQUE: weak shrub 2 m, common, cut over pine-oak forest El Cerro, vicinity of San Antonio, 1300 m, 30 Aug 1968, fl, A. Molina R. 22478 (F). **Mexico.** CHIAPAS: steep rocky slope with *Quercus* along Mexican Highway 190 in the Zinacantán paraje of Multajoc, municipio of Ixtapa, 3500 ft, 17 Aug 1965, fl, D. E. Breedlove 11845 (F). Shrubby slope 4 mi SW of Bochil along road to Soyalo, Minicipio of Bochil, 4500 ft., 21 Aug 1965, fl, D. E. Breedlove 12085 (F, LL, US); steep slope with *Quercus* along Mexican Highway

190, 3 mi S of La trinitaria, municipio of La Trinitaria, 5100 ft, 14 Oct 1965, D. E. Breedlove & P. H. Raven 13230 (F); slopes with *Pinus* and *Quercus* 6-8 km west of Teopisca on the side of Cerro Chenek'ultik, Municipio of Totolapa, 2150 m, 16 Aug 1972, D. E. Breedlove 27076 (LL); steep-walled canyon at the head of the Rio de la Venta at the Chorreadero near Derna, tropical deciduous forest, *Hauya*, *Ceiba*, *Tabebuia*, and *Capparis*, Municipio of Ocozocoautla de Espinosa, 800-1000 m, 16 Dec 1972, fr, D. E. Breedlove & R. F. Thorne 30289 (RSA); slope with *Pinus*, *Quercus* and *Liquidambar* near Pueblo Nuevo Solistahuacán, Municipio of Pueblo Nuevo Solistahuacán, 5800 feet, 22 Aug 1967, fr, O. F. Clarke 427 (RSA); Municipio la Trinitaria, 6-7 km S of La Trinitaria, 1400-1500 m, rocky limestone hills with open deciduous forest, treelet 3 m tall, leaves bipinnate, 17 Nov 1984, fr, G. Davidse, M. Sousa, O. Téllez, E. Martínez & J. Davidse 29973 (BM, MO); along road between Teneapa and Yajalon, 3000-5000 ft, 13 Oct 1895, fr, E. W. Nelson 3237 (US); between San Cristobal and Teopisca, 6700-8500 ft, 4 Dec 1895, fr, E. W. Nelson 3451 (US); Hacienda Monserrate, Sep 1923, C. A. Purpus 9160 (BM, US), 9232 (F); slope with *Quercus* and *Pinus* along the creek "Chenek' Ha" near Amatenango, Municipio of Amatenango del Valle, 5700 ft, 28 Jul 1967, fr, A. Shilom T. 2692 (F); steep slope with *Quercus*, *Pinus*, *Liquidambar*, *Podocarpus* and *Magnolia* along the ridge above Pueblo Nuevo Solistahuacán, municipio of Pueblo Nuevo Solistahuacán, 6500 ft, 15 Aug 1967, fl, A. Shilom T. 2889 (F); 3 mi W of Pueblo Nuevo Solistahuacán, 9 Sep 1963, fl, R. A. Marin 88 (F); Chiapas, along Rt 195, 5 km N of Soyalo, Mpio. Bochil, 1483 m, 16°54.27'N, 92°55.54'W, shrubs ca 1 m tall on shrubby slope, leaves pinnate to bipinnate, 15 May 2006, fl, J. Wen & E. Martinez 8707 (US). CHIHUAHUA: Mpio. De Batopilas, Barranca de Batopilas, vicinity of La Bufa, Arroyo Bakosiachi, Nov 1973, young fr, R. A. Bye 5952 (NCU); Sierra Charuco, Rio Fuerte, 22 Jul 1935, fr, upper Sonoran, canyon, H. S. Gentry 1516 (F); Guayanopa Canyon, Sierra Madre Mts., 24 Sep 1903, fl, 3600 ft, M. E. Jones s.n. (US); Majarachic, 7 Sep 1939, floral buds, I. W. Knobloch 5802 (MSC); Rio Bonito, Dec 1936, fl, H. LeSueur 1153 (F), 1154 (F); Candamena Barranca transect on road from Cruz Verde to CandamenaRiver, 28°06'40"N to 28°20'30"N,

108°17'W, 5500-3250 feet, from pine-oak woods at 7000 feet to thorn forest & riparian *Platanus-Sassafridium* assn. at 3250 feet, 18 Mar 1986, fr, but leafless, *P. S. Martin et al.* 78 (RSA); Mpio. De Madera, Rio Sirupa, 44 km al Se de Madera, 29 Sep 1982, young fr, *P. Tenorio L. 1881* (MEXU); woods of *Acacia*, *Quercus*, *Garrya*, *Juniperus* et al., on limestone hills 3 mi NW of Comitán, 5700 ft, 10 Aug 1962, fl, *G. L. Webster et al.* 12906 (MO). COLIMA: Desviación cerca Río Salado, 5 Dec 1959, fl, *F. Miranda 9068* (MEXU). DURANGO: Mpio. El Mezquital, camino de El Mezquital a Temoaya, 193\0 m, 22 Jan 1987, fl, *M. Gonzalez & S. Acevedo 2163* (MEXU); Sianori, 1924, *J. G. Ortega 5388* (US); San Ramon, 21 Apr – 18 May 1906, fr, *E. Palmer 110* (F). GUANAJUATO: el Baral Blanco, ladera S, municipio de Tarimoro, orilla de arroyo con vegetación de matorrales secundarios, 2300 m, 25 May 1987, fr, *H. Díaz-Barriga 3739* (F). GUERRERO: Llano, 4 m high, local, Manchon, Mina, 28 Sep 1936, in fl., *G. B. Hinton et al.* 9605 (P, RSA, US, 2 sheets); Montes de Oca, Vallecites, oak woods, 2 m shrub, 30 Sep 1937, fr, *G. B. Hinton 11440* (RSA, US); Arroyo, tree 3 m, fls white, Manchon, Mina, Dec 1937, fr, but leafless, *G. B. Hinton et al.* 11295 (RSA, US, 2 sheets); Apaxtla, Sep 1926, late fl, *B. P. Reko 4977* (US). JALISCO: Salcillo, 1 Jun 1892, fr, like elder, a bush, *M. E. Jones 25* (US); bluffs of Barranca, 20 May 1891, fr, *C. G. Pringle 5144* (US); barranca of Guadalajara, 28 Sep 1891, sterile, *C. G. Pringle s.n.* (US); on road between Bolaños and Guadalajara, 21 Sep 1897, late fl, *J. N. Rose 3049* (US); Guadalajara, shrub or small tree growing on or among rocks, hillsides near the Rio Grande de Santiago, 27 km E of Guadalajara, 5200 ft, 26 Aug 1941, sterile, *W. & M. Leavenworth 1898* (F). MEXICO: District of Temascaltepec, Puerto Salitre, 1300 m, 20 Sep 1932, fl, 3 m high, *G. B. Hinton 1789* (G); Tenayac, Temascaltepec, 1500 m, 15 Aug 1933, fl, rocky hill, 3.5 m high, 1500 m, *G. B. Hinton 4430* (BM, F); Tenayac, 1520 m, 24 Nov 1933, fr, *G. B. Hinton 5141* (F). MICHOACAN: oeste de Santa Gertrudis, municipio de Zacapu, matorral pedregoso, ladera de cerro, 2000 m, arbusto de 2.5 m de alto, 18 Jan 1989, fl & young fr, no leaves, *A. Grimaldo N. 511* (F)). MORELOS: Xochitepec, Nov 1934, fr, *J. Elcoro 1152* (US); Sep 1935, fl, *J. Elcoro 1153* (US); hills, Cuernavaca, 5000 ft, Oct – Nov 1895, in fr., *C. G. Pringle 6237* (BM, F, G, LE, MSC, P, 2 sheets, US, 2 sheets, WU). OAXACA: San Felipe, village north of Oaxaca, valley of Rio San Felipe (also called Toma) on slope of San Felipe Mountain, 5700-7200 ft, 7 Mar 1949, fr, no leaves, *M. C. Carlson 1355* (F); Cerro San Felipe, 2100 m, 7 Mar 1898, fl, *C. Couzatti & V. Gouzaley 674* (US); vicinity of Cerro Zempoaltepetl, along trail from Tlahuitoltepec to Santo Domingo Albarradas, 18-25 km west-southwest of summit, upright spreading shrub to 5 m, in lowland Bursera scrub woodland, 1400 m, 16 Aug 1950, fl, *B. Hallberg 984* (US); Oaxaca, 2000 m, Oct 1902, fr, *Herrera s.n.* (G); Distrito Teposcolula, Mpio. Yolomecatl, 4.5 km de Yolomecatl, sobre la carretera de terracería a Nicananduta, 17°29'44.8", 97°37'0.5", 2250 m, plant highly pubescent, bosque de *Pinus*, *Quercus* y *Juniperus*, 10 Apr 2003, fr, *J. Ismael C. 23891* (MEXU); valley of Oaxaca, 6000 ft, 20 Sep 1894, fl, *E. W. Nelson 1435* (US); hills near Tamazulapam, 7800 ft, 13 Nov 1894, sterile, *E. W. Nelson 1952* (US, 2 sheets); hills near Oaxaca, 6000 ft., 3 Dec 1895, in fl & young fr, leaves bipinnate, 5-8 ft, *C. G. Pringle 6173* (F, G, P, RSA, US, 2 sheets, WU); Monte Alban, near Oaxaca City, 5500-6000 ft, 23 Oct 1894, young fr, *C. L. Smith 898* (US); Oaxaca, San Felipe, Toma de Agua, 1729 m, 17°6.916'N, 96°42.628'W, in remnant forest of *Pinus*, *Taxodium*, *Anona*, *Ipomoea*, and *Alnus*, 13 May 2006, *J. Wen & E. Martínez 8679* (US, 2 sheets). PUEBLA: approx. 4 km al S de Xochiltepec, 7 km al N de San Luis Atolotitlán, arbol de 2.5 m, frutos morados, 23 Mar 1982, fr, *F. Chiang C. 2291* (MEXU, RSA); 6 km al E de San Luis Atolotitlán, por la terracería rumbo a Caltepec, 18 11'N, 97 25'W, 2200 m, cerro pedregoso rojizo, con *Senecio praecox*, *Ipomoea murucoides*, etc, 8 Jun 1985, fr, *F. Chiang et al. F-2594* (F, G); Cerros calizos al NE Tehuacán, 1750 m, 21 Feb 1986, fr, no leaves, infl. pubescent, *A. Salinas T. et al. F-3144* (MEXU, MO). SINALOA: Mpio. Sinaloa de Leyva ceros de alrededor de la finca de adobe y los laurels, 1350 m, 26 Feb 1988, fl, *G. Bojórquez & H. Aguiar 545* (MEXU); Balboa, Jan 1923, young fr, *J. G. Ortega 5051* (US); Mpio. Badiraguato a 56 km de Badiraguato rumbo a Surutato, bosque tropical caducifolio, 1000-1200 m, 8 Dec 1987, fr, *R. Vega et al. 2645* (MEXU). SONORA: San Javier, a 1 km de la Carr. Fed. 16, 28°34'48"N, 109°44'42", 750 m, 12 May 1993, fl, *A. Búúrquez 93-111* (MEXU); San Javier, Microondas en el Cerro El Durazno, 28°36'43",

109°45'25", 1075 m, A. *Búurquez & D. Yetman 95-213* (MEXU); Sierra de Alamos, Canon La Huerta (eastern tributary of Canon Agua Escondida), 26°59'N, 108°59'W, 1300 m, growing in canyon bottom in riparian forest with *Eysenhardtia*, *Lysiloma watsoni*, *Montanoa rosei*, *Guardiola platyphylla*, and *Quercus tuberculata*, 8 m tall tree with gray fissured bark and greensish perianth, uncommon, 19 Mar 1994, fl, M. *Fishbein et al. 1617* (MEXU); 5.5 mi E of Nacozari International Airport, 30°28'N, 109°29'W, rock outcrop, *Quercus-Arctostaphylos*, 5000 ft, L. *Nash & E. Lehto L19400* (ASU); vicinity of Alamos, high up in Sierra de Alamos, 19 Mar 1910, young fr & fl, J. N. *Rose et al. 13097* (US); Cerro del Capulin, northwest of Aribabi, 6100 ft, 4 Sep 1939, floral buds, S. S. *White 2728* (MEXU); La Mina Verde 31 kilometers de Cumpas, 23 Sep 1934, fr & fl, I. L. *Wiggins 7415* (US); Sonora, locality unknown, 1890, C. V. *Hartman 143* (US). VERACRUZ: Maltrata, Jan 1883, E. *Kerber 266* (LE, US). Mexico locality unknown, May 1842, Pl. Mexic. Liebm. 1270, Araliaceae n. 32, leaves very pubescent, C. L. *Felipe 1270* (US); Mexico, Chapuleo, Dec 1841, fl & young fr, leafless, *Liebmann 12135* (F). **Nicaragua.** ESTELI: N slope of Cerro Tamabú, 13°02'N, 86°17'W, 1200-1400 m, roadside pasture and grazed oak forest, with a few scattered pines above, 16 Oct 1979, W. D. *Stevens 14925* (BM). JINOTEGA: southwest of Jinotega, along road to La Cantera and Los Pinos, in region of pine forest, 1050-1350 m, moist thicket, shrub 2 m, scarce, 25 Jun 1947, sterile, P. C. *Standley 10160* (F); ca. 4.7 km S of Jinotega (square) on old road to Hwy 3 near Matagalpa, then along road to city dump and abandoned mine, 13°02'N, 86°00'W, 1150-1250 m, open pine-oak forest on steep rocky slopes, 25 Aug 1978, W. D. *Stevens 10139* (BM). **U.S.A.** ARIZONA: Cochise Co., Dragoon Mts., Stronghold Canyon East along USFS Trail 279, 5000-5200 ft, dry riparian zone in mixed oak woodland and oak chaparral on gravelly granite slopes, with *Quercus*, *Garrya*, *Cupressus*, *Pinus*, *Arbutus*, and *Juniperus*, subshrub to 5 dm, infrequent, 7 Sep 1983, fl, T. F. *Daniel 2993* (ASU); Mule Mountains, west side, 14 Sep 1961, fl, L. N. *Gooding 258-61* (NCU); Dragoon Mountains, Stronghold Canyon East, 1/6 mi up first major canyon coming into Stronghold Canyon from FS Road, just above first waterfall, 1540 m, boulderly canyon, local, rare, shrub 4 ft

tall, berries maroon-purple, juicy, 8 Nov 1991, mature fr, W. *Hodgson 6433* (ASU, DES); Dragoon Mts., Cochise Stronghold, 5000 ft, 18 Sep 1936, late fl, S. W. *Hutchinson 7321* (CAS, RSA); Huachuca Mts., 4 Sep 1903, 7000 ft, M. E. *Jones s.n.* (NY); Texas Canyon, decomposing granite, 5200 ft, E. *Lehto 2154* (ASU, NCU); Huachuca Mts., Aug 1882, *Lemmon Herb. 2616* (G), *Lemmon Herb. 2716* (BM, F, G, LE, P, US); southern Huachuca Mountains, top of Montezuma Peak, oak and pinyon, 7000-7600 ft, 16 Jul 1990, sterile, B. D. *Parfitt 4387* (ASU); southern Huachuca Mountains, canyon above Yaqui Spring, 6000-6300 ft, 16 Sep 1990, fr, B. D. *Parfitt & C. M. Christy 4696* (ASU); 16 Sep 1990, fl, B. D. *Parfitt & C. M. Christy 4698* (ASU); Mule Mountains, Banning Creek Canyon, ca. 2.5 miles northwest of the tunnel at Bisbee on hwy 80, O. F. Clarke property on the steep rocky slopes below Juniper Flats, oak woodland with *Quercus emoryi*, *Q. arizonica*, *Agave parryi*, *Dasyllirion*, *Eragrostis*, *Andropogon*, etc, 5600 ft, 31 Aug 1984, fl, A. C. *Sanders et al. 5195* (TEX); Texas Canyon, ca. 70 miles E of Tucson on I-70, dry habitat with large boulders, mixed with *Quercus* sp., 18 Sep 1999, young fr, shrub ca. 3 m tall, J. *Wen 4974* (CS, F, US); near Fort Huachuca, Aug 1894, fr, T. E. *Wilcox 309* (US). Pima Co., shady canyons, W slope of Baboquivari Peak, 30 Sep 1944, fl, O. M. *Clark 12555* (NY); Toro Canyon, Baboquivari Mts., 29 Aug 1931, fl, M. F. *Gilman 39* (NY); on shaded slope in canyon about 1 mile above guest house, western side of Mt. Baboquivari, 4000 ft, 6 Oct 1944, fl, F. W. *Gould et al. 2681* (NY, US); Sycamore Canyon, Baboquivari, 22 Oct 1945, young fr, L. N. *Gooding 230-45* (NY); Baboquivari Mts., 19 Sep 1931, M. E. *Jones s.n.* (BM, DS, RSA); Baboquivari Mts., Thomas Canyon near Max Seep & Broken Trough Spring, rare on shaded slope above canyon bottom, 5200 ft, 22 Sep 1982, fl, M. *Mittleman 550* (ASU); Stone Cabin Canyon, Santa Rita Mountains, 5000 ft, 12 Sep 1903, fr, J. *J. Thornber 182* (ASU, NY). Santa Cruz Co., on shaded rocky slopes, 4000 ft, Sycamore Canyon, near Ruby, 30 Sep 1944, fl, R. A. *Darrow & H. S. Haskell 2023* (NY); Santa Rita Mts., 25 Aug 1903, 4500 ft, M. E. *Jones s.n.* (BM, NY); AZ 289 S of Pena Blanca Rec. area, among big whitish boulders, grassland with *Quercus emoryi*, *Q. oblongifolia*, *Arctostaphylos pungens*, *Rhus choriophylla*, and *Mimosa dysocarpa*, 8 Sep 1976,

fl. *L. McGill & E. Lehto L20373* (ASU, NY, US).

Smith (1944) indicated that *Aralia humilis* occurs in southern New Mexico and Arizona to Guatemala. Frodin and Govaerts (2003) indicates the distribution from southern New Mexico, southern Arizona, Mexico to C. America. So far I have not seen any collections from New Mexico and the species was not recorded in floras of New Mexico by Wooten and Standley (1915) and Martin and Hutchins (1980). Within the U.S., the species appears to occur only in Arizona.

There seems to be no specimens in the Sessé & Mociño herbarium corresponding to the original material of *Aralia chilapensis*. The watercolor plate of "*Aralia chilapensis* Sp. N.", accession number 6331.0246 in the Torner Collection of Hunt Institute for Botanical Documentation, Pittsburgh is herein selected as the lectotype. The Torner plate bears the number "346" near the top (also see Field Museum negative 30658, designated as "S. + M. Pl. 346"). A print of 30658 is now at the US National Herbarium with the courtesy from the Field Museum Herbarium.

Pentapanax mexicanus C. B. Shang & X. P. Li was described based on *Pringle 4366* collected from Zapotlan, Jalisco, Mexico (Xiang and Li 1990). The holotype was indicated to be at PE, and no isotypes were cited in the original description. I examined a specimen of *Pringle 4366* at P, indicated by the senior author C. B. Shang as the holotype; and I also failed to locate any specimen of *Pringle 4366* at PE. In an earlier draft of the paper by Xiang and Li (1990) distributed by the junior author, the holotype of the species was indicated to be at P. It seems that "PE" was a misprint of "P" in the protologue when the holotype was indicated. This raises an intriguing issue on whether the name *Pentapanax mexicanus* is valid, as the holotype was not in the herbarium as indicated in the original description. Nevertheless, *Pringle 4366* clearly is a specimen of *Aralia humilis*.

My delimitation of *Aralia humilis* is the same as that of Smith (1944). Standley (1924) recognized *Aralia pubescens* as from Sonora to Oaxaca of Mexico based on pedicel pubescence. Nevertheless, he suggested that *A. pubescens* may be a synonym of *A. humilis* (Standley 1924, p. 1081). I examined the collections across Mexico and also made field observations in Mexico and

Arizona. Initially I attempted to recognize three entities within the current concept of *Aralia humilis*. These three entities include *Aralia humilis* s. s. from southern Arizona and northern Mexico (Chihuahua, Durango, Sinaloa, and Sonora), *Aralia pubescens* from Jalisco, Michoacan, Oaxaca, Puebla and Colima of Mexico with pubescent and more or less shorter pedicels, and *Aralia chilapensis* widespread in central to southern Mexico, Guatemala, Honduras, and south to Nicaragua with glabrous and somewhat longer pedicels. Clearly these distinctions have lots of intermediates and the narrower species concept will make it difficult practically to identify taxa in Oaxaca, Jalisco and Puebla where both "*Aralia chilapensis*" and "*A. pubescens*" and their intermediate forms occur. I herein treat *Aralia humilis* as a variable species especially concerning its pubescence and length of pedicels and leaflet shape. Most likely *Aralia humilis* may be the progenitor of both *Aralia regeliana* and *A. scopulorum*. Based on the leaf architecture and leaflet morphology as well as geographic distribution, *Aralia regeliana* may have derived from the bipinnate forms of *Aralia humilis* from central to southern Mexico; and *A. scopulorum* of Baja California may be a derivative of *A. humilis* from northern Mexico. Detailed phylogeographic analyses are needed to construct the speciation history of *Aralia* sect. *Humiles*.

17. *Aralia regeliana* Marchal — Fig. 46; color plate 13: C-F.

Aralia regeliana Marchal, Bull. Acad. Roy. Sci. Belgique, ser. 2, 47: 73. 1879. TYPE: **Mexico**. TAMAULIPAS: Tanque Colonada ad Victoria, Aug 1842, *Karwinsky 777* (holotype: LE!).

Deciduous shrub 1-4 m tall. Stem grayish brown, branchlets terete. Leaves 10-20 cm long, 7-13 cm wide, bipinnate or mixed with pinnate ones, with 3-7 leaflets, accessory leaflets absent; stipule 2.5-3.5 mm long, 1.2-1.5 mm wide, adnate to petiole base, lanceolate in outline, ciliate at margin; petioles 3-8.5 cm long, glabrous; leaflets (2) 3-6 cm long, 2-3.8 cm wide, chartaceous, broadly ovate to ovate, acuminate at apex, subcordate to truncate at base, symmetrical, sparsely serrate at margin, teeth often callose-tipped, lateral veins 6-7, conspicuous above and below, abaxial

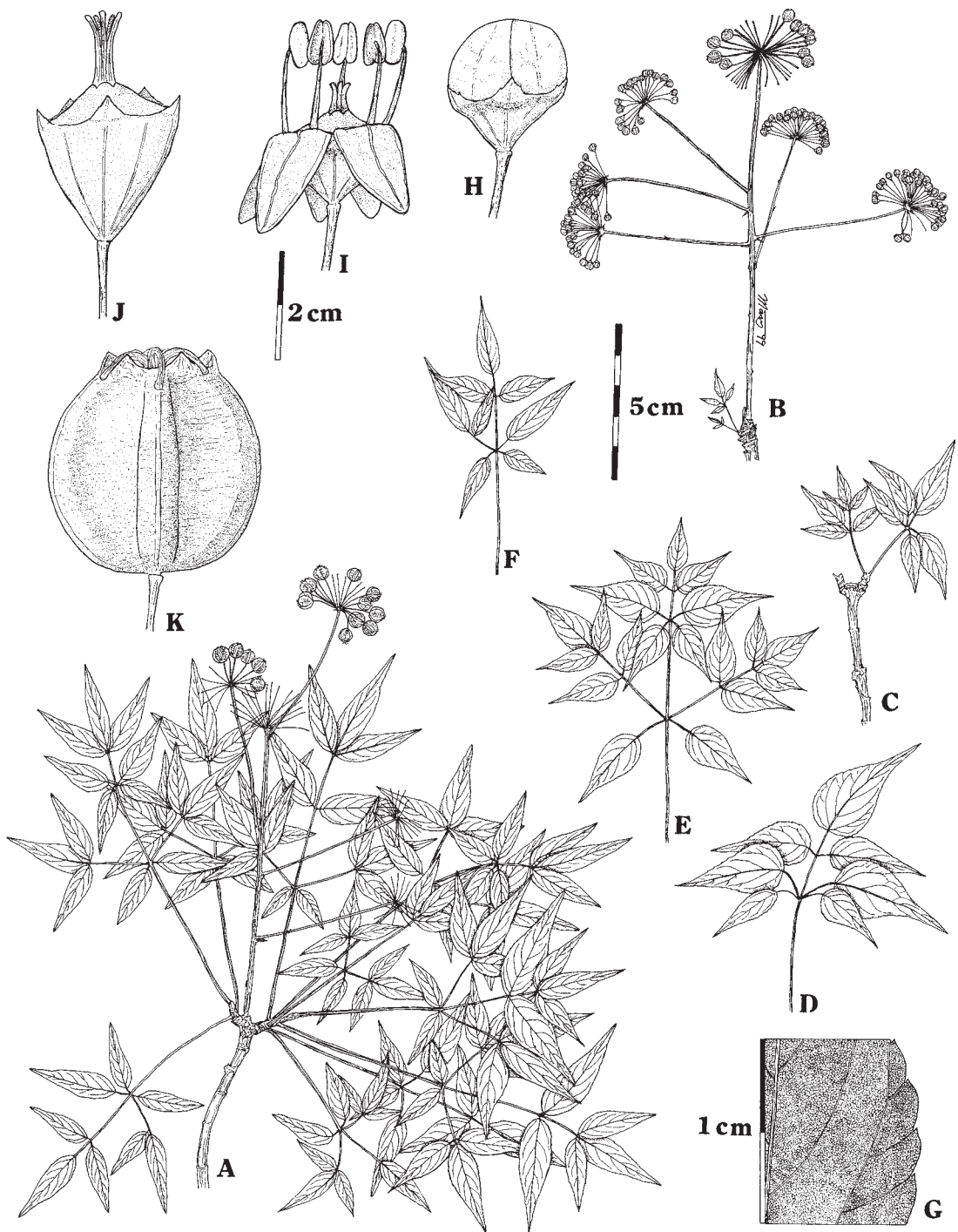


Fig. 46. *Aralia regeliana* Marchal. A. Habit with leaves, stem and inflorescence. B. Inflorescence. C. Leaves on upper portion of stem, showing leaf variation in architecture. D. Leaf with accessory leaflets. E. Bipinnate leaf with accessory leaflets. F. Leaf. G. Lower leaf surface and teeth at margin. H. Floral buds. I. Flower. J. Flower after anthesis. K. Fruit.

and adaxial surface glabrous, or occasionally with a few scattered hairs on the veins on the upper surface, petiolules 1.5-8.5 mm long, glabrous. Inflorescence 6-15 cm long, 5-11 cm wide, terminal at the branch apex, pilose, consisting of 3-10 primary branches arranged on a main axis; inflorescence bracts 5-8, arranged spirally at the base, 5-7 mm long, 3-4 mm wide, not persistent, narrowly triangular in shape, brown in color; each primary branch with 1-3 umbels with the terminal umbel well developed and the lateral ones poorly developed or aborted, terminal umbels with 25-35 flowers, lateral umbels 15-25 flowered, peduncles 1.5-3 cm long; pedicels pilose, slightly enlarged at the tip, pedicels of the main terminal umbel at the tip of each inflorescence 12-16 mm long, those of the terminal umbel of primary branches 7-12 mm long, those of lateral umbels of 5-7 mm long; bracts of primary branches 5-7 mm long, 2-3.5 mm wide, narrowly triangular to lanceolate, ciliate at margin; bracteoles 2-3 mm long, 0.8-1 mm wide, lanceolate, ciliate at margin. Sepals 0.3-0.4 mm long and wide, rounded to triangular; petals 2.1-2.3 mm long, 1.3-1.5 mm wide, ovate; stamens 5-6, filaments 2.3-2.5 mm long, anthers 0.6-0.7 mm long, ovate; styles 5-6, ca. 1.0 mm long after falling off of petals, divided; floral disk projected. Fruits 6-6.5 long, 5.2-5.5 mm wide, ovoid globose, black with purple juice, persistent styles 1.2-1.5 mm long, divided up to the base. Seeds 4.7-5 mm long, 2-2.2 mm wide, 1.5-1.6 mm thick, kidney-shaped.

Common name: jamoncillo (Tamaulipas, Mexico).

Phenology: flowering from February to March; fruiting in April to June, also in October.

Distribution: endemic to Mexico (Coahuila, Durango, Guanajuato, Hidalgo, Queretaro, San Luis Potosi, and Tamaulipas) (Fig. 47).

Ecology: in canyons, limestone hill slopes, open limestone ridges, steep rocky slopes; 1250-3138 m.

Additional specimens examined: **Mexico.** COAHUILA: Sierra de Jimulco and up to 3 km N of Mina San Jose which is 8 km NE of Estacion OTTO, 25°6'30"-8°30"N, 103°13'30"W, 1800-3138 m, mat. Esp. lat. – chaparral on higher slopes, steep to very steep slopes of limestone in places highly mineralized calcareous, assoc. with *Acacia berlandieri*, *A. crassifolia*, *Fouquieria*, higher is

Quercus spp., 27 Sep 1972, in fr., *F. Chiang et al.* 9549b (MEXU, TEX); ca. 26 (air) miles SW of Torreon in Sierra de Jimulco, ca. 6 (air) mi SSW of La Rosita, along trail to summit, on open limestone ridge between two canyons, just below oak forest, with *Artemisia*, *Agave*, *Daslirion*, *Opuntia*, *Cercocarpus*, *Croton*, *Cordia*, and grasses, small gnarled tree, to 6 inches in diameter, 4 ft tall, 6 ft wide at crown, fls yellowish, 8200 ft, 18 Sep 1973, in fr., 25°10'N, 103°15'W, *J. Henrickson* 13172 (MEXU, RSA, TEX); Sierra de Jimulco, N-facing cliffs, NW-facing notches, 25°11'N, 103°12'W, 1600-2150 m, mostly chaparral, lower some matorral desertico, limestone, assoc. with *Fraxinus greggii*, *Lindleya*, *Agave parrasana*, *Bonnetiella anomala*, and *Juniperus* sp., 27 Jun 1973, in young fr. & late fl., *M. C. Johnston et al.* 11484 (LL, MEXU, MO); Sierra de Jimulco, Mina San Jose, ca. 10 km al NE de la Flor de Jimulco, 103°13'30"W y 25°6'30"N, 2150 m, veg. Matorral de *Acacia crassifolia*, *A. berlandieri*, *Lindleya mespiloides*, *Cercocarpus mojadensis* y *Vauquelinia californica*, 25 Aug 1988, veg., *J. A. Villarreal* 4377 (TEX); 25 Aug 1988, in fr., *J. A. Villarreal* 4388 (TEX); Sierra de Jimulco, mina San Jose, vereda hacia la cima, 25°08'N, 103°13'W, matorral de *Bonetiella*, *Agave lechuguilla*, *Acacia berlandieri*, *Flourensia*, *Hechitiia*, and *Spiraea*, 1800-1850 m, 10 Aug 1994, fr., *J. A. Villarreal* 7807 (MEXU, TEX, 2 sheets). DURANGO: northwestern third of Sierra del Rosario, 25°42' – 25°45'N, 103°57' – 104°00'W, 1800-2655 m, chaparral on top, steep limestone sierra with some zones of igneous mineralization, limestone derived gravel, assoc. with *Garrya*, *Rhus virens*, *Arctostaphylos*, and *Agave macroculmis*, rare, 25 Jun 1973, fl. & young fr., *M. C. Johnston et al.* 11466 (LL, MO). GUANAJUATO: Puerto de La Calera, Mpio. De Atarjea, 1900 m, 12 Jul 1990, fr, *E. Ventura & E. Lopez* 8241 (MEXU). Cerro de Veracruz, Mpio. Atarjea, 16 May 1990, fr, 1250 m, *E. Ventura & E. Lopez* 7998 (MEXU). HIDALGO: Barranca de Venados, al principio, a 1 km de Paso de León, 1800 m, 3 Jun 1976, fr, *A. Delgado S. & R. Hernández* 239 (MEXU, 2 sheets). Barranca de Venados, mpio de Atotonilco el Grande, planta arbustiva, de 1-2 m, 1900 m, 8 May 1981, fr, *R. Hernández* M. 6058 (MO). 3 km al SE de Venados, 2 Nov 1975, *F. Gonzalez* M. 8408 (MEXU); Municipio Cardonal, Barranco Tolantongo, El Marmo, the third curve from the



Fig. 47. Map of Mexico showing the distributions of *Aralia regeliana* Marchal and *A. scopulorum* Brandegee.

bottom of Grutas de Tolantongo, limestone slope, rocky, 1550 m, 21 Mar 1988, fl., *J. Wen & E. Martinez S. 384* (OS, US). QUERETARO: ca. 80 km NE of Querétaro, lower limit of piñon-juniper belt in dry mountains above Pilón on road to Pinal de Amoles, 2700 m, occasional on N slopes of barranca, 24 Apr 1949, in fl. & young fr., *R. McVaugh 10348* (BM, LL, 2 sheets, MEXU, MO, TEX, US). SAN LUIS POTOSI: Minas de San Rafael, May 1911, *C. A. Purpus 5010* (BM, E, MO, US), *5011* (BM, MEXU, MO, US); Guadalcázar, 6 km al W del Crucero carr. Matehuala-Noria de las Flores, Cañada a mano, izquierda hacia Noria de Las Flores (frente cerro Chirrion), arbolito de 4-5 m, con fr., 27 Jun 2000, *R. Torres Colin 15689* (MEXU, TEX). TAMAULIPAS: Mpio. Miquihuana, Loc. Rincón de las Vacas, 7 km de Miquihuana, entre Miquihuana y la Perdina, 1870 m, pinar de *P. cembroides* en laderas N, arbusto de 4 m, escasa, blanco-verdosas, 23 May 1974, fl., *F. González-Medrano 7029* (RSA); 18 km by winding road SE of Bustamante toward La Presita and Tula, 23°20'N, 99°40'W, 1700 m, Pinar, gypseous limestone slope, calcareous gypseous gravelly soil,

assoc. with *Pinus nelsonii*, *Arctostaphylos*, *Coldenia*, *Ilex*, and *Lindleya*, 20 May 1973, in fl., *M. C. Johnston et al. 11149* (LL, MO); Jaumave Valley, ca. 2000 ft, 1 Jun 1898, *E. W. Nelson 4463* (US); 5.8 mi N of Rte. 101 on road to Bustamante, 23°20'N, 99°41', 2100 m, matorral/chaparral, limestone mountains, associated with *Quercus* spp., *Dasylyrion*, *Juniperus*, *Brahea*, *Agave*, *Rhus*, *Dalea*, *Cowania*, *Ephedra*, *Mortonia*, and *Pinus nelsonii*, 26 May 1974, in fl., *T. Wendt & F. Chiang 185* (TEX). Tamaulipas, Felipe Angeles Ojo de Agua San Jose, 2-3 km al W de Ejido, Municipio. Bustamante, 1600 m, matorral alto subinermes, arbol 2 m, 5 Oct 1985, *R. Diaz 00494* (MO). Mexico, La Miquiguana, 1841-42, *Karwinsky 1248* (LE).

Aralia regeliana is characterized by its glabrous and bipinnate leaves with ovate leaflets having a long acuminate apex. It is noted that *E. Ventura & E. Lopez 9217* (el Pinalito Redondo, por Carricillo, Mpio. De Atarjea, Guanajuato, MEXU) appears to be *A. regeliana*, yet they have pubescent leaflets. Because this collection was from transitional zones

of *Aralia regeliana* and *A. humilis*, it may represent a hybrid of the two species.

18. *Aralia scopulorum* Brandegee — Fig. 48; color plate 13: A-B.

Aralia scopulorum Brandegee Proc. Calif. Acad. Sci. 2:165. f. 8. 1889. *Pentapanax scopulorum* (Brandegee) C. B. Shang in Y. W. Yuan & al. (eds.), Proc. Intern. Symp. Bot. Gard. 1990: 630, 1990. TYPE: **Mexico**. BAJA CALIFORNIA SUR: Comondu Canon, common on rocks, 12 Mar 1889, fl & young fr, *T. S. Brandegee s.n.* (holotype, UC!; isotypes, A!, GH!, GH photo!, PH!, US!).

Deciduous shrub to small tree 1.5-8 m tall. Stem grayish brown, branchlet terete. Leaves 10-20 cm long, 7-13 cm wide, pinnate, with 3-7 leaflets, accessory leaflets absent; stipule 3-4 mm long, 1-1.5 mm wide, adnate to petiole base, lanceolate in outline, ciliate at margin; petioles 3-8.5 cm long, glabrous; leaflets (2) 3-6 cm long, 2-3.8 cm wide, chartaceous, broadly ovate to ovate, acuminate at apex, subcordate to truncate at base, symmetrical, sparsely serrate at margin, teeth often callose-tipped, lateral veins 6-7 on each side, conspicuous above and below, abaxial and adaxial surface glabrous, or occasionally with a few scattered hairs on the veins on the upper surface; petiolules 1.5-8.5 mm long, glabrous. Inflorescence 6-15 cm long, 5-11 cm wide, terminal at the branch apex, pilose, consisting of 3-10 primary branches arranged on a main axis; inflorescence bracts 5-8, 5-7 mm long, 3-4 mm wide, not persistent, arranged spirally at the base, narrowly triangular in shape, brown in color; each primary branch with 1-3 umbels with the terminal umbel well developed and the lateral ones poorly developed or aborted, terminal umbels with 25-35 flowers, lateral umbels 15-25-flowered; peduncles 1.5-3 cm long; pedicels of the main terminal umbel at the tip of each inflorescence 12-16 mm long, those of the terminal umbel of primary branches 7-12 mm long, those of lateral umbels of 5-7 mm long, pilose, slightly enlarged at the tip; bracts of primary branches 5-7 mm long, 2-3.5 mm wide, narrowly triangular to lanceolate, ciliate at margin; bracteoles 2-3 mm long, 0.8-1 mm wide, lanceolate, ciliate at margin. Sepals 0.3-0.4 mm long and wide, rounded to triangular; petals 2.1-

2.3 mm long, 1.3-1.5 mm wide, ovate; stamens 5-6, filaments 2.3-2.5 mm long, anthers 0.6-0.7 mm long, ovate; styles 5-6, divided, ca. 1.0 mm long after falling off of petals, floral disk projected. Fruits 6-6.5 long, 5.2-5.5 mm wide, ovoid globose, black with purple juice; persistent styles 1.2-1.5 mm long, divided up to the base. Seeds 4.7-5 mm long, 2-2.2 mm wide, 1.5-1.6 mm thick, kidney-shaped.

Common names: sauco cimarrón, and sauchio.

Phenology: flowering from February to May; fruiting in April to June, also in October.

Distribution: Baja California (primarily in Baja California Sur), Mexico (Fig. 47).

Ecology: in canyons, deep canyon bottom, hillsides, among rocks, hill ridge, rocky slopes, volcanic rock outcrops, and also around high arid rims (in lesser stature); 200-1600 m.

Additional specimens examined: **Mexico**. BAJA CALIFORNIA NORTE: ca. 3 on southeast ridge, Cerro la Sandía, 28°24'N, 113°27.5'W, 1300 m, 24 Jan 1964, sterile, shrub ca. 2 m tall, *R. Moran 11545* (RSA, US); ca 10 individuals on north slope under cliff, ca. 2.5 mi east of La Sandía, 28°24'N, 113°25.5'W, 925 m, 25 Jan 1964, *R. Moran 11554* (LL). BAJA CALIFORNIA SUR: ca. 2 km SW of San Francisco de la Sierra, north side of Sierra Agua Verde, north-running canyon with *Dodonaea viscosa*, *Nicotiana glauca*, *Nolina beldingii*, *Perezia palmeri*, *Rhamnus crocea*, *Rhus integrifolia*, and *Washingtonia robusta*, N27°35', W113°02', 1150 m, sympodial tree to 6 m tall, as broad, 20 Feb 1994, fl, *M. A. Baker et al. 11308* (ASU); dry, rocky, broad bed of Arroyo Carrizal, east of Rancho El Horno (NE of San Xavier), 550-700 m, 25°53'N, 111°31.5'W, *A. Carter & R. Ferris 3816* (MEXU, MO, TEX); Sierra de la Giganta, La Victoria, 540 m, 25°52.5'N, 111°25'W, 20 Mar 1960, *A. Carter & R. Ferris 3893* (BM, MEXU, MO, TEX); deep, vertical-walled canyon, Aguaje de los Encinos (S side of Cerro Giganta), 26°5'N, 111°35'W, 850 m, 27 Mar 1960, in young fr., *A. Carter & R. Ferris 3984* (BM, MEXU, MO); volcanic rock outcrops, vicinity of La Tinaja, Mesa de San Alejo (west of San Javier), 750 m, 25°51.5'N, 111°34.5'W, 10 Mar 1961, fl, *A. Carter & H. Sharsmith 4165* (MEXU); on steep north-facing canyon wall, La Esperanza, 25°48'N, 111°24.5'W, 20 Apr 1962, *A. Carter 4393* (BM,

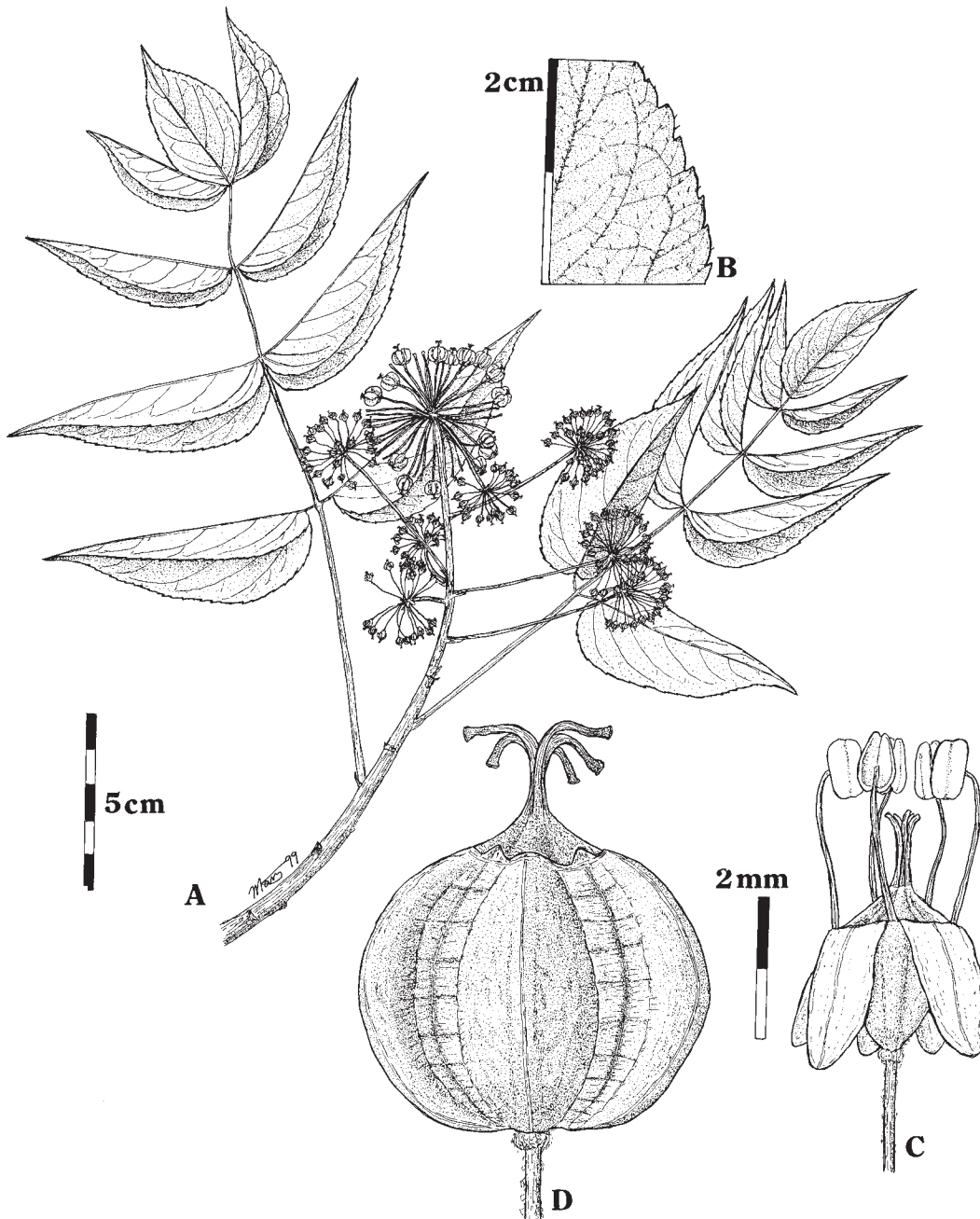


Fig. 48. *Aralia scopulorum* Brandege. A. Habit with leaves and inflorescence. B. Close-up of leaf margin and lower leaflet surface. C. Flower. D. Fruit.

MEXU); Canada south of Rancho de Los Encinos, Valle de Los Encinos (south side of Cerro Giganta), 26°3.5'N, 111°35'W, 7 Jun 1963, A. Carter & J. Reese 4565 (BM, MEXU, MO); south-facing slope of Cerro del Pinto, N of Portezuelo de San Antonio, headwater of Arroyo el Coyote (SE of La Soledad and N of Cerro Mechudo, 850 m, 24°50.5'N, 110°44'W, 21 Feb 1970, fl, A. Carter 5453 (MEXU); Sierra San Francisco, southwest edge of Mesa San Jorge, ca. 8 km southwest of San Francisco and 13 km WNW of Santa Marta, near 27°33.5'N, 113°05.75'W, 9 Jun 1984, fr, 800 m, J. Dice et al. 507 (RSA); Sierra San Francisco, SW edge of Mesa San Jorge, ca. 8 km SW of San Francisco de la Sierra, near 27°33.5'N, 113°05.75', 800 m, 24 Jun 1986, young fr, J. C. Dice et al. 680 (MEXU); Volcan de Lar Virgines, 1893, 1500 m, *Diguet s.n.* (P); La Champagna, Sierra de las Palmas, south of Santa Rosalia, 27-29 Apr 1952, in fl. & young fr., *Nolina* grassland over undulating, broken terrain of volcanic mountain top, 4500-5000 ft, treelet 4-6 m, with spreading crown, drought-pauperized leaves, & white flowers, H. S. Gentry & W. B. Fox 11806 (LL, MEXU); Los Encinos, Sierra Giganta, deep canyon bottom, 2500 ft, 27 Feb 1939, fl, H. S. Gentry 4262 (K, MEXU, MO, US); Sierra San Francisco, just southeast of town of San Francisco de la Sierra, 113°00'39.4"W, 27°35'23"N, 1200 m, rocky dry slopes and narrow drainages, frequent large shrub, 20 Apr 1994, fl, W. Hodgson 8121 (ASU); Sierra San Francisco, Canon Santa Theresa, ca. ½-¾ mile south of Arroyo Solidad, 113°04'14.2"W, 27°37'51.1"N, 515 m, in canon, north-south orientation, common shrub, called sauchio by local inhabitants, 21 Apr 1994, fr, W. Hodgson 8148 (ASU, DES); Arroyo Undo Ranch, Loreto, 26 Oct 1930, M. E. Jones 27094 (RSA); ca. Cucua "El Raton," 27°35'N, 113°03'W, 27 Jan 1989, young fr, 1420 m, J. L. León 3560 (RSA); summit, Cerro San Juan, rather scarce, from 950 m, 1250 m, 27°58'N, 113°00'W, 4 Feb 1964, fl, R. Moran 11586 (RSA); fairly common on lower north slope of Volcan las Tres Virgenes, seen from 800 m, 1100 m, tree to 8 m tall, trunk to 8 dm thick, or with several trunks from a base of 1 m, bark gray, 11 Apr 1973, in fl., 27°29'N, 112°36'W, R. Moran 20405 (ASU, LL, MO, NCU); fairly common, Cerro la Laguna, highest peak of Sierra San Francisco, seen 700-1500 m, 27°35'N, 113°02'W, 1450 m, 24 Nov 1976, sterile, R. Moran 23846 (MSC); Aguajidi Santana, 35 miles N of San Ignacio, 3400 ft, 4 Oct 1905, young fr, E. W. Nelson & E. A. Goldman 7189 (US); rocky slopes San Pablo, Santa Gertrudis, 1000-2000 ft, Jan-Mar 1898, C. A. Purpus s.n. (K, US, WU); rocky mountain flats at San Francisco de la Sierra, 27°36'N, 113°01'W, 28 May 1992, fl & young fr, J. Rebman et al. 1420 (ASU); Sierra Agua Verde, upper parts of the large canyon 1.5 miles to the west of the town of San Francisco de la Sierra, growing with *Condalia*, *Nolina*, *Polygala apopetala*, and palm trees, 113°02'W, 27°36'N, tree to 6 m tall, 6 Mar 1994, fl, J. P. Rebman 2372 (ASU, RSA); woods of *Bursera*, *Lysiloma*, *Aralia* et al., in east-facing ravine, hilly slopes W of Volcán Las Tres Virgenes, 200 m, 27°30'N, 112°38'W, 29 Mar 1989, fl, G. L. Webster 26161 (MEXU, 2 sheets); scrub and woodlands in the vicinity of Cueva de la Ratón, 4 mi SW of San Francisco de la Sierra, 1000 m, 27°24'N, 113°00'W, 25 Mar 1989, fl, G. L. Webster 26312 (MEXU); Camp and hillsides near Comondu, shrub 2 m high, stalks erect, 26 Apr 1931, young fr, I. L. Wiggins 5489 (RSA, US).

ARALIA SECT. *SCIADODENDRON* (GRISEB.) J. WEN

Aralia sect. *Sciadodendron* (Griesb.) J. Wen, comb. et stat. nov.

Sciadodendron Griseb., *Bonplandia* 6: 7. 1858. Type species: *Sciadodendron excelsum* Griseb.

Coemansia Marchal, *Bull. Acad. Roy. Sci. Belgique* 47: 94. 1879. *nom. illeg.*, non Tiegh. & Monnier in *Ann. Sci. Nat. Bot.*, Ser. 5, 17: 392. 1873.

Coudenbergia Marchal, *Bull. Acad. Roy. Sci. Belgique* 47: 514, 1879. Type species: *Coudenbergia warmingiana* (Marchal) Marchal.

Megalopanax Ekman ex Harms, *Notizbl. Bot. Gart. Berlin* 9: 122, 1924. Type species: *Megalopanax rex* Ekman ex Harms.

Unarmed glabrous shrub or tree, highly branched. Leaves tri- to bipinnate or quadripinnate. Umbels clustered into panicles, several inflorescences usually aggregated at tip of stem or a somewhat short branch, with persistent bracts at the base, pedicels articulated or non-articulated at

the base of the flower. Flowers 5-, 6- or 8-12-merous, styles connate or at least at the base, occasionally completely distinct. Fruits dark purple.

Five species from Central and South America.

Key to species of *Aralia* sect. *Sciadodendron*

1. Pedicels not articulated 2
 1. Pedicels articulated 3
2. Fruits subglobose, 6-7 mm long, peduncles relatively slender, 1-1.5 mm in thickness *A. excelsa*
 2. Fruits ovoid globose to globose, 7-8 mm long, peduncle stout, 2-3 mm in thickness *A. bahiana*
3. Ovary 5-locular *A. soratensis*
 3. Ovary 6-10-locular 4
4. Leaflets entire at margin, subcordate to less often rounded at base; peduncle of umbel thick, 3-5 mm in diameter; umbels 90-120-flowered; endemic to Cuba *A. rex*
 4. Leaflets sparsely serrate at margin, rounded at base; peduncle of umbel 1.5-2 mm in diameter; umbels 25-40-flowered; distributed in South America (Brazil and Paraguay, extending to Argentina) *A. warmingiana*

19. *Aralia soratensis* Marchal — Fig. 49; color plate 14: A-F.

MO!, NY!, US!, 2 sheets, photo at K).

Aralia soratensis Marchal, Bull. Acad. Roy. Sci. Belgique 47: 75. 1879. TYPE: **Bolivia**. LA PAZ: Prov. Larecaja, near Sorata, San Pedro, 2600 m, Mar 1860, fr, *G. Mandon 570* (lectotype, designated by Wen, 1993, P!; isolectotype, K!, W!).

Pentapanax angelicifolius Griseb., Abh. Konigl. Ges. Wiss. Göttingen 24: 144. 1879. *Coudenbergia angelicifolium* (Griseb.) C. B. Shang in Y. W. Yuan & al. (eds.), Proc. Intern. Symp. Bot. Gard. 1990: 632. 1990. TYPE: **Argentina**. TUCUMAN: near la Cruz, "Palo de San Antonia," hier höherer schlanker Baum, 22-25 Dec 1872, *P. G. Lorentz & G. Hieronymus 1173* (holotype, GOET!; isotypes, GOET!, 2 sheets).

Aralia? weberbaueri Harms, Repert. Spec. Nov. Regni Veg. 15: 254. 1917. TYPE: **Peru**. HUANCABELICA: Prov. Angaraes, left side of the river Huarpa, 2800-2900 m, Jun 1910, fr, *A. Weberbauer 5668* (lectotype, designated by Wen, 1993, A!; isolectotypes: G!, GH!, K!,

Tree 4-15 m tall, about 7-15 cm in dbh, polygamo-monoecious. Bark furrowed, gray. Leaves 80-125 cm long, 70-120 cm wide, bipinnate to tripinnate, sometimes pinnate near the inflorescence; stipule 3-5 mm long, 2-3 mm wide, adnate to the base of petiole, the free portion triangular to narrowly so, subcoriaceous, glabrous; petioles purplish green to light green, 20-50 cm long; rachises green, turning purplish, subtended by a pair of accessory 3-5-foliolate pinnae at the base of the first two lower pinnae and a pair of accessory leaflets at the upper pinnae; leaflets 5.5-10.5 cm long, 2.5-6.0 cm wide, glabrous, acuminate at apex, rounded, obtuse to subcordate, sometimes truncate at base, sparsely finely serrate to sometimes crenately serrate at margin, adaxial surface green, abaxial surface light green, petiolule 6-17 mm long, glabrous. Inflorescence terminal, consisting of an aggregation of 2-5 panicles on a short axis, each panicle 17-30 cm long, 10-20 cm wide, with 25-40 primary branches arranged racemosely on a main axis, primary branches 4-9 cm long, glabrous, each with 2-5 umbels, lateral

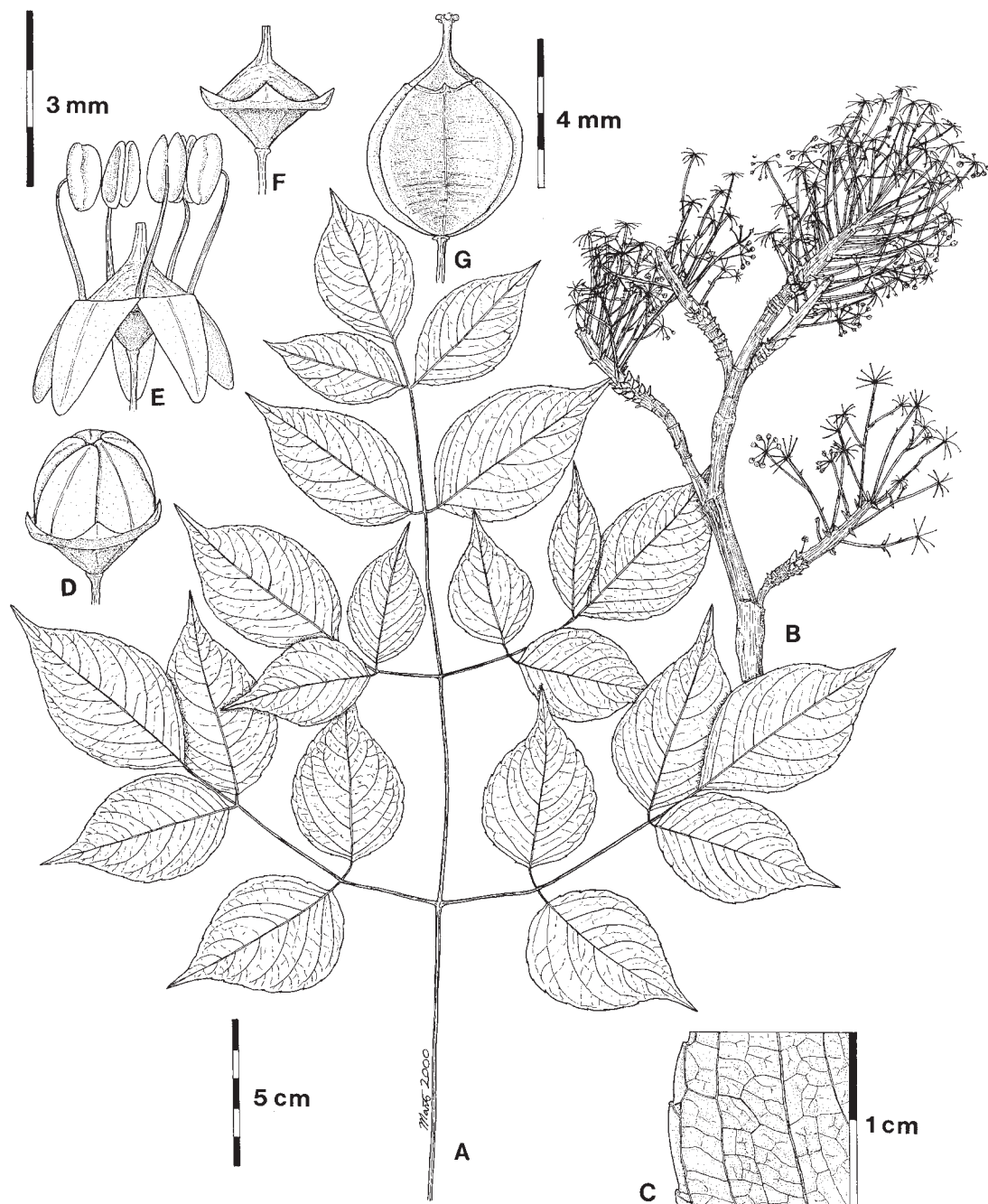


Fig. 49. *Aralia soratensis* Marchal. A. Leaf. B. Inflorescence. C. Close-up of lower leaflet surface and margin. D. Floral bud. E. Flower. F. Flower after anthesis. G. Fruit (A & C – Schnell 189, W; B - Vervoort & Cuezze 7632, W; D-F – Meyer s.n., 15 Sep 1967, W; G - Lorentz & Hieronymus 214, GOET).

umbels often aborted or functionally male, bracts and bracteoles persistent, glabrous, primary bracts (subtending the individual panicles) 3-5 mm long, 6-8 mm wide, triangular, subcoriaceous, secondary bracts 3.5-5 mm long, 2.5-4 mm wide, narrowly triangular, bracteoles 0.6-0.9 mm long, 0.4-0.6 mm wide, narrowly triangular; umbels 12-25-flowered, pedicels 5-9 mm long, glabrous, articulated near the base of the flower. Flowers yellow-green, nearly odorless, appearing at the same time as leaves; sepals minute, triangular; petals 2.1-2.3 mm long, 1.2-1.3 mm wide, greenish white, ovate; filaments 2.1-2.5 mm long, anthers 0.8-1 mm long, oblong; ovaries 5-locular. Fruits 4-5 mm in diameter, globose, blackish purple when mature, persistent styles slightly divided at the tip, connate 4/5 at the lower part, floral disc 2-3 mm in diameter at the fruiting stage, conspicuous.

Local names: sacha paraiso (Jujuy, Salta and Tucumán, Argentina), paraiso (Jujuy, Argentina), yapicay (by Guaraní tribe, Chuquisaca, Bolivia), and mara blanca (Santa Cruz, Bolivia).

Uses: firewood or making utensils (Potosí of Bolivia), medicinal (Chuquisaca, Bolivia).

Phenology: flowering in September to October; fruiting in December.

Distribution: northern Argentina, Bolivia, and Peru (Fig. 50).

Ecology: scattered in valley bottom and dry deciduous scrub on hillsides, open dry forests, premontane moist forest, slopes with semi-deciduous forests, and dry legume-dominated vegetation; 380-2900 m.

Additional specimens examined: **Argentina.** JUJUY: Jujuy, *Dr. Grisebach & Dr. Lorentz 11/77* (K); Dec 1878, fl, *Grisebach s.n.* (K); S. Lorenzo, Nov 1873, in fl., *P. G. Lorentz & G. Hieronymus 214* (GOET, 2 sheets, NY, US); Prov. Jujuy, Depto. Ledesma, Arroyo la Cantara in the Cerro de Calilegua, 16 km north of Calilegua, overhanging streambank, 600 m, 19 Oct 1938, fl, *W. J. Eyerdam & A. A. Beetle 22669* (K); Limite Camino, Salta – Jujuy, 1280 m, 15 Sep 1967, in fl., *F. Meyer s.n.* (W). Jujuy, 1913, *Schuel 189* (W). San Pedro, Cuesta de las Lajitas, 12 Nov 1978, fl, *A. L. Cabrera et al. 29806* (MO). Depto. Capital, Cuesta de Las Lajitas, 18 Nov 1980, fl, *A. L. Cabrera et al. 32084* (MO). SALTA: Dep Orán, Gartagal, 500 m, Oct 1940, fl., *Schreiter 11380* (A, U). Dep Orán,

Selva Tucumano-Boliviana, Rio los Sosa, ca. 60 km SW of Tucuman, N Argentina, subtropical rainforest, 700 m, 24 Nov 1967, late fl., *J. H. de Haas 886* (U). Dep. Oran, Vade Honde (Rio Zenta), 380 m, 26 Oct 1970, *P. Vervoorst & A. R. Cuezze 7632C* (GH, W). TUCUMÁN: San Pablo, 15 Jul 1888, sterile, *Lillo 163* (P). Tucumán, Yerba Buena, 650 m, tree 10 m tall, 16 Nov 1924, fl, *S. Venturi 1081* (US, 2 sheets) *1081b* (MO, US). Tucuman, Dep Rio Chico, Iseaba, 600 m, 20 Dec 1913, fl, *Monetti 1748* (NY). **Bolivia.** CHUQUISACA: Prov. Hernando Siles, zona de la Hacienda Naurenda, 83 km al S de Monteagudo, alrededor de la Hacienda Ipati, 1 km al S, camino al Ingre, 1150 m, bosque boliviano-tucumano, suelo franco-arenoso, moderadamente inclinado, sub-humedo, 20 Nov 1991, fl., *L. Rea et al. 74* (LPB). Prov. Tamina/H. Siles, por el camino de Padilla a Monteagudo, 80 km, 1650 m, 20 Sep 1980, in fl., *Mühlbauer 01* (LPB). COCHABAMBA: Ayopaya, Sailapata, 1200 m, tree 6-8 m tall, dry slopes, Oct 1935, fr, *M. Cárdenas 3361* (US). Prov. Campero quebrada de Mataral a Yuraj Pampa, 2120 m, bosque seco de *Anadenanthera macrocarpa*, arbolito 7 m, 23 Mar 1993, sterile, *C. Antezana 650* (MO). Prov. Mizque, desvio de la carretera a Tucma Alta, ca. 5 km de Mizque, 2300 m, 19 Nov 1990, in fl, *E. Saravia et al. 35A* (LPB). LA PAZ: Prov. Inquisivi, comunidad Khora-Vilabarranco, ladera izquierda del rio Miguillas, 21 km de Choquetanga, 16°40'S, 67°20'W, 1470 m, bosque semideciduo, alterado en generacion con predominio de Cactacees, 14 Jun 1994, sterile, *N. Salinas 3471* (LPB). Prov. Inquisivi, 10 km al N de Inquisivi por el camino a Suri, alrededores del Puente sobre el Río Kato, bosque seco con *Prosopis*, *Acacia*, *Schinopsis* y *Pereskia*, 16°48'S, 67°11'W, 2100-2200 m, 12 Mar 1988, sterile, *J. C. Solomon & M. Nee 18122* (MO). POTOSÍ: Prov. Chayanta, Localidad Cruz Kasa, 2535 m, Sep 1996, in fr., *V. H. Zamora 194* (LPB). SANTA CRUZ: Prov. Caballero, 1-15 km E of Comarapa (17°54'S, 64°29'W), dry legume-dominated vegetation, ca. 1940 m, tree 5-6 m tall, 15-16 Jan 1990, in fl., *L. J. Dorr & L. C. Barnett 7059* (LPB); 8.7 km (by road) E of Saipina on gravel road to Pulquina, 18°06'05"S, 64°31'05"W, 1710 m, narrow canyon with arid thorn scrub vegetation with many cacti, small tree 7 m tall, 15 cm in dbn, with 3 trunks, inflorescence hanging with fruit, a nearby tree had only flowers and the



Fig. 50. Map of South America showing the distribution of *Aralia soratensis* Marchal and *A. bahiana* J. Wen.

inflorescences were more or less erect, flowers yellow-green, fruit green with purple tinge, 9 Dec 2005, in fr (also in fl in this season), *M. Nee et al.* 53714 (NY, 2 sheets). Prov. Florida, between Huerba Buena and Aqua Clasa on road from Mairana to Matasal, steep sided valley with irrigated cultivation in valley bottom and dry deciduous scrub on hillsides, scattered trees, in dry bushland above the river, 1400 m, 28 Sep 1996, fl, leafless, *J. R. I. Wood* 11444 (K, 2 sheets); 5 km (by road) SE of Bermejo, along highway from Santa Cruz to Samaipata, gorge of Río Piraí, steep slopes with semi-deciduous subtropical forest with many Mimosoid legumes, 18°09'53"S, 63°36'20"W, 840 m, 17 Jan 2006, sterile, *M. Nee & J. Wen* 53807 (LPB, NY, US, USZ); 6.4 km S of Mataral on road to Vallegrande, 18°10'05"S, 64°11'58"W, 1460 m, dry forest on slopes, with *Capparis speciosa*, *Carica quercifolia*, *Aspidosperma quebracho-blanco*, *Prosopis kuntzei*, *Cereus comarapanus*, *Harrisia tetracantha*, and *Jodina rhombifolia*, tree ca. 8 m tall, 18 cm dbh, flowers yellow-green, anthers nearly white, fruit green, older ones tinged with light purple, none yet ripe, 20 Jan 2006, young fr, *M. Nee & J. Wen* 53878 (LPB, NY, US, USZ); 0.6 km NE of central square of Mairana, on dirt road to Campamento La Younga of Parque Nacional Amboro, 18°07'04"S, 63°56'05"W, 1380 m, narrow valley with dry forest of *Schinopsis haenkenia*, *Anadenanthera macrocarpa*, *Cnidioscolus cnicodendron*, *Cereus comarapanus*, and *Porlieria microphylla*, tree ca. 8 m tall, 18 cm dbh, bark furrowed, fruit turning very dark purple and globose with truncate top, 19 Jan 2006, fr, *M. Nee & J. Wen* 53845 (LPB, NY, US, USZ). Prov. Vallegrande, 0.5 km N of highest point on road from El Trigal to Mataral, 12 km (by air) NNW of El Trigal, steep slopes with semi-deciduous forest, 18°12'S, 64°12'W, 1700 m, 15 Dec 1990, in fl & fr., *M. Nee* 40304 (GH, 2 sheets, LPB, 2 sheets, MO, 2 sheets, NY, 2 sheets, US); Vallegrande, on decent from Pucara to Santa Rosa in Rio Grande valley, open dry well-developed forest on steep slopes, scattered trees, constituents of open dry forest, 1900 m, 12 Feb 1996, *J. R. I. Wood* 10637 (K). Prov. Warnes, E side of Okinawa No. 1, 17°14'S, 62°53'W, 250 m, brushy areas, very flat, 28 Jan 1987, sterile, *M. Nee* 33832 (NY). Manuel María Caballero, Saipina, Estancia Buena Vista, 6 km NW del pueblo, vegetación en transición de

monte seco y subandino con presencia de *Dodoneae viscosae* y *Tipuana* spp., 2400 m, 18°03'18"S, 64°39'44"W, 2 Jan 1994, fl, *J. Balcazar II* (MO, 2 sheets). **Peru.** 1839-1840, in floral buds, *M. Cl. Gay* 486 (P). Entre Cusco y Abancay, Departamentos de Cusco y Apurímac, 20 Nov 1947, fl, *R. Ferreyra* 2751 (US). APURÍMAC: 2600 m, 1909-1914, *A. Weberbauer* 5840 (US). CUSCO: Prov. Anta, Río Apurímac drainage, dry inter-Andean Valley, 2400-2500 m, below Limatamba, mostly along side road to Mollepata, 13°32'S, 72°30'W, tree 10 m, fls green, 10 Jan 1984, fl, *A. Gentry et al.* 44106 (MO); Prov. Anta, Limatambo, Sisal-Cunyacc, stony habitat, 2300 m, tree 6-8 m tall, 14 Mar 1963, past fr, *C. Vargas C.* 14342 (US). HUANCABELICA: Prov. Tayacaja, road from Pampas to Rio Huanchuy, between milestone 19 km and 20 km from Pampas, S12°18'15", W74°50'78", 2669 m, dry slope with sandy soil, tall entirely leafless tree, in full fl, very rare, 20 Sep 2001, *M. Wiegand et al.* 5841 (BM). Central Electrica Mantaro, 4 Feb 1968, sterile, *J. Soukup* 5417 (US). TUMBES: Cerros de Amotape 15-25 km SE of Cherrelique, premontane moist forest, along Quebrada Los Conejos, 04°09'S, 80°37'W, 600-800 m, treelet 2 m, sterile, 9 Jun 1987, *A. Gentry & C. Diaz* 58212 (MO).

20. *Aralia warmingiana* (Marchal) J. Wen — Fig. 51.

Aralia warmingiana (Marchal) J. Wen, *Brittonia* 45: 54. 1993. *Coemansia warmingiana* Marchal, *Bull. Acad. Roy. Sci. Belgique* 47:95. 1879. *Coudenbergia warmingiana* (Marchal) Marchal, *Bull. Acad. Roy. Sci. Belgique* 47:514. 1879. *Pentapanax warmingianus* (Marchal) Harms in Engler & Prantl, *Nat. Pflanzenfam.* 3(8): 56. 1898. TYPE: **Brazil.** MINAS GERAES: Near Lagoa Santa, 22 Aug, *E. Warming s.n.* (holotype: BR).

Pentapanax ulei Harms, *Bot. Jahrb.* 42:237. 1908. *Coudenbergia ulei* (Harms) C. B. Shang in Y. W. Yuan & al. (eds.), *Proc. Intern. Symp. Bot. Gard.* 1990: 632. 1990. TYPE: **Brazil.** BAHIA: Catinga near Tambury, Oct 1906, in flower, largely unopen, pedicels clearly articulated, *E. Ule* 7073 (lectotype, K!, here designated) [the lectotype at K bears Harms' handwriting "*Pentapanax ulei* Harms, n. sp."]

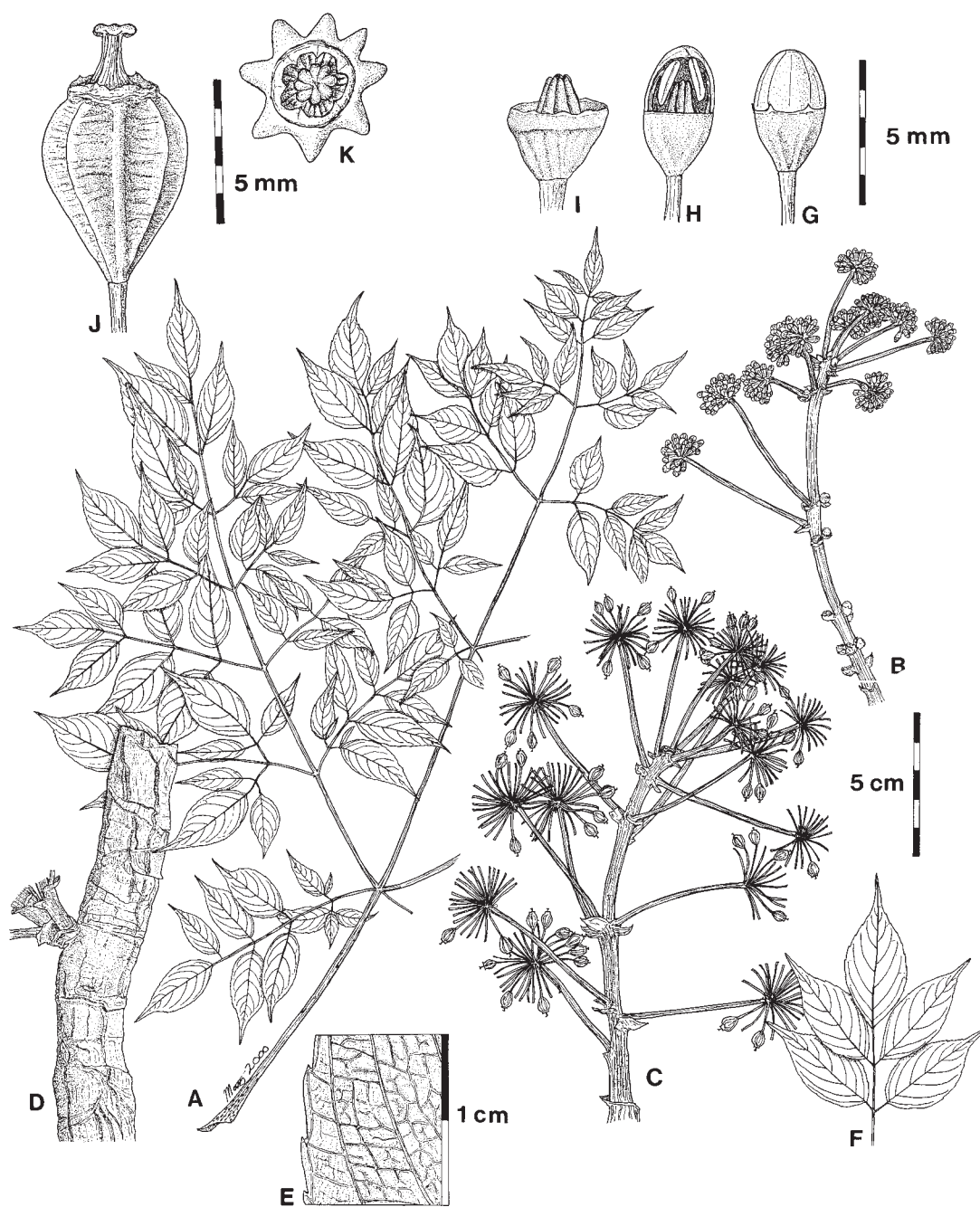


Fig. 51. *Aralia warmingiana* (Marchal) J. Wen. A. Leaf. B. inflorescence. C. Infructescence. D. Stem with the base of an inflorescence. E. Close-up of lower leaflet surface and margin. F. Leaf segment. G. Floral bud. H. Flower. I. Flower after anthesis. J. Fruit. K. Fruit, apical view (A, B, E & G-I – *Stutz 2280*, US; C, F, J & K – *Smith 14120*, US; D – *Filho, Martins & Stubblebine 13280*, E).

Ule's main set went to Berlin and was destroyed in the World War II.]

Aralia fluminensis Glaziou, Bull. Soc. Bot. France 56 (3): 332. 1909. TYPE: **Brazil**: RIO JANEIRO: Rio Janeiro, Feb 1874, A. Glaziou 6559 (lectotype, P!, here designated; isolectotype, K!)

Tree 5-30 m tall, dbh to 40 cm, hermaphrodite. Leaves 45-100 cm long, 40-90 cm wide, tripinnate, with 4-6 pairs of pinnae; stipules 5-10 mm long, 4-6 mm wide, adnate to the base of petiole, the free portion triangular, subcoriaceous, glabrous; petioles 15-45 cm long, purplish green; rachises green, turning purplish, subtended by a pair of accessory 3-5-foliolate pinnae at the base of the first two lower pinnae and a pair of accessory leaflets at the upper pinnae; leaflets 3-6.5 cm long, 1.5-3.5 cm wide, glabrous, acuminate at apex, rounded at base, sparsely serrate at margin, adaxial surface green, abaxial surface light green, petiolule articulated below the blade, that of lateral leaflets 4-8 mm long, that of terminal leaflets 13-20 mm long, glabrous. Inflorescence terminal, consisting of an aggregation of 2-5 panicles on a short axis, each panicle 13-23 cm long, 10-15 cm wide, with 8-20 umbels racemously arranged on a main axis, main axis with light brownish scales, appearing rough, each umbel with a thick peduncle, peduncle 4-7 cm long, 1.5-2 mm thick, with light brownish scales, thus appearing rough, bracts and bracteoles persistent, glabrous, primary bracts subtending the individual umbels 4-8 mm long, 5-8 mm wide, triangular, coriaceous, bracteoles 1.7-3 mm long, 1.2-1.5 mm wide, narrowly triangular, glabrous. Flowers appearing at the same time as young leaves open; umbels 25-40-flowered, pedicels 4-7 mm long at anthesis, 10-13 mm long when fruiting, glabrous, stout, articulated near the base of the flower; sepals 6-8, minute, triangular; corolla cream, petals 7-8, 2.4-2.6 mm long, 1.1-1.2 mm wide, narrowly ovate; filaments 2.1-2.5 mm long, anthers 0.8-1 mm long, oblong; ovaries 6-8-locular. Fruits 5-6 mm long, 4-5 mm wide, ovoid globose, blackish purple when mature, persistent styles 1.8-2.1 mm long at the fruiting stage, stout, slightly divided at the tip, connate 4/5 at the lower part.

Common names: salbugueiro falso and salbugueirão (Minas Gerais, Brazil), and caroba (Paraguay).

Phenology: flowering from March to December; fruiting from October to January.

Distribution: Brazil, Paraguay, and Argentina (Fig. 52).

Ecology: in dry deciduous caatinga forest on calcareous hills; 150-300 m.

Additional specimens examined: **Argentina**. FORMOSA: Territurro de Formosa, Guayenlec, arbol giganteo, fr, P. Jørgensen 3254 (MO, US). **Brazil**. MINAS GERAIS: Vicosá, 11 Jan 1935, sterile, J. G. Kuhlmann 54822 (NY); Sagarana, Projeto Integrado de Colonizacao (INCRA), NW Minas Gerais, c. 16°S, 47°W, wood very weak and useless, no good for firewood or charcoal, flowers with same smell as *Hedera helix*, 19 Sep 1985, fl, J. A. Ratter et al. 5047 (K, 2 sheets, NY, 2 sheets); Pasmado (mun. Itaobim), Minas Gerais, 200 m, 14 Jun 1986, fl, G. Hatschbach & J. M. Silva 50381 (K, 2 sheets, MEXU, NY, US). APA Carste de Lagoa Santa, Lagoa Santa, 3 Mar 1996, A. E. Brina & L. V. Costa 32.691 (K, 2 sheets). PARAÍBA: 4.5 km de Mata Grande, na Estrada para Bonito de Santa Fé, contacto floresta-caatinga, 30 Nov 1971, fl, Acad. Bras. de Ciências 1101 (MEXU). PARANÁ: Londrina, Floresta Godoy, proximo parc. 5 e 14 da porcao norte, 18 Mar 1994, fl, tree 30 m tall, F. Chagas et al. 01682 (K); Parque Estadual Mata dos Godoy, 3 Mar 1989, fl, F. Chagas & Silva 00000, FUEL No. 10742 (K). RIO JANEIRO: Rio Janeiro, 28 Oct 1878, vegetative, Glaziou 10895 (K, LE, P, 2 sheets); Rio Janeiro, Engenho Noro, 8 Aug 1873, Glaziou s.n. (P); Rio Janeiro, Imbolica, 2 Aug 1891, Glaziou 19416a (P). SANTA CATARINA: Mun. Itapiranga, forest above Rio Uruguai, Barra Macaco Branco, ca. 27°10'S, 53°46'W, 150-250 m, 18 Dec 1964, fl., ovary 6-locular, 20 m tall, L. B. Smith & R. M. Klein 14120 (MO, NY, P, US). SÃO PAULO: Est. de S. Paulo, Mun. de S. Simão, faz. Aritozina, 29 Jan 1982, in fl., H. F. Leitao Filho, F. R. Martins & W. H. Stubblebine 13280 (E). **Paraguay**. Chino, tree 15 m tall, Oct 1879, in fr., B. Balansa 3758 (BM, K, P, 2 sheets). ALTO PARANÁ: Para Parayguazu route, C.F.A.P. (Ciudad del Este, Alto Paraná), Puerto Stroessner, Km 12, 2 Jan 1985, fr, arbre 23 m, L. C. Stutz O. 2280 (US). SAN PEDRO: Primavera, small sterile tree, 3 Jun 1961, A. L. Woolston 1260 (K, NY). On the Parana 26°-27°S lat., D. Parodi 4/83 (K).



Fig. 52. Map of South America showing the distribution of *Aralia warmingiana* (Marchal) J. Wen.

Three syntypes were cited by Glaziou when he described *Aralia fluminensis* (Glaziou 1909, p. 332) and they are *Glaziou 6559, 1895, and 109416a*. I have seen the following Glaziou collections: *Glaziou 6559* (K, P), *Glaziou 10895* (K, LE, P, 2 sheets), *Glaziou 19416a* (P), and *Glaziou s.n.* (P) collected from Engenho Noro of Rio Janeiro, 8 Aug 1873 (see specimens cited for detailed information of the four collections). All of these specimens bear the handwriting of Glaziou “*Aralia fluminensis* Glaz.” The specimens clearly represent *Aralia warmingiana* and they are all vegetative bearing no flowers nor fruits, as the original description says. I suspect *Glaziou 1895* and *109416a* in the original description (Glaziou 1909) were misprinted and they actually represent *Glaziou 10895* and *19416a*. Because of the confusion concerning two of the three syntypes, I herein select *Glaziou 6559* as the lectotype for *Aralia fluminensis*.

21. *Aralia rex* (Ekman ex Harms) J. Wen — Fig. 53.

Aralia rex (Ekman ex Harms) J. Wen, Brittonia 45: 53. 1993

Megalopanax rex Ekman ex Harms, Notizbl. Bot. Gart. Berlin 9: 122. 1924. TYPE: **Cuba**. HABANA: Lomas de Camoa, 25 km from Habana, 29 Sep 1923, fl, *E. L. Ekman 17551* (lectotype, K!, here designated; isolecotypes, BM!, MO!, NY!, 2 sheets, US!).

Tree 5-13 m tall, hermaphrodite. Leaves ca. 100 cm long, tripinnate, to pinnate near the inflorescence, with 3-4 pairs of pinnae; stipules adnate to the base of petiole, lanceolate, subcoriaceous, glabrous; petioles 10-20 cm long; the primary pinnae subtended by a pair of accessory 3-5-foliolate pinnae or a small bipinnate structure on the at the base of the lowermost pinnae; leaflets 4.8-8 cm long, 2.4-4.3 cm wide, glabrous, membranaceous to chartaceous, acuminate at apex, subcordate to rounded at base, entire at margin, adaxial surface green, abaxial surface light green, petiolule articulated below the blade, that of lateral leaflets 2-8 mm long, that of terminal leaflets 10-30 mm long, glabrous. Inflorescence paniculate with a thick main axis, main axis 13-20 cm long, glabrous, brown, conspicuously lenticellate, with ca. 2 whorls of umbels, each whorl with 10-20

umbels; each umbel with a thick peduncle, peduncle 7-14 cm long, 2.5-5 mm thick, articulated near the middle, rough and lenticellate; bracts and bracteoles persistent, glabrous, primary bracts subtending the individual umbels 4-6 mm long, 3-5 mm wide, triangular, coriaceous, bracteoles 1-1.5 mm long, 0.7-1 mm wide, narrowly triangular, glabrous. Flowers appearing after the opening of young leaves; umbels 90-120-flowered, pedicels 9-13 mm long at flowering stage, glabrous, slender, articulated at the base of the flower. Sepals minute, triangular, 4-7-toothed on the calyx ring; petals 7-10, 3.5-5 mm long, 1.5-2 mm wide, narrowly oblong to lanceolate; filaments 4-5 mm long, anthers 2-3 mm long, oblong; ovaries 7-10-locular. Fruits 6-7 mm in diameter, subglobose, with 6-8 ribs when dry, styles stout, persistent stigmas divergent.

Phenology: flowering in September; fruiting in November.

Distribution: endemic to Cuba (Havana and Cienfuegos) (Fig. 54).

Ecology: on limestone rocks, mountain forests, thickets or low forests; ca. 450 m.

Conservation: a rare species in need of conservation.

Additional specimens examined: **Cuba**. CIENFUEGOS: Topaz de Colantes, W80°15', N21°55', 16 Nov 1988, sterile, 450 m, mountain forest, trees 5-13 m tall, *R. Dechamps & R. Carrera 12190* (MO). HABANA: Lomas de Camoa, on naked limestone rocks, in thickets or low forests, 6 Nov 1921, *E. L. Ekman 13451* (NY); 22 Nov 1921, *E. L. Ekman 13523* (BM, MO).

Harms (1924) cited three specimens when describing Ekman's *Megalopanax rex* (*Ekman 17551, 13451* and *13523*). The original specimens were most likely at B and were destroyed during WWII. *Ekman 17551* bears many flowers and is most widely distributed. The Kew specimen of *Ekman 17551* bears Harms' handwriting and is thus selected as the lectotype here.

22. *Aralia excelsa* (Griseb.) J. Wen — Fig. 55; color plate 15: A-F.

Aralia excelsa (Griseb.) J. Wen, Cathaya 13/14: 96. 2002, non Linden, Cat. Pl. Exot. 11: 34.

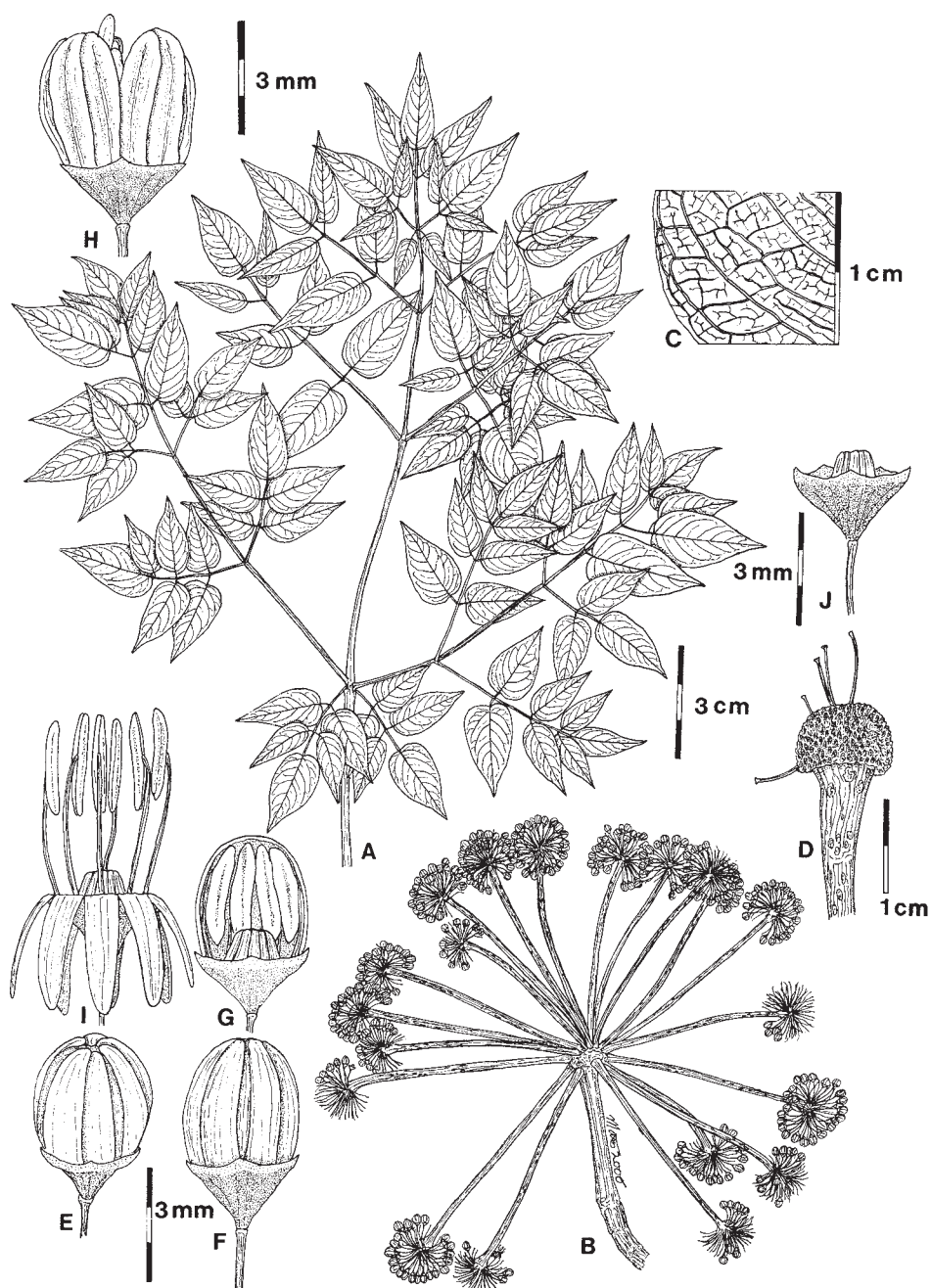


Fig. 53. *Aralia rex* (Ekman ex Harms) J. Wen. A. Leaf. B. Inflorescence. C. Lower leaflet surface. D. Tip of peduncle showing the thickened joint area of the pedicels and the peduncle. E. Floral bud. F. Floral bud. G. Flower. I. Flower. J. Flower after anthesis.

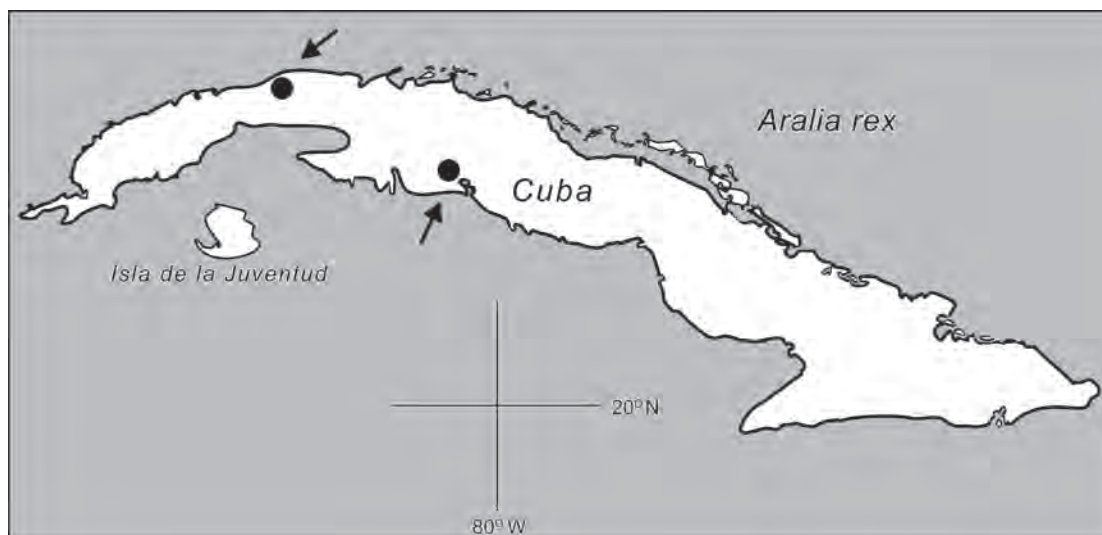


Fig. 54. Map of Cuba showing the distribution of *Aralia rex*.

1856, *nom. nud.* *Sciadodendron excelsum* Griseb., *Bonplandia* 6: 7. 1858. TYPE: **Panama**. *Duchassaing s.n.* (lectotype: GOET!, here designated).

Reynoldsia americana Donn.Sm., *Bot. Gaz.* 49: 455. 1910. TYPE: **Costa Rica**. Peninsula Nicoya, tree of medium height, nomen vernaculare "Chile", Jan 1900, A. Tonduz 13823 (holotype: US!, photo at NY; isotype: US!).

Pentapanax granatensis Rusby, *Desc. S. Amer. Pl.* 72. 1920. TYPE: **Colombia**. MAGDALENA: Santa Marta, near Masinga, 250 ft, a tree to 40 ft or more, occasional in forest below 1500 ft, flowers March-April, white, flowers terminal 10-20 short branchlets crowded together forming a large cluster, leaves deciduous about the time flowering, leaves 3-pinnate, 22 Mar 1898-99, H. H. Smith 1595 (holotype: NY!; isotypes: E!, K!, P!, 2 sheets, PH!, U!, US!, 2 sheets).

Highly branched and unarmed tree (4) 8-30 m tall, dbh 20-50 cm, hermaphrodite, bark furrowed. Leaves 60-125 cm long, 50-100 cm wide, quadripinnately to tripinnately compound, or bipinnately compound when young, with 5-6 pairs of primary pinnae; stipules 10-13 mm long, 1.5-2.5 mm wide, adnate to the base of petiole, lanceolate, subcoriaceous, glabrous and more or

less ciliate at margin; petioles 20-50 cm long, purplish green; rachises green, turning purplish, subtended by a pair of accessory 3-5-foliolate pinnae at the base of each primary pinna; leaflets 4-7 cm long, 1.5-4 cm wide, glabrous, apex acuminate, base rounded, margin sparsely serrate, adaxial surface green, abaxial surface light green, petiolule more or less articulated below the blade, that of lateral leaflets 0-5 mm long, that of terminal leaflets 10-20 mm long, glabrous. Inflorescence consisting of 1-6 panicles on a short branch, each panicle 7-15 cm long, 5-12 cm wide, with 10-20 umbels racemously arranged on a main axis, main axis glabrous, lower portion appearing rough and with scales, each umbel with a peduncle 3.5-10 cm long, 1-1.5 mm thick, glabrous, each subtended by a few coriaceous broadly triangular bracts, bracts and bracteoles persistent, glabrous, primary bracts subtending the individual umbels 3-6 mm long, 3.5-7 mm wide, triangular, coriaceous, bracteoles 1-1.4 mm long, 0.8-1.1 mm wide, narrowly triangular, glabrous. Flowers appearing before or at the same time as young leaves open; umbels 15-35-flowered, pedicels 4.5-8 mm long at flowering stage, 5-9 mm long when fruiting, non-articulated below the flower, glabrous, stout. Sepals 9-10, minute, semicircular or inconspicuous; petals 9-10, 2.6-2.8 mm long, 1-1.5 mm wide, narrowly ovate, often calyprate and falling together, yellowish white; filaments 3-4 mm

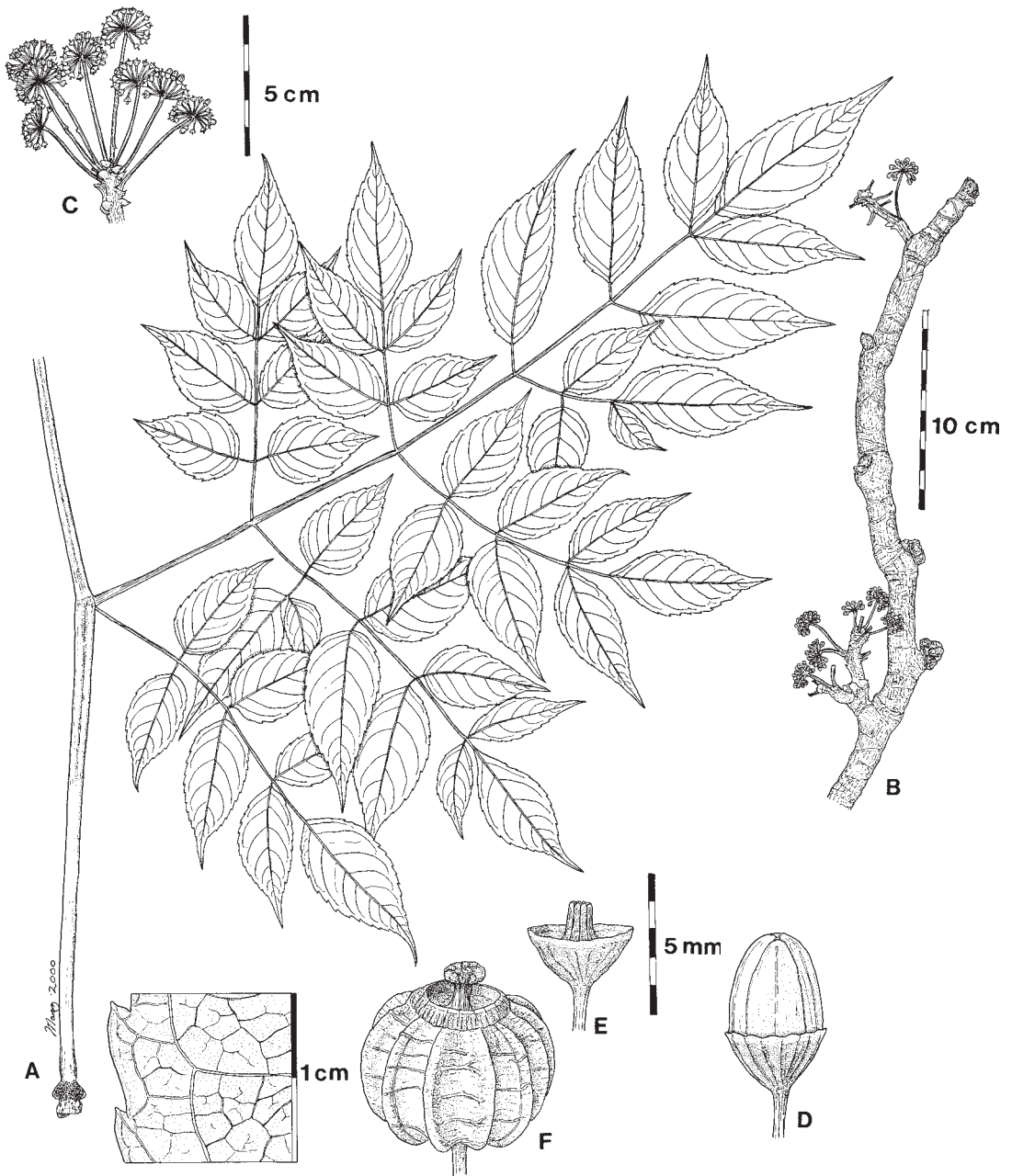


Fig. 55. *Aralia excelsa* (Griseb.) J. Wen. A. Leaf with accessory pinna. B. Stem with inflorescences. C. Inflorescence. D. Floral bud. E. Flower after anthesis. F. Fruit. (A – Steyermark et al. 109907, NY; B – Moreno 25344, BM; C-E – Smith 1595, NY; F – Folsom 3436, BM).

long, anthers 1.5-1.8 mm long, ca. 1 mm wide, narrowly oblong; ovaries 9-10-locular. Fruits 6-7 mm long, 7-8 mm wide, subglobose, dark purple when mature, persistent styles slightly divided at the tip, largely connate, styler column 1.2-1.5 mm long at the fruiting stage, stout.

Vernacular names: calenturo (Colombia), cebratano, lagarto, and corroncho de lagarto (El Salvador), lagarto and palo de lagarto (Nicaragua), cedro macho (Chamela, Jalisco, Mexico), jobo de lagarto (Alligator Jobo), and mangabé (Panama), and "Chile" (Costa Rica).

Uses: in Panama, the species was cultivated as a street tree; and the petioles were employed for making bird cages (Standley 1928). The natives of Panama apply the macerated leaves with beneficial effect to ulcers. In Nicaragua, it was used as fence post; and the ashes of the wood are used for making soap.

Phenology: flowering in January to July; fruiting in May to August.

Distribution: Colombia, El Salvador, Haiti, Mexico (Jalisco, Colima, and Islas Marías), Costa Rica, Honduras, Nicaragua, Panama, and Venezuela (Fig. 56).

Ecology: Tropical lowland dry forests, or dry forest – moist forest transitional areas, densely forested floodplains to more open hillsides (selva mediana); 0-860 m.

Additional specimens examined: **Colombia.** Municipio Fonseca: Corregimiento Distraccion, sitio Las Casitas-El Socorro, bosque a 2 km, sitio modera damente pendiente con abundantes rocas, bien drenado, algo perturbado, parcela, 500 m, 72°59.4'W, 10°9.1'N, 31 Aug 1990, sterile, *O. Marulanda & J. Betancur 2128* (K, 2 sheets). **Costa Rica.** ALAJUELA: entre Guachipelin y Valean de La Vieja, 26 May 1932, sterile, *A. M. Brenes 15535* (NY); along quebrada, simple shrub 6 ft, El Coyolar, 240 m, Apr 1924, sterile, *P. C. Standley 40062* (US). GUANACASTE: Parque Nacional Santa Rosa Sendero Indio Desnudo, 10°50'20"N, 85°37'00"W, 320 m, arbol de 16 m x 40 cm DAP, 22 Jul 1992, sterile, *Q. Jiménez et al. 1085* (NY); pasture land and deciduous forest now in full leaf in the areas of Bahía El Coco, Bahía Playa, Hermosa, and Sardinal, 0-150 m, 10°32'N, 85°40'W, 29-31 Jul 1971, floral buds, *W. C. Burger & M. Burger 7742* (NY); Santa Rosa, Parque

Nacional Santa Rosa, Dry Tropical Forest Research Center, near the cross of the big house to the administration, 10°50'17"N, 85°36'52"W, 310 m, 20 Sep 2002, *J. Wen & R. Aguilar 6779* (F, US). PUNTARENAS: Cantón de Garabito, Cuenca del Río Grande de Tárcoles, camino a Playa Guacalillo, 09°51'30"N, 84°37'30"W, 100 m, arbol de 10 m x 35 cm DAP, 28 Sep 1993, sterile, *Q. Jiménez et al. 1358* (NY, 2 sheets). **El Salvador.** Depto. Ahuachapán, San Francisco Menéndez, El Corozo, Mariposario, zona baja "Mariposario", 200 m, 13°49'N, 89°59'W, 18 May 2000, fr, *J. M. Rosales 787* (BM, MEXU); zona baja "Los Peralta", 175 m, 13°49'N, 89°59'W, 7 Jun 2000, fr, *J. M. Rosales 1270* (BM, MEXU). Region NE of Chalatenango, near Comalapa, Dept. Chalatenango, 1500 ft, 16 Nov 1958, tree 60 ft, bark brittle, thick with conspicuous longitudinal corrugations, *P. H. Allen & M. L. van Severen 7093* (NY, US). Laguna de Maquique, Departamento de la Unión, 60 m in altitude, 18 Feb 1922, sterile, *P. C. Standley 20932* (NY, US); vicinity la Unión, 150 m, Feb 1922, sterile, *P. C. Standley 20829* (NY, US). Near Los Apoyos, Dept. Santa Ana, shrub or a small tree of very handsome aspect, trunk straight, corky, not branched, 1924, sterile, *S. Calderón 2171* (US). **Haiti.** 5 Jul 1927, fl, *E. L. Ekman H7966* (K, NY); Plain Centrale, Hinche, ravine, Papaye, 225 m, 6 May 1926, fr, *E. L. Ekman H6009* (US, 2 sheets, one fr, one leaves). Massif de la Hotte, gr. Mome Rochclois, Miragoane, 30 Jul 1926, sterile, *E. L. Ekman H6545* (US). Massif des Mathieux, l'Archaie, Montagne Terrible, northern slope, ca. 700 m, limestone, 7 Feb 1926, fl, *E. L. Ekman H5524* (US). **Honduras.** DEPT. COMAYAGUA: Matorrales húmedos y cafetales cerca de Quebrada la Jutera, 3 km de la Libertad, 20 May 1956, 600 m, *A. Molina R. 7039* (NY). **Mexico.** COLIMA: selva camino Camotlán, 28 Jan 1958, sterile, *Miranda 8820* (MEXU). JALISCO: Mpio. La Huerta, Rancho Cuixmala, Cumbres 1, Arroyo Cajones, ca. 3 km inland from the Puerto Vallarta – Barra de Navidad hwy, tropical deciduous forest with *Lonchocarpus*, *Ruprechtia*, *Bursera*, near lat. 19°2 in arroyo, uncommon tree 15 m, 19 Aug 1991, fr, *E. L. Lott 3802* (K, MEXU, RSA); Mpio. La Huerta, Estación de Biología Chamela (UNAM), 19°30'N, 105°03'W, 26 May 1982, fl, arbol 8 m, corteza gris, fissurada, flores amarillas, *E. J. Lott 1055* (MEXU, 2 sheets); Mpio. La Huerta, Rancho Cuixmala, along the road into the Cumbres via the



Fig. 56. Map of Central America and northern South America showing the distribution of *Aralia excelsa* (Griseb.) J. Wen.

Rio Cuitzmala, 9 km above the Hwy 200 bridge and 5 km above the river, in a heavily wooded canyon, 104°55'W, 19°30'N, 150 m, tropical semi-deciduous forest, a scarce 10-15 m high tree, 50 cm dbh, on the canyon bottom, bark gray, deeply furrowed and somewhat corky, 13 Sep 1991, fr. A. C. Sanders 11212 (RSA); Camino Antiguo a 100 m de la Vereda Tejón, arbol 4 m, botones verdes, 1 Apr 1982, floral buds, E. J. Lott 964 (MEXU); Cumbres de Cuixmala, el 45 camino a Cumbres I, Municipio La Huerta, 19°26'00"N, 104°58'45"W, 100 m, selva mediana subcaducifolia, primaria, suelo pardo arenoso, arbol 25 m, abundante, fruto seco, 25 Aug 1988, fr. R. Acevedo R. & J. L. Martinez 965 (MEXU); Estación de Biología UNAM, Chamela, Mpio. La Huerta Camino Antiguo Norte 150, 13 Dec 1989, sterile, S. H. Bullock 2080 (K, MEXU); 2 Jul 1978, fl. J. A. S. Magallanes 1110 (MEXU); arbol 18 m, 28 Apr 1974, fl. L. A. Pérez J. & M. Pérez G 834 (MEXU); L. A. Pérez J. III (MEXU); arbol 17 m, 8 Aug 1974, fr. L. A. Pérez J. 958 (MEXU); ca. Campamento, arbol 15 m, botones Amarillo-

verdosas, 2 Jul 1978, fl. L. A. Pérez J. 1770 (MEXU); selva mediana sub-caducifolia, suelo metamorfico, 16 Aug 1977, fr. J. A. S. Magallanes 777 (MEXU). NAYARIT: Islas Marías, Isla Ma. Magdalena, hacia el SW (centro de la isla), 021°27'N, 106°27'W, arbol 3 m, selva baja caducifolia, 27 Nov 1986, sterile, F. Chiang C. 1085 (RSA). **Nicaragua.** U.S. North Pacific Exploring Expedition, 1853-56, fl. C. Wright 8 (P, US). CARAZO: area de la Estación Biológica de Chacocentro, en el limite departamental Carazo-Rivas, bosque seco tropical, 0-100 m, 22-23 Jun 1984, fr. D. Soza, A. Grijalva & M. Aranda 81 (BM). CHONTALES: 6.3 km from Hwy on road to Cuapa, 12°11'N, 85°25'W, 170 m, dry rocky hills, 13 Jun 1984, fr. W. D. Stevens 22963 (BM, MEXU, NY). MANAGUA: along a dry wash near km 8, Carretera Sur, outskirts of Managua, tropical dry forest – moist transition, 200 m, 19 Oct 1976, D. Neill 1082 (BM, 2 sheets); Carretera a Montelimar, comarca Aduana, al Norte del rio Aduana, 80-100 m, 21 Jul 1980, in fl., M. Guzman, D. Castro & A. Montiel 398 (BM); ca. 5 km NNW

of Hwy 12 along road on ridge of Sierra de Mateare, 12°07'N, 86°23'W, 420 m, roadside and slope, fence-post tree, 28 Jan 1978, *W. D. Stevens* 6192 (BM, MEXU, NY). MASAYA: Jardín Botánico UCA, km 17.5 carretera Managua-Masaya, bosque seco, 2 Sep 1982, *J. C. Sandino* 3492 (BM); Parque Nacional Volcan Masaya, dry forest near west shore of Laguna de Masaya, 140 m, 10 Apr 1978, fl, *D. Neill* 3458 (BM). MATAGALPA: entre "Sta. Juana" y el "Rincon del Diablo" (camino a "Puertas Viejas"), 12°32-34'N, 85°57-59'W, 860 m, 6 Apr 1983, in young fr, *M. Araquistain* 3478 (BM); "La Mojada," 10 km al SO de Esquipulas, 12°37'N, 85°51'W, 400 m, 24 Jan 1985, floral buds, *P. P. Moreno* 25344 (BM). **Panama.** At Turbaco, Apr 1862, fl, *S. Hayes* 734 (BM, K). CANAL ZONE, 1923, sterile, *H. Johansen* 15 (US), *H. Johansen* 43 (US); Balboa, *P. C. Standley* 25481 (US), 25558 (US), 32104 (US, 2 sheets). CHIRIQUI: Km 103 W of Panama City, tree 15 m in fence row, mature leaves to 75 cm, 20 Feb 1978, fl, *B. Hammel* 1604 (BM, NY). COCLE: Rio Hato, street trees, 27 May 1977, sterile, *J. F. Folsom* 3436 (BM); pasture along the Rio Hato at Pan. Am. Hwy bridge, scattered trees and fringe of forest along rio, alt. 20 m, tree 10 m tall, 30 cm dbh, twigs thick, soft, one branch with huge compound leaves, tree otherwise leafless with new leaves beginning to come out from tips of twigs, flowers yellow green, with musty odor, 19 Mar 1974, late fl, *M. Nee* 10784 (US). PANAMÁ: Río Las Lajas, alt. ca. 20 m, tree 12 m, flowers greenish white, 5 Feb 1939, fl, no leaves, *P. H. Allen* 1604 (NY, US); along Interamerican Hwy 2 miles west of turnoff to El Valle, tree 17 m, flowers cream, fruits in huge globular clusters, becoming purple, sweet and fleshy, 16 May 1971, fl & fr, *T. B. Croat* 14629 (RSA, 2 sheets); Río Tecumen, moist thicket, shrub or tree 10-20 ft, frequent, 3 Jan 1924, sterile, *P. C. Standley* 29415 (US); Las Sabanas, 4 Dec 1923, sterile, "mangabé", open slope, tree 15-40 ft, common, petioles used to make bird cages, *P. C. Standley* 25892 (US); Río Tapia, moist forest, shrub or tree 10-20 ft, *P. C. Standley* 28218 (US); Taboga Island, tree 20 ft, frequent, brushy slope, "Jobo de lagarto", Dec 1923, sterile, *P. C. Standley* 27858 (US); *Standley* 27023 (US); near Matías Hernández, moist thicket, shrub 8-12 ft, 30 Dec 1923, sterile, *P. C. Standley* 28941 (US); Nuevo San Francisco, 12 Jan 1924, sterile, *P. C. Standley*

30706 (US); between Las Sabanas and Matías Hernández, in thicket, shrub or tree 10-20 ft, common, 21 Jan 1924, sterile, *P. C. Standley* 31813 (US). Chepo, trunk 35 ft, 24 inches in diameter, "Jobo de lagarto", 1924, fl, no leaves, *H. C. Kluge* 50 (US). **Venezuela.** ARAGUA: Parque Nacional Pittier, along road between El Limon and Guamita, 1 km below Guamita, 700 m, 20 Oct 1961, sterile, *J. A. Steyermark* 89765 (NY, US). GUÁRICO: Morros de San Juan, Jun 1960, sterile, *L. Aristeguieta* 4232 (US); Altigracia de Orituco-Aimará, Mar 1966, fl, *L. Aristeguieta* 6047 (NY, US); Hacia San Francisco de Macaira, entre Altigracia de Orituco y Tamanaco, Jun 1966, fr, arbol de unos 8 m, frutos esféricos, de color verde oscuro cuando maduros, con pulpa azucarada, comido por los pájaros, *L. Aristeguieta* 6157 (NY, U, US). LARA: Distrito Palavecino, terreno plano en sabanas alternando con matorrales y selva tropófila, entre Sarare y El Altar, 350 m, 2 Jun 1974, *J. A. Steyermark*, *R. Smith*, *S. Nehlin* & *M. Lobo* 109907 (NY, U, 2 sheets). YARACUY: a 5 km este de Yaritagua, 1 Apr 1980, fl, *N. Romérez* 367 (K).

N. Romérez 367 (K) from Venezuela shows transitional pedicel articulation. The tip of pedicel has a slight constriction, but is not articulated.

Grisebach (1858) cited that Duchassaing's name "*Arbor excelsa*," which apparently represents a misprint. The lectotype from GOET bears the name "*Aralia excelsa*" below Grisebach' writing "*Sciadodendron excelsum*." The type is a collection made after the flowering with petals already falling off. The ovaries on the type are clearly 10-12-locular, as also indicated on the type specimen by Grisebach.

I am aware that Linden (1856) used *Aralia excelsa* as a *nomen nudum*. Hooker (1862) mentioned that the name *Aralia excelsa* was used for the plant *Leea coccinea* Planch. (Leaceae) in the horticulture trade with no authority. As the *nomen nudum* by Linden has no nomenclatural standing, the new combination of *Aralia excelsa* (Griseb.) J. Wen is the correct name for this widely distributed taxon of Araliaceae in Central America extending to South America.

The specimen *Bernardi* 7382 (K, NY) collected from Bolívar, Venezuela clearly has an articulation below the flower. It was collected in floral bud condition and appeared to be 5-merous in floral

parts, but each petal seemed to split into two. Like *A. warmingiana*, the specimen has an articulation at the pedicel tip, yet the flowers seem to be smaller than those of *Aralia warmingiana*. Geographically it is out of the normal distributional range of *A. warmingiana*. The inflorescence and floral morphology are similar to those of *A. excelsa*, except that they differ in the pedicel articulation. This collection may represent a new species, but more collections are needed to confirm its identity. Its collection data are as below: Venezuela, bosque de San Mateo, El Cristo-La Paragua, Estado Bolivar, 300 m, 7 Mar 1959, floral buds, no leaves yet, *A. L. Bernardi* 7382 (K, NY).

23. *Aralia bahiana* J. Wen, sp. nov. — Fig. 57.

Aralia bahiana J. Wen. TYPE: **Brazil.** BAHIA: Mun. de Itiuba, Fazenda Experimental da Epaba, arvore de aproximadamente 6 m de altura, fuste retilineo com casca lembrando o pau-d'arco-roxo, madeira mole, estepe arborea densa e floresta estacional decidual, afroamentos rochosos, 10°43'S, 39°50'W, 26 May 1983, young fr, *G. C. P. Pinto & H. Bautista* 91/83 (holotype: US!; isotype: NY!).

Arbor. Folia ampla tripinnata, usque 50-70 cm longa, foliola glabra, ovata, apice acuminata, basi rotundata, margine parce serrulata. Umbellae 15-35-florae, pedicellis inarticulatis. Fructus oblongo-globosus, stylis 8-9.

Branched and unarmed tree 6-7 m tall. Leaves 50-70 cm long, 50 cm wide, tripinnately compound; stipules 6-7 mm long, 1.2-1.5 mm wide, adnate to the base of petiole, lanceolate, subcoriaceous, glabrous; petioles 15-20 cm long; each pinna subtended by a pair of accessory 3-5-foliolate pinnae; leaflets 3-5 cm long, 1.5-2.5 cm wide, glabrous, ovate, acuminate at apex, rounded at base, sparsely and inconspicuously serrulate at margin with a few teeth, adaxial surface green, abaxial surface light green, petiolule more or less

articulated below the blade, that of lateral leaflets 0-2 mm long, that of terminal leaflets 10-15 mm long, glabrous. Inflorescence consisting of 4-5 umbellate units on a short branch, each unit with 5-10 umbels racemously arranged on a main axis, main axis 4-6 cm long, glabrous, appearing rough and with scales, each umbel with a peduncle 4-6 cm long, 2.5-3 mm thick, glabrous and more or less rough, each subtended by a few bracts at the base and ca. 0.5-1 cm from the base, bracts and bracteoles persistent, glabrous, primary bracts subtending the individual umbels 4-6 mm long, 5-7 mm wide, triangular, coriaceous, bracteoles 1.8-2.2 mm long, 1.2-1.5 mm wide, narrowly triangular, glabrous. Umbels 15-35-flowered, pedicels 6-13 mm long, glabrous, stout, non-articulated below the flower. Sepals 8-9, minute, inconspicuous; petals 8-9, 4-4.5 mm long, 1.2-1.3 mm wide, narrowly ovate, seemingly non-calyptate, white; filaments 3.5-4 mm long, anthers 1.6-1.9 mm long, 0.9-1 mm wide, narrowly oblong; ovaries 8-9-locular, persistent sepals 8-9, minute, inconspicuous. Fruits 7-8 mm long, 6-8 mm wide, ovoid globose to globose, persistent styles slightly divided at the tip, largely connate, styler column 1-1.5 mm long.

Vernacular name: tingui-bravo.

Phenology: with a few flowers in late April, and in young fruits from late April to late May.

Distribution: Bahia, Brazil (Fig. 50).

Ecology: Estepe Arborea Densa e Floresta Estacional Decidual.

Additional specimens examined: **Brazil.** Bahia: Município de Santa Terezinha, ca. 5 km W da Estrada Santa Terezinha-Itatim, em uma Estrada vicinal distando ca. 14 km E de Itatim, 26 Apr 1994, in fruit & with a few flowers, *L. P. de Quiroz & N. S. Nascimento* 3853 (K, 3 sheets).

Aralia bahiana is closely related to *A. excelsa*, sharing the character of the non-articulated pedicel. It is distinguished from the latter by the very stout peduncle and the ovoid globose fruits of the new species.

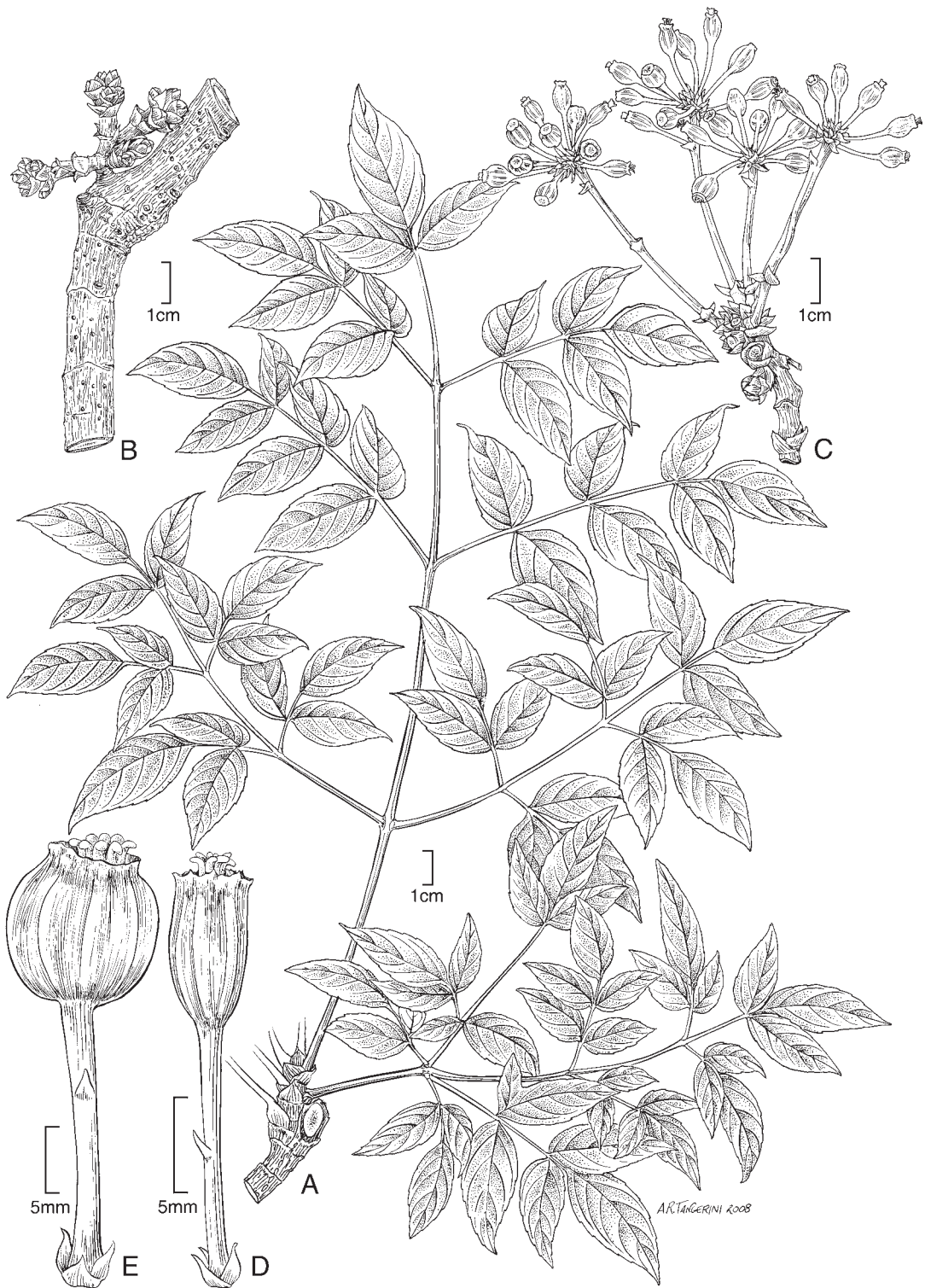


Fig. 57. *Aralia bahiana* J. Wen. A. Branch with leaves showing leaf architecture. B. Branch showing young inflorescence on old branch. C. Young infructescence. D. Young fruit. E. Older fruit (A-E - Pinto & Bautista 91/83, US).

EXCLUDED NAMES

Aralia sololensis Donnell-Smith, Bot. Gaz. 56: 58. 1913. TYPE: **Guatemala**. Prope Patulul, Dept. Sololá, Feb 1906, fl. W. A. Kellerman 5828 (holotype: US!; isotype: OS!)
= *Sambucus simpsonii* Rehder (Adoxaceae) This

species is clearly not a member of Araliaceae and was excluded from the New World *Aralia* (see Smith 1936; Standley and Williams 1966; Frodin and Govaerts 2003).

ACKNOWLEDGEMENTS

This study was supported by the National Science Foundation (DEB-0196051, and DEB-0108536), the Institute of Botany of the Chinese Academy of Sciences, the Field Museum, the Smithsonian Institution (the Small Grants Program of the National Museum of Natural History, the Botany Collections Fund, the Walcott Fund, and the Laboratory of Analytical Biology), and the John D. and Catherine T. MacArthur Foundation. Field and/or herbarium assistance was kindly provided by many colleagues and friends: Susan Agnew, Reinaldo Aguilar, Qing Ban, Manzhu Bao, John Beaman, Stephan Beck, John Boggan, Zhiyu Cao, A. S. Chauhan, Martin Cheek, Hongfeng Chen, Longqin Chen, Yansheng Chen, Zhiyuan Chen, Fernando Chiang, Nancy Coile, A. P. Das, J. I. Davis, Yunfei Deng, Michael Dillon, Hanmin Dong, James Dong, Michael Dong, Larry Dorr, Barbara Ertter, Kuomei Feng, David Frodin, De-zhi Fu, Song Ge, Gang Hao, James W. Hardin, M. Hasebe, De-yuan Hong, Chiming Hu, Pu-hua Huang, Sovanmoly Hul, Stefanie Ickert-Bond, Hugh H. Iltis, M. Ito, Yunsheng Jiang, Samuel B. Jones, Jr., Shusheng Lai, Thomas G. Lammers, De-zhu Li, Heng Li, Liangqian Li, Na Li, Rong Li, Xiangping Li, Xuedong Li, Qi Lin, Yourun Ling, Ho-Yih Liu, Yan Liu, Zhengyu Liu, Pete Lowry, Zhengwei Lu, Xiaozhong Luo, Yibo Luo, A. A. Mao, Esteban Martinez, Lucinda McDade, Ying Meng, Michael Nee, Bing Ni, Zelong Nie, Christine Niezgodá, Simon Owens, Ze-hui Pan, Arun K. Pandey, Jose Panero, M. K. Pathak, Ching-I Peng, Mike Powell, Alan Prather, John Pruski, Haining Qin, Jim Reveal, Rusty Russell, M. Sanjappa, Ed Schilling, Suhua Shi, N. P. Singh, Larry Skog, Jim Solomon, David M. Spooner, Tod Stuessy, Hang Sun, Hui Tang, Guangfu Tao, Roy Vickery, Jose L. Villasenor R., Huilin Wan,

Chaoliang Wang, Jinghua Wang, Meila Wang, Xiao Wei, Tom Wendt, Carol Wilson, Emily Wood, C.-Y. Wu, Fuwu Xin, Kexue Xu, Aleck Yang, Gan Yao, Tingshuang Yi, Nelson Zamora, Mingli Zhang, Qifa Zhang, Zhiyun Zhang, Jim Zech, and Shiliang Zhou. The curators of A, ASU, B, BKF, BM, BSHC, CAS, DES, DS, E, F, G, GH, GOET, HAST, K, K-W, KUN, L, LE, LL, LPB, MEXU, MO, MSC, MT, MU, NCSC, NCUF, NY, OS, P, PE, PH, RSA, SRSC, TAI, TAIF, TEX, TI, TNM, U, UC, UNM, US, W, WU, WUK, and YU are gratefully acknowledged for permitting the examination of their specimens. I thank Jeff Martz, Nancy Klaud, Zorica Dabich and Alice Tangerini for providing the botanical illustrations, Larry Dorr, Dan Nicolson, Fred Barrie, Pedro Acevedo and Warren Wagner for helpful discussions and advice on nomenclature, historical references, localities and/or collectors, Jimmy Triplett and Akiko Soejima for checking locality names of *Aralia cordata* from Japan, Christian Feuillet for interpreting references in French, and Paul Peterson for valuable advice during the preparation of the manuscript. Zelong Nie, Hanmin Dong and Michael Dong helped plot the distributional maps, Stefanie Ickert-Bond and Sue Lutz put together the plates on pollen and trichome morphology, Tracy Belaski made the 14 color plates with InDesign, and Sue Lutz and Stanley Yankowski helped with SEM work on trichomes and pollen morphology. John Boggan helped draft distributional maps, provided valuable comments on the earlier version of the manuscript, and helped with obtaining interlibrary loans. Finally, without the love and support from my family, Hanmin, Michael, James, and Grandma and Grandpa Dong, this monograph series of *Aralia* would never have been completed!

LITERATURE CITED

- Backer, C. A. and R. C. Bakhuizen van den Brink. 1965. *Flora of Java*. Groningen.
- Barrett, S. C. H. and K. Helenurm. 1981. Floral sex ratios and life history in *Aralia nudicaulis* (Araliaceae). *Evolution* 35: 752-762.
- Barrett, S. C. H. and J. D. Thomson. 1982. Spatial pattern, floral sex ratios and fecundity in dioecious *Aralia nudicaulis* L. (Araliaceae). *Can. J. Bot.* 60: 1662-1670.
- Bawa, K. S., C. R. Keegan and R. H. Voss. 1982. Sexual dimorphism in *Aralia nudicaulis* L. (Araliaceae). *Evolution* 36: 371-378.
- Blair, A. 1975. Karyotype of five plant species with disjunct populations in Virginia and the Carolinas. *Amer. J. Bot.* 62: 833-837.
- Blanco, M. 1877. *Flora de Filipinas*, 3rd edition. Manila: C. Lopez.
- Blume, C. L. 1826. Araliaceae. In *Bijdragen tot de flora van Nederlandsch Indie*, 15: 869-880. Batavia: Lands Drukkerij.
- Boufford, D. E. and S. A. Spongberg. 1983. Eastern Asian-Eastern North American phytogeographical relationships a history from the time of Linnaeus to the twentieth century. *Ann. Missouri Bot. Gard.* 70: 423-439.
- Bowden, W. M. 1945. A list of chromosome numbers in higher plants. I. Acanthaceae to Myrtaceae. *Amer. J. Bot.* 32: 81-92.
- Bretschneider, E. 1898. *History of European botanical discoveries in China*. London: Sampson Low, Marston & Co. Ltd. (Reprinted in 1962, ZentralAntiquariat, Leipzig.)
- Bui, N. S. 1964. Matériaux pour la flore du Cambodge du Laos et du Viet-Nam genre *Aralia* L. *Adansonia* 4: 461-465.
- Burkill, I. H. 1902. Ginseng in China. *Bull. Misc. Inform. (Kew)* 1902: 4-11.
- Cavanilles, A. J. 1797. *Icones et descriptions plantarum*, vol. 4. Matriti: Regia Typographia.
- Clarke, C. B. 1879. Araliaceae. In *Flora of British India*, ed. J. D. Hooker, 2: 134-179. London: L. Reeve & Co.
- Cornut, J. P. 1635. *Canadensium plantarum ... historia*. Paris: Le Moyne.
- De Candolle, A. P. 1813. Catalogues plantarum horti botanici Monspeliensis addito observationum circa species novas aut non satis cognitatas fasciculo. Monspeli [Montpellier]: J. Martel.
- De Candolle, A. P. 1830. Araliaceae. In *Prodromus systematis naturalis regni vegetabilis*, ed. A. P. de Candolle, 4: 251-266. Paris: Treuttel & Wurtz.
- Decaisne, J. 1844. *Aralia cachemirica*, pp. 72 & pl. 81 in V. Jacquemont, *Voyage dans l'Inde*, vol. 4. Paris: Firmin Didot Frères.
- Decaisne, J. & J. E. Planchon. 1854. Esquisse d'une monographie des Araliacees. *Rev. Hort. Ser.* 4. 3: 104-109.
- Don, G. 1834. *A general history of the dichlamydeous plants*, vol. 3. London.
- Donnell Smith, J. 1910. Undescribed plants from Guatemala and other Central American republics. *Bot. Gaz.* 49: 453-458.
- Edwards, J. 1984. Spatial pattern and clone structure of the perennial herb, *Aralia nudicaulis* L. (Araliaceae). *Bull. Torrey Bot. Club* 111: 28-33.
- Eyde, R. H. and C. C. Tseng. 1971. What is the primitive floral structure of Araliaceae? *J. Arnold Arbor.* 52: 205-239.
- Felsenstein, J. 1985. Confidence limits on phylogenies: An approach using the bootstrap. *Evolution* 39: 783-91.
- Fernald, M. L. 1950. *Gray's manual of botany*. 8th ed. New York: American Book Co.
- Flanagan, L. B. and W. Moser. 1985. Flowering phenology, floral display and reproductive success in dioecious, *Aralia nudicaulis* L. (Araliaceae). *Oecologia* 68: 23-28.
- Flanagan, L. B. and J. F. Bain. 1988. The biological flora of Canada 8. *Aralia nudicaulis* L., wild sarsaparilla. *Can. Field-Nat.* 102: 45-59.
- Franchet, M. A. 1896. Araliaceae, Cornaceae et Caprifoliaceae novae e flora sinensi. *J. Bot. (Morot)* 10: 301-308.
- Franchet, M. A. and L. Savatier. 1875. *Enumeratio plantarum in japonia sponte crescentium*, vol. 1. Paris: F. Savy.
- Frodin, D. G. and R. Govaerts. 2003. World checklist and bibliography of Araliaceae. Kew: the Royal Botanic Gardens.
- Gentry, A. H. 1993. *A field guide to the families*

- and genera of woody plants of northwestern South America (Colombia, Ecuador, Peru): with supplementary notes on herbaceous taxa.* Chicago: Univ. Chicago Press.
- Glaziou, A. F. M. 1909. *Plantae Brasiliae centralis a Glaziou lectae, liste des plantes du Bresil Central recueillies en 1861-1895.* Mem. Soc. Bot. France 1 (3): 297-392.
- Graham, A. (ed.). 1972. *Floristics and paleofloristics of Asia and eastern North America.* Amsterdam: Elsevier.
- Graham, S. A. 1966. The genera of Araliaceae in the Southeastern United States. *J. Arnold Arbor.* 47: 126-136.
- Gray, A. 1840. Dr. Siebold, *Flora Japonica*; sectio prima, Plantas ornatui vel usui inservientes; digessit Dr. J. G. Zuccarini: fasc. 1 10, fol. (A review). *Amer. J. Sci. Arts* 39: 175176.
- Gray, A. 1846. Analogy between the flora of Japan and that of the United States. *Amer. J. Sci. Arts, Ser. 2, 2:* 135136.
- Gray, A. 1859. Diagnostic characters of phanerogamous plants, collected in Japan by Charles Wright, botanist of the U. S. North Pacific Exploring Expedition, with observations upon the relationship of the Japanese flora to that of North America and of other parts of the northern Temperate Zone. *Mem. Amer. Acad. Arts* 6: 377453.
- Gray, A. 1878. Forest geography and archaeology. A lecture delivered before the Harvard University Natural History Society. *Amer. J. Sci. Arts, Ser. 3, 16:* 8594, 183196.
- Grisebach, A. 1858. *Novitiae florum panamensis.* *Bonplandia* 6: 2-12.
- Grisebach, A. 1879. *Pentapanax* Seem. *Abh. Konigl. Ges. Wiss. Göttingen* 24: 144.
- Ha, T. D. 1974. *Flora Vietnamensis taxa nova e tribu Aralieae Benth. (Fam. Araliaceae).* *Nov. syst. Vyssh. Rast.* 11: 226240. (In Russian.)
- Halenius, J. 1750. *Plantae rariores Camschatcenses.* Thesis. Uppsala: Univ. Uppsala.
- HandelMazzetti, H. 1933. Araliaceae. *Symb. Sin.* 7: 690706.
- Hansen, C. and A. F. Maule. 1973. Pehr Osbeck's collections and Linnaeus's *Species Plantarum* (1753). *J. Linn. Soc., Bot.* 67: 189212.
- Hara, H. 1952-1956. Contributions to the study of variations in the Japanese plants closely related to those of Europe or North America. *J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot.* 6: 2996, 343391.
- Hara, H. 1972. Corresponding taxa in North America, Japan and Himalayas. In *Taxonomy, Phytogeography, and Evolution*, ed. D. H. Valentine, 61-72. London: Academic Press.
- Hardin, J. W. and R. L. Beckmann. 1982. Atlas of foliar surface features in woody plants, V. *Fraxinus* (Oleaceae) of eastern North America. *Brittonia* 34: 129140.
- Harms, H. 1896. Zur Kenntnis der Gattungen *Aralia* und *Panax*. *Bot. Jahrb. Syst.* 23: 1-23.
- Harms, H. 1897. Ueber die cultivierte *Aralia*. *Gartenflora*.
- Harms, H. 1898. Araliaceae. Pp. 162. In: A. Engler and K. Prantl (eds.), *Die natürlichen Pflanzenfamilien*, Teil 3, Vol. 8. Wilhelm Engelmann, Leipzig.
- Harms, H. 1908. Araliaceae. *Bot. Jahrb. Syst.* 42: 237-238.
- Harms, H. 1918. Araliaceae andinae. *Repert. Spec. Nov. Regni Veg.* 15: 245-254.
- Harms, H. 1924. *Megalopanax* Ekman. *Notizbl. Bot. Gart. Berlin* 9: 122-123.
- Harms, H. 1928. Zur Kenntnis der Gattung *Sciadodendron* Griseb. *Notizbl. Bot. Gart. Mus. Berlin-Dahlem* 10: 452-456.
- Harrington, H. D. and L. W. Durrell. 1957. *How to identify plants.* Chicago: Swallow Press.
- Ho, C. N. 1952. Additamenta Araliaceis Chinensis. *Acta Phytotax. Sin.* 2: 7179. (In Chinese with Latin description.)
- Hoo, G. and C. J. Tseng. 1965. Contributions to the Araliaceae of China. *Acta Phytotax. Sin.* Add. 1: 129176.
- Hoo, G. and C. J. Tseng. 1978. Angiospermae, Dicotyledoneae, Araliaceae. *Flora Reipublicae Popularis Sinicae*, vol. 54. Beijing: Science Press. (In Chinese)
- Hooker, W. J. 1862. *Leea coccinea*. *Bot. Mag.* 18: pl. 5299.
- Hu, H. H. 1935. A comparison of the ligneous flora of China and eastern North America. *Bull. Chinese Bot. Soc.* 1: 7997.
- Hu, H. H. 1936. The characteristics and affinities of Chinese flora. *Bull. Chinese Bot. Soc.* 2: 6784.
- Huang, T.-C. (ed.). 1993. *Flora of Taiwan*, 2nd ed., vol 3. Taipei: Editorial Committee of Flora of Taiwan, 2nd Edition.
- Hutchinson, J. 1967. Araliaceae. Pp. 52-81 *The genera of flowering plants (Angiospermae)*,

- vol. 2. Oxford: Clarendon Press.
- Kearney, T. H. and R. H. Peebles. 1951. *Arizona flora*. Berkeley: Univ. California Press.
- Kitagawa, M. 1935. Contribution ad cognitionem florum Manshuricae. VI. Bot. Mag. (Tokyo) 49: 222-233.
- Kitagawa, M. 1979. *Neo-Lineamenta florum Manshuricae*. Vaduz: J. Cramer.
- Komarov, V. L. 1907. *Flora Manshuriae*, vol. 3. Petropoli [St. Petersburg].
- Lawrence, G. H. M. 1951. *Taxonomy of vascular plants*. New York: Macmillan.
- Lee, T. B. 1993. *Illustrated flora of Korea*. Seoul: Hyangmoonsa.
- Lee, Y. N. 1970. Chromosome numbers of flowering plants in Korea (1). J. Korea Res. Inst. Better Living 5: 127-129.
- Lee, Y. N. 1972. Chromosome numbers of flowering plants in Korea (4). J. Korea Res. Inst. Better Living 8: 41-51.
- Lewis, H. 1955. Specific and infraspecific categories in plants. In *Biological systematics*, 16th Ann. Biol. Colloq., 13-20. Corvallis: Oregon State Univ.
- Li, H. L. 1942. The Araliaceae of China. Sargentia 2: 1134.
- Li, H. L. 1952. Floristic relationships between Eastern Asia and eastern North America. Trans. Amer. Philos. Soc. 42: 371-429.
- Li, H. L. 1972. Eastern Asia-Eastern North America species pairs in wideranging genera. In *Floristics and Paleofloristics of Asia and Eastern North America*, ed. A. Graham, 65-78. Amsterdam: Elsevier.
- Li, X. P. and Q.-B. Xiang. 1992. Studies on the genus *Aralia* Linn. J. Nanjing Forest. Univ. 16 (2): 17-24. (In Chinese with English abstract)
- Linden, J. J. 1856. *Catalogue plantes exotiques*, vol. 11. Bruxelles: Jardin Royal de Zoologie et d'Horticulture.
- Ling, Y. R. 1977. Materials for the Araliaceae from Kwangtung. Acta Phytotax. Sin. 15: 8486. (In Chinese)
- Ling, Y. R. 1987. Araliaceae. Pp. 272-295 in F. H. Chen (ed.), *Flora of Guangdong*, vol. 1. Guangzhou: Guangdong Science & Technology Press. (In Chinese)
- Linnaeus, C. 1753. *Species plantarum*. Stockholm.
- Liu, Y. C. and F. Y. Lu. 1976. *Aralia* Linn. Quart. J. Chin. Forest. 9: 136.
- Löve, A. and D. Löve. 1982. In IOPB chromosome number reports LXXV. Taxon 31: 344-360.
- Lovell, J. H. 1898. The insect-visitors of flowers. Bull. Torrey Bot. Club 25: 382-390.
- Manchester, S. R. 1999. Biogeographical relationships of North American Tertiary floras. Ann. Missouri Bot. Gard. 86: 472-522.
- Manos, P. S. and M. J. Donoghue. 2001. Progress in Northern Hemisphere phytogeography: an introduction. Int. J. Pl. Sci. 162: S1-S2.
- Marie-Victorin, F. 1964. *Flore Laurentienne*. Deuxième édition, revised by E. Rouleau. Montréal: Univ. Montréal Press.
- Marie-Victorin, F. and J. Rousseau. 1940. Nouvelles entités de la flore phanérogamique du Canada oriental. Contrib. Inst. Bot. Univ. Montréal 36: 1-74
- Marchal, E. 1879a. Révision des Hédéracées américaines. Bull. Acad. Roy. Sci. Belgique 47: 70-97.
- Marchal, E. 1879b. Rectification synonymique relative à ma notice intitulée *Révision des Hédéracées américaines*. Bull. Acad. Roy. Sci. Belgique 47: 514-515.
- Martin, W. C. and C. R. Hutchins. 1981. *A flora of New Mexico*. 2 vols. Vaduz: J. Cramer.
- Matsumura, J. 1899. Notulae ad plantas asiaticas orientales. Bot. Mag. (Tokyo) 12: 17-18.
- McNeil, J., E. A. Odell, L. L. Consaul and D. S. Katz. 1987. American code and later lectotypifications of Linnaean generic names dating from 1753: a case study of discrepancies. Taxon 36: 350-401.
- McVaugh, R. 2000. *Botanical results of the Sessé & Mociño Expedition (1787-1803)*, VII. A guide to relevant scientific names of plants. Pittsburgh: Hunt Institute for Botanical Documentation.
- Miquel, F. A. W. 1840. *Commentarii phytographici*. Leiden.
- Miquel, F. A. W. 1856a [1 May 1856]. Araliacearum indicarum genera et species aliquod novae. Bonplandia 4: 137-139.
- Miquel, F. A. W. 1856b [10 Jul 1856]. Araliaceae. Pp. 745-769 in F. A. G. Miquel (ed.), *Flora Indiae batavae*, vol. 1. Amsterdam: C. G. van der Post.
- Miquel, F. A. W. 1857. Araliaceae. Pp. 81-92 in W. H. de Vries (ed.), *Plantae Indiae batavae orientalis*, vol. 2. Lugduni-Batavorum: E. J. Brill.

- Miquel, F. A. W. 1863. Araliaceae novae, adjecta aliarum specierum praesertim indicarum revisione. *Ann. Mus. Bot. Lugd.-Bat.* 1: 1-27.
- Mitchell, A., C. D. Meurk and S. J. Wagstaff. 1999. Evolution of *Stilbocarpa*, a megaherb from New Zealand's sub-antarctic islands. *New Zealand J. Bot.* 37: 205-211.
- Mizushima, M. 1966. Araliaceae. In *Flora of eastern Himalaya*, ed. H. Hara, 225226. Tokyo: Univ. Tokyo Press.
- Nakai, T. 1909. *Flora Koreana*, pars prima. *J. Coll. Sci. Imp. Univ. Tokyo* 26 (1): 1-304.
- Nakai, T. 1924. Araliaceae Imperii Japonici. *J. Arnold Arbor.* 5: 1-36.
- Nakai, T. 1927. *Flora sylvatica Koreana*, vol. 16. Seoul: Forestal Experiment Station.
- Nishikawa, T. 1985. Chromosome counts of flowering plants of Hokkaido (9). *J. Hokkaido Univ. Education*, sect. IIB 36: 25-40.
- Nixon, K. C. and Q. D. Wheeler. 1990. An amplification of the phylogenetic species concept. *Cladistics* 6: 211-223.
- Ohwi, J. 1984. *Flora of Japan*. Washington, D.C.: Smithsonian Institution.
- Parks, C. R. and J. F. Wendel. 1990. Molecular divergence between Asian and North American species of *Liriodendron* (Magnoliaceae) with implications for interpretation of fossil floras. *Amer. J. Bot.* 77: 1243-1256.
- Peng, C. I., S. F. Yen and J. Y. Guo. 1986. Notes on the chromosome cytology of some rare, threatened, or endangered plants of Taiwan (I). *Bot. Bull. Acad. Sin. (Taipei)* 27: 219-235.
- Persoon, C. H. 1805. *Synopsis plantarum*, vol. 1. Paris: C. F. Cramer.
- Philipson, W. R. 1951. Contributions to our knowledge of Old World Araliaceae. *Bull. Brit. Mus. (Nat. Hist.), Bot.* 1: 320.
- Philipson, W. R. 1977. An enumeration of the Malesian species of *Aralia* L. *Gard. Bull. Straites Settle.* 30: 97100.
- Philipson, W. R. 1979. Araliaceae. Pp. 1-105 in C. G. G. J. van Steenis (ed.), *Flora Malesiana*, vol. 9. The Hague: Martinus Nijhoff Publishers.
- Plante, S. 1995. IOPB chromosome data 10. *Newslett. Int. Org. Pl. Biosys. (Zürich)* 25: 9-10.
- Plunkett, G. M., J. Wen, and P. P. Lowry II. 2004. Intrafamilial relationships in Araliaceae: insights from nuclear (ITS) and plastid (trnL-trnF) sequence data. *Pl. Syst. Evol.* 245: 1-39.
- Poyarkova, A. I. 1950. Araliaceae. Pp 1-36 in B. K. Shishkin (ed.), *Flora URSS*, vol. 16. Moscow: Academiae Scientiarum.
- Poyarkova, A. I. 1973. Araliaceae. Pp 3-36 in B. K. Shishkin (ed.), *Flora of the U.S.S.R.*, vol. 16. Jerusalem: Israel Program for Scientific Translations.
- Probatova, N. S. and A. P. Sokolovskaya. 1986. Chromosome numbers of the vascular plants from the far east of the USSR. *Bot. Zurn.* 71: 1572-1575.
- Ray, J. 1688. *Historia plantarum*. London.
- Regal, E. 1864a. *Index seminum quae Hortus Botanicus Imperialis Petropolitanus*. Petropoli [St. Petersburg].
- Regal, E. 1864b. *Aralia racemosa* L. var. *sachalinensis*. *Gartenflora* 13: 100-101, t. 432.
- Rehder, H. 1900. *Aralia*. In *Cyclopedia of American Horticulture*, ed. L. H. Bailey, 1: 87-88. London: MacMillan.
- Ridley, H. N. 1922. *The flora of the Malay Peninsula*, Vol. 1. London: L. Reeve & Co.
- Rusby, H. H. 1920. *Descriptions of three hundred new species of South American plants, with an index to previously published South American species by the same author*. New York: published by the Author.
- Schlessman, M. A., D. G. Lloyd and P. P. Lowry II. 1990. Evolution of sexual systems in New Caledonian Araliaceae. *Mem. New York Bot. Gard.* 55: 105-117.
- Schlessman, M. A., G. M. Plunkett, P. P. Lowry II and D. G. Lloyd. 2001. Sexual systems of New Caledonian Araliaceae: a preliminary phylogenetic reappraisal. *Edinb. J. Bot.* 58: 221-228.
- Scoggan, H. J. 1978. *The flora of Canada*. Ottawa: National Museums of Canada.
- Scoggan, H. J. and W. Cody. 1979. Interesting vascular plants from the southern Yukon Territory. *Canadian Field-Naturalist* 73: 163-170.
- Seemann, B. 1868. *Revision of the natural order of Hederaceae*. London: L. Reeve & Co.
- Sessé, M. and J. M. Mociño. 1888. *Plantae novae Hispaniae*. Mexico City: Naturaleza.
- Sessé, M. and J. M. Mociño. 1894. *Flora Mexicana*. Mexico City: Naturaleza.
- Shang, C. B. 1985a. Araliaceae. In *Silva Sinica*, ed. W. C. Cheng, 2: 1720-1823. Beijing:

- Chinese Forestry Press. (In Chinese)
- Shang, C. B. 1985b. New taxa and some revisions about the Araliaceae of China. *J. Nanjing Inst. Forest.* 1985 (2): 15-28. (In Chinese with English abstract)
- Siebold, P. F. and J. G. Zuccarini. 1837. *Flora Japonica*, vol. 1. Lugduni Batavorum.
- Smith, A. C. 1936. Notes on North American Araliaceae. *Brittonia* 2: 247-261.
- Smith, A. C. 1944. Araliaceae. In *North American flora*, 28B: 3-41. Bronx: New York Bot. Gard.
- Sprengel, K. 1825. *Systema vegetabilium*, Vol. 1. Gottingen.
- Standley, P. C. 1924. Araliaceae in *Trees and shrubs of Mexico*. *Contr. US Natl. Herb.* 23: 1080-1084.
- Standley, P. C. 1928. Flora of Panama Canal zone. *Contr. US Natl. Herb.* 27: 1-416.
- Standley, P. C. and L. O. Williams. 1966. Araliaceae. In P. C. Standley and L. O. Williams (eds.), *Flora of Guatemala*. *Fieldiana* 24 (pt. 8): 1-21.
- Stearn, W. T. 1983. *Botanical latin: history, grammar, terminology and vocabulary*. 3rd ed. Newton Abbot, England: David and Charles.
- Stuessy, T. F. 1990. *Plant taxonomy: the systematic evaluation of comparative data*. New York: Columbia Univ. Press.
- Sun, B. Y., C. H. Kim and W. Y. Soh. 1988. Chromosome numbers of Araliaceae in Korea. *Korean J. Pl. Taxon.* 18: 291-296.
- Swofford, D. L. 2003. *PAUP*: Phylogenetic analysis using parsimony*, ver. 4.0. Sunderland, MA: Sinauer Associates Inc.
- Taylor, R. L. and S. Taylor. 1977. Chromosome numbers of vascular plants of British Columbia. *Syesis* 10: 125-138.
- Thomson, J. D. 1988. Effects of variation in inflorescence size and floral rewards on the visitation rates of traplining pollinators of *Aralia hispida*. *Evol. Ecol.* 2: 65-76.
- Thomson, J. D. and C. H. Barrett. 1981. Temporal variation of gender in *Aralia hispida* Vent. (Araliaceae). *Evolution* 35: 1094-1107.
- Thomson, J. D., W. P. Maddison and R. C. Plowright. 1982. Behavior of bumble bee pollinators of *Aralia hispida* Vent. (Araliaceae). *Oecologia* 54: 326-336.
- Thomson, J. D. and J. Brunet. 1990. Hypotheses for the evolution of dioecy in seed plants. *TREE* 5: 11-16.
- Thomson, J. D., M. A. McKenna and M. B. Cruzan. 1990. Temporal patterns of nectar and pollen production in *Aralia hispida*: implications for reproductive success. *Ecology* 70: 1061-1068.
- Thunberg, C. P. 1784. *Flora Japonica*. Lipsiae.
- Tiffney, B. H. 1985a. Perspectives on the origin of the floristic similarity between Eastern Asia and eastern North America. *J. Arnold Arbor.* 66: 7394.
- Tiffney, B. H. 1985b. The Eocene North Atlantic land bridge: its importance in Tertiary and modern phytogeography of the northern hemisphere. *J. Arnold Arbor.* 66: 243273.
- Tournefort, J. P. de. 1700. *Institutiones rei herbariae editio altera*. Paris.
- Van Steenis, C. G. G. J. 1948. Notes on Malaysian species of *Aralia* (Aral.). *Bull. Jard. Bot. Buitenz.* 17: 391-395.
- Wallich, N. 1831-1832. *A numerical list of dried specimens of plants, in the East India Company's Museum collected under the superintendence of Dr. Wallich of the Company's botanic garden at Calcutta*. Numbers 4878-6264. London.
- Wang, Z. Z. and J.-H. Hu (eds.). 2001. *Biological study and utilization of plants of genus Aralia*. Shanghai (China): the Second Military Medical University Press. (In Chinese)
- Wanscher, J. H. 1933. Studies on the chromosome numbers of the Umbelliferae III. *Bot. Tidskr.* 42: 384-399.
- Welsh, S.L. & N. D. Atwood. 1975. Araliaceae. P. 333 in Welsh, S. L., N. D. Atwood and J. L. Reveal. *Endangered, threatened, extinct, endemic, and rare or restricted Utah vascular plants*. *Great Basin Nat.* 35: 327-376.
- Wen, J. 1991. *Systematics of Aralia (Araliaceae)*. Ph.D. Dissertation. Columbus: Ohio State University.
- Wen, J. 1993. Generic delimitation of *Aralia* (Araliaceae). *Brittonia* 45: 47-55.
- Wen, J. 1994. New taxa and nomenclatural changes in *Aralia* (Araliaceae). *Novon* 4: 400-403.
- Wen, J. 1998. Evolution of the eastern Asian and eastern North American disjunct pattern: insights from phylogenetic studies. *Korean J. Pl. Taxon.* 28: 63-81.
- Wen, J. 1999. Evolution of eastern Asian and eastern North American disjunct pattern in flowering plants. *Ann. Rev. Ecol. Syst.* 30: 421-455.

- Wen, J. 2000a. Internal transcribed spacer phylogeny of the eastern Asian and eastern North American disjunct *Aralia* sect. *Dimorphanthus* (Araliaceae) and its biogeographic implications. *Intl. J. Pl. Sci.* 161: 959-966.
- Wen, J. 2001a. Evolution of the *Aralia* - *Panax* complex (Araliaceae) as inferred from nuclear ribosomal ITS sequences. *Edinb. J. Bot.* 58: 183-200.
- Wen, J. 2001b. Evolution of eastern Asian and eastern North American biogeographic pattern: a few additional issues. *Intl. J. Pl. Sci.* 162: S117-S122.
- Wen, J. 2002. Revision of *Aralia* sect. *Pentapanax* (Seem.) J. Wen (Araliaceae). *Cathaya* 13-14: 1-116.
- Wen, J. 2004. Systematics and biogeography of *Aralia* L. sect. *Dimorphanthus* (Miq.) Miq. (Araliaceae). *Cathaya* 15-16: 1-187.
- Wen, J. and J. L. Reveal. 1992. On the typification of the Linnean species of *Aralia* (Araliaceae). *Taxon* 41: 69-75.
- Wen, J. and E. A. Zimmer. 1996. Phylogeny and biogeography of *Panax* L. (the ginseng genus, Araliaceae): inferences from ITS sequences of nuclear ribosomal DNA. *Mol. Phylogen. Evol.* 6: 166-177.
- Wen, J., R. K. Jansen and E. A. Zimmer. 1996. Phylogenetic relationships and DNA sequence divergence of eastern Asian and eastern North American disjunct plants. Pp. 37-44 in M. Nei and N. Takahata (eds.), *Current topics in molecular evolution*. Published jointly by The Pennsylvania State University, USA, and Graduate School for Advanced Studies, Hayama, Japan.
- Wen, J., S. Shi, R. K. Jansen and E. A. Zimmer. 1998. Phylogeny and biogeography of *Aralia* sect. *Aralia* (Araliaceae). *Amer. J. Bot.* 85: 866-875.
- Wen, J. and J. W. Nowicke. 1999. Pollen ultrastructure of *Panax* (the ginseng genus, Araliaceae), an eastern Asian and eastern North American disjunct genus. *Amer. J. Bot.* 86: 1624-1636.
- Wen, J., G. M. Plunkett, A. Mitchell and S. Wagstaff. 2001. Evolution of Araliaceae: a phylogenetic analysis based on ITS sequences of nuclear ribosomal DNA. *Syst. Bot.* 26: 144-167.
- Wen, J., A. K. Pandey and M. K. Pathak. 2002. Revision of *Aralia* L. (Araliaceae) in India. *Rhedia* 12 (1): 1-20.
- Wootton, E. O. and P. C. Standley. 1915. Flora of New Mexico. *Contr. US Nat. Herb.* 19: 1-794.
- Wu, Z. Y. 1983. On the significance of Pacific intercontinental discontinuity. *Ann. Missouri Bot. Gard.* 70: 577-590.
- Xiang, Q.-B. and X.-P. Li. 1990. Studies on *Pentapanax* Seem. of Araliaceae. Pp. 619-633 in Y. W. Yuan & al. (eds.), *Proceedings of the International Symposium of Botanical Garden 1990*. Nanjing: Jiangsu Science & Technology Publishing House.
- Xiang, Q.-Y., D. E. Soltis, P. S. Soltis, S. R. Manchester and D. J. Crawford. 2000. Timing the eastern Asian-eastern North American floristic disjunction: molecular clock corroborates paleontological estimates. *Mol. Phylogen. Evol.* 15: 462-472.
- Yi, T.-S., P. P. Lowry II., G. M. Plunkett and J. Wen. 2004. Chromosomal evolution in Araliaceae and close relatives. *Taxon* 53: 987-1005.

ALPHABETICAL INDEX TO COLLECTORS

- Abrams 1954 (1)
 Acad. Bras. de Ciências 1101 (20)
 Acevedo & Martínez 965 (22)
 Adams, J. E. 21(1)
 Adams, J. W. & Hopkins, G. 897 (2)
 Ahart, L. 2483 (1); 5106 (1)
 Ahart, L. & P. 4214 (1)
 Ahles 14228 (15); 40851 (2); 46779 (2); 49417
 (2); 49872 (2); 53987 (15); 61512 (2); 66006
 (15); 79975 (15); 84804 (2)
 Ailts 234 (2)
 Albrecht s.n. (4), 1861
 Alexander et al. 5480 (1); 5587 (1)
 Allard 3158 (2); 11526 (2)
 Allen 1604 (22)
 Allen & van Severen 7093 (22)
 Anderson 3041 (1)
 Anderson & Brown 9881 (15)
 Andreas 1827 (15)
 Andreas, B.A. & T. S. Cooperrider 2186 (2)
 Anect 135 (3)
 Antezana 650 (19)
 Apgar s.n. (15)
 Applegate 2703 (1); 6528 (1)
 Aquilar 1421 (16)
 Araquistain 3478 (22)
 Aristeguieta 4232 (22); 6047 (22); 6157 (22)
 Arsène 17733 (3)
 Asano 5060 (13)
 Auclair & Walther 57 (2)
 Augustinowiz 71 (5)
 Austin s.n. (1); 512 (1)
 Baishuijiang Expedition 1661 (14); 2477 (14)
 Baishuijiang Expedition Team 5728 (7)
 Baker et al. 11308 (18)
 Balansa 3758 (20)
 Balcazar 11 (19)
 Ball s.n. (1)
 Ballard s.n. (2)
 Barber 151 (3)
 Barclay et al. 1456 (1)
 Barkalov s.n. (5), 20 Jul 1982; s.n. (5), 5 Aug
 1988
 Bartley 1377 (15)
 Batchelder s.n. (2)
 Beauchamp 1003 (4); 1033 (4)
 Beckwith 128 (1)
 Bedker 1543 (3)
 Beer 25333 (9)
 Benítez P. 2930 (3)
 Benke 362 (2)
 Benson 2196 (1)
 Bernardi 7382 (20)
 Beyer et al. 119 (4)
 Bigelow s.n. (1)
 Bi Jie Team 862 (14); 873 (14)
 Biltmore 28a (16); 1301 (15)
 Bioletti s.n. (1)
 Biology Department of Sichuan University
 Expedition Team 51545 (7)
 Bisset s.n. (4)
 Blake 837 (1); 2329 (2); 3827 (15); 4041 (15);
 6725 (2)
 Blanchard s.n. (2), 10 Sep 1883; s.n. (2), 29 Jul
 1892
 Blankinship s.n. (1), 7 Sep 1929
 Blatchford s.n. (15)
 Blewitt 2587 (2)
 Blouín et al. 7198 (15)
 Blumer 1625 (3); 1625a (3)
 Bohrer 1263 (3)
 Bohl 4193 (15)
 Boivin, B. 13927 (15)
 Boivin, B. & D. Dunbar 10360 (15)
 Boivin, B. & J.-M. Perron 12535 (15)
 Bojórquez & Aguiar 545 (16)
 Bolander s.n. (1)
 Boom B3058 (4)
 Boufford, D.E. & M. Kato 22429 (4)
 Boufford, D.E. & E.W. Wood 19842 (4)
 Boufford, D.E. et al. 14256 (15); 15452 (2)
 Bowerman 233 (1)
 Bowman 70 (15)
 Boyd s.n. (15)
 Bracelin, H. P. 1092 (1)
 Bracelin, N. F. 1439 (1); 2290 (1)
 Bradley 7877 (15)
 Bradshaw s.n. (2)
 Brandegee s.n. (1)
 Brandegee, K. s.n. (1), Jun 1905
 Brandegee, T. S. s.n. (18), 12 Mar 1889
 Braun, E. L. 2494 (15); 3579 (2); s.n. (2), 7 Jul
 1903; 4508 (15); s.n. (15), 31 Aug 1955
 Braun, L. s.n. (2), 3 Aug 1910

- Bravo Bolaños 1314 (3)
Breedlove, D.E. 11845 (16); 12085 (16); 27076 (16)
Breedlove, D.E. & P.H. Raven 13230 (16)
Breedlove, D.E. & R. F. Thorne 30289 (16)
Brenes 15535 (22)
Brewer 747(1)
Brina & Costa 32.691 (20)
Brinkman 2072 (15)
Brinton s.n. (2)
Britton et al. s.n. (2)
Bross s.n. (15)
Brown, H. A. et al. s.n. (15), 2 Jun 1890
Brown, H. E. 903 (1)
Brown, S. 357 (15)
Browne & Browne Jr 4417 (2)
Brumbach 8414 (2)
Brummitt 19027 (4)
Bullock 2080 (22)
Bürger s.n. (4)
Burger & Burger 7742 (22)
Burgess s.n. (2); s.n. (15), Jun 1983; s.n. (15)
Burk 505 (2)
Burton s.n. (2); s.n. (15)
Búúriquez, A. 93-111 (16)
Búúriquez, A. & D. Yetman 95-213 (16)
Bye 5952 (16); 5996 (16); 6628 (3)
Cabrera et al. 29806 (19); 32084 (19)
Calder, J. A. & J. M. Gillett 25404 (15)
Calder, J. A. et al. 13026 (15); 16828 (15); 16865 (15); 17415 (15)
Calderón 2171 (22)
Camp 38-3 (3)
Canby s.n. (2); s.n. (15)
Canright 327a (2)
Cárdenas 3361 (19)
Carlson 1355 (16)
Carpenter s.n. (2)
Carr 131 (15)
Carter, A. 4393 (18); 5453 (18)
Carter, A. & R. Ferris 3816 (18); 3893 (18); 3984 (18)
Carter, A. & J. Reese 4565 (18)
Carter, A. & H. Sharsmith 4165 (18)
Carter, E. 331 (1)
Chagas, F. & Silva 00000, FUEL No. 10742 (20)
Chagas, F. et al. 01682 (20)
Chakraborty 2397 (9)
Chamberland 950 (2)
Chandler 816 (2)
Chaney 187 (2)
Chang 346 (11)
Chapman s.n. (2)
Chase, A. 1949 (2)
Chase, V. H. 3455 (2); 10781 (2); 13596 (2)
Chen, C.-H. 1033 (6)
Chen, D. C. 910 (7)
Chen, S. Q. 15429 (7); 15792 (7)
Chen, S.Z. & B.S. Li 00296 (9)
Cheng 2664 (6)
Chestnut 220 (1)
Chiang, F. 1085 (22); 2291 (16)
Chiang, F. et al. F-2594 (16); 9549b (17)
Chiao 2069 (9)
Chien 1172 (7)
China-Soviet Union Expedition Team 2039 (14)
Ching 2957 (7); 7151 (7); 23567 (11); 24437 (11)
Chittenden & Peil 481 (15)
Chow 40973 (7)
Christ 12837 (15)
Chu 3780 (7); 3300 (10)
Chuan-Jing-A (Sichuan Economic Plants Aba) 1333 (see discussion in 9)
Churchill, J. R. s.n. (2), 18 Aug 1886 ; s.n. (2), 3 Sep 1921; s.n. (2), 26 Jul 1915
Churchill, S. P. 5625 (15)
Clark, H. S. s.n. (2)
Clark, O. M. 12555 (16)
Clark, R. C. 1165 (2)
Clarke, C. B. 29470 (8); 30906 (8); 30918 (8)
Clarke, O. F. 427 (16)
Clausen 7904 (2)
Clemens, J. s.n. (2), 28 Jul 1909; s.n. (15), 11 Aug 1908
Clements 230 (15)
Cody & Matte 8242 (15)
Coile 3376 (2)
Colin 15689 (17)
Collector unknown s.n. (3)
Collett 6568 (9); 584 (9); 5542A (8)
Collins & Pease s.n. (2)
Congdon s.n. (1)
Constance s.n. (1)
Cooper, R.E. 650 (9); 2983 (9)
Cooper, R. E. & A. K. Bulley 270 (9); 2567 (9)
Core s.n. (19); 2666 (15)
Couzatti & Gouzaley 674 (16)
Coville s.n. (15)
Crandall s.n. (15)
Croat 14629 (22)

- Curtiss s.n. (2)
 Daniel, T. F. 2993 (16)
 Daniel, T. F. & S. Nelson 3572 (3)
 Darrow & Haskell 2023 (16)
 Dash & Maih 18555 (9)
 Davidse, G. & G. E. Pilz 31617 (16)
 Davidse, G., M. Sousa, O. Téllez, E. Martínez & J. Davidse 29973 (16)
 Davidson 1978 (15)
 Davis 4853 (2)
 Davy s.n. (1)
 Dawson 4991 (15)
 Day 77 (2); 78 (15)
 Deam s.n. (2), 25 Aug 1897; 495 (2); s.n. (15), 28 May 1905
 Deane s.n. (8)
 Dechamps & Carrera 12190 (21)
 de Haas 886 (19)
 Delavay, M. s.n. (11), 27 Aug 1885
 Delavay, P. J. M. 4027 (11); 4530 (11); 4536 (11); s.n. (11), 22 Aug 1885; s.n. (11), 26 Jul 1885; s.n. (11), 6 Aug 1885
 Delevoryas s.n. (2)
 Delgado & Hernández 239 (17)
 de Quiroz & N. S. Nascimento 3853 (23)
 Detling 9040 (1)
 Dhevoj 0493 (9)
 Diamond 1297 (2)
 Díaz-Barriga 3739 (16)
 Diaz 00494 (17)
 Dice et al. 507 (18); 680 (18)
 Diguët s.n. (18)
 Dodge s.n. (2)
 Donnell Smith 194 (15); 779 (15)
 Dorr, L. 1604 (15)
 Dorr, L. & L. Barnett 7059 (19)
 Downs 1580 (2); 7243 (15); 8124 (2); 8765 (15)
 Drummond 24236 (8)
 Duchassaing s.n. (22)
 Ducloux 3941 (11)
 Dudley s.n. (1)
 DuMond 1307 (2); 1809 (2)
 Duncan, D. s.n. (1)
 Duncan, W.H. 7560 (15)
 Dungboo 2 (9)
 Dunkle 402 (15)
 Duthie 595 (8); 12254 (8); 19618 (8); s.n. (8)
 Dutton s.n. (2)
 Eames, A.W. s.n. (2)
 Eames & Godfrey 269 (2); s.n. (15)
 Earle 4596 (1)
 Eastwood, A. 13922 (1)
 Eastwood, A. & J. T. Howell 1173 (3)
 Eaton s.n. (2), Meriden, Aug 1856; s.n. (2), New Haven; s.n. (15), New Haven, Jun 1856
 Ebinger 857 (2)
 Edgeworth 187 (8)
 Edmondson 1333 (2); s.n. (15)
 Edwards s.n. (1)
 Eggleston & Kelly 22748 (2); 22752 (15)
 Eiseman 21 (15)
 Ekman 13451 (21); 13523 (21); 17551 (21); H5524 (22); H6009 (22); H6545 (22); H7966 (22)
 Elcoro 1152 (16); 1153 (16)
 Ellis 428 (8)
 Elmer 4987 (1)
 Engelmann s.n. (1)
 Epling 7179 (15)
 Everett et al. 23942 (1)
 Ewan 9426 (1); 9433 (1)
 Eyerdam & Beetle 22669 (19)
 Fang et al. 31839 (10)
 Farges s.n. (10); s.n. (14)
 Faurie 398 (5); 3322 (4)
 Faurie, P. 806 (4); 1159 (4); 1284 (4)
 Faurie, U. s.n. (4); 6849 (4)
 Felipe 1270 (16)
 Feng 116 (11); 1351 (12); 1566 (12); 2791 (11); 5534 (12); 5909 (12); 23499 (12)
 Fernald, M. L. s.n. (15)
 Fernald M. L. & B. Long 9112 (2)
 Fernald, M.L. & K. M. Wiegand 5948 (15)
 Ferreyra 2751 (19)
 Filho, Martins & Stubblebine 13280 (20)
 Fink 250 (2); s.n. (15)
 Fishbein et al. 704 (3); 725 (3); 1617 (16)
 Fitzpatrick s.n. (15)
 Flanagan & Kirkham ESUS 130 (7)
 Fleck s.n. (3)
 Fleming 331 (9)
 Foley s.n. (2)
 Folsom 3436 (22)
 Forbes 1702 (3)
 Foreman s.n. (2)
 Fosberg 48647 (1); S5286 (1)
 Fowler s.n. (2) 1868; s.n. (2), Aug 1893; s.n. (2), 25 Jul 1893; s.n. (15)
 Fox, H. E. s.n. (4)
 Fox, W. B. & R. K. Godfrey 3388 (2); 5378 (2); 5415 (2)
 Freer, R. S. 2442 (2); 2782 (15)

- Freer & Hooks 3856 (15)
French s.n. (2)
Fu, G. X. 403 (9)
Fu, G. X. & K. S. Zhang 1397 (7)
Fu, K. J. 5140 (14); 17097 (7)
Fu, L. K. 0776 (7)
Fukuyama & Suzuki-Tokio ST 15202 (6)
Furuse 21403 (13); 26619 (4); 45807 (4)
Gage 2512 (5); 2632 (5)
Galen 1047 (2)
Gales 325 (1)
Gamble 25054 (8); 25231 (8); 27311 (8)
Gammie 712 (9)
Garton 24121 (2); 9786 (11)
Gates 864 (2); 130 (2); 344 (15)
Gay 486 (19); s.n. Jun 1817 (16)
Gayle 714 (15)
Gentry, A. & C. Diaz 58212 (19)
Gentry, A. et al. 44106 (19)
Gentry, H. S. 1516 (16); 4262 (18)
Gentry, H. S. & W. B. Fox 11806 (18)
Giddiqi 4052 (8)
Gierisch 3789 (3)
Gilbert et al. 876 (2)
Giles 544 (8)
Gillett 4985 (15)
Gillis 2964 (15)
Gilman 39 (16)
Glassman 8380 (15)
Glaziou 1895 (20); 6559 (20); 10895 (20);
109416a (20); 19416a (20); s.n. (20)
Glaziou, A. 6559 (20)
Glowenke 5192 (15)
Godfrey, C. C. s.n. (2)
Godfrey, R. K. & J. E. O'Connell 51881 (2);
52001 (2)
Godfrey R. K. et al. 51656 (15)
Gonzalez M. 8408 (17)
González-Medrano 7029 (17)
Gonzalez & Acevedo 2163 (16)
Goodding 324 (3); s.n. (3); 58-61 (16); 230-45
(16)
Goodman & Lawson 8672 (15)
Gorman 1668 (1)
Gorovoy s.n. (7)
Gould et al. 2681 (16)
Grant, G. B. 4450 (1)
Grant, M. L. 2769 (15)
Graves s.n. (2)
Greenman 2554 (2)
Greenman et al. 32 (15)
Griffin s.n. (1)
Griffiths 7122 (3)
Grimaldo N. 511 (16)
Grisebach s.n. (19)
Grisebach & Lorentz 11/77 (19)
Guan 75598 (7)
Guang-Fu Forestry District Team 00928 (7);
01076 (7)
Guzman, Castro & Montiel 398 (22)
Haber & Shchepanek 1613 (15)
Haines 2245 (8)
Hajra 525 (9)
Hallberg 984 (16)
Hall, H. M. s.n (1); 9383 (1)
Hall, J. s.n. (2)
Hall, W. S. s.n. (15)
Halley 49 (3)
Halse 5634 (1)
Hammond 168 (1)
Hammel 1604 (22)
Handel-Mazzetti 7025 (11); 8979 (12)
Hansen, G. 325 (1)
Hansen, G. M. s.n. (1)
Hardin 712a (15); 13220 (15)
Harger s.n. (2)
Harms, L. J. 2673 (2)
Harms, V. L. 17640 (15)
Harshberger s.n. (2)
Harris, G. W. s.n. (2)
Harris, S. K. & C. C. et al. 6976 (1)
Harrison, G. J. 4849 (3)
Harrison, H. H. s.n. (15)
Hartman, C. V. 143 (16)
Hartman, R. L. 17576 (15)
Harvill 17768 (2)
Hatschbach & Silva 50381 (19)
Haught 737 (2)
Hayes 734 (22)
Hayne 958 (15)
Hayward 240 (15); 290 (15); 840 (15); 868 (15);
1131 (15); 1203 (15); 1348 (15); 1439 (15);
1716 (15); 1922 (15)
Hazlett 712 (15)
He, D. P. 45641 (12)
He, Z. & Z. L. Zhou 12948 (10)
Heidenreich 437 (2)
Heller 5717 (1)
Henrickson 11442 (3); 13172 (17)
Henry 6088 (14); 6655 (14); 6655A (14); 6785
(12)
Hermann 7879 (15)

- Hernández M. 6058 (17)
 Herrera s.n. (16)
 Hess, W. 2367 (3)
 Hess, W. et al. 7817 (1); 8260 (15); 8684 (15);
 8770 (2); 8809 (15)
 Higgins 1827 (2)
 Hill 9576 (2)
 Hickey II 276 (15)
 Hinckley s.n. (3); 405 (3)
 Hinton, G. B. 1789 (16); 4430 (16); 5141 (16)
 Hinto, G. B. n et al. 9605 (16); 11295 (16);
 11440 (16)
 Hitchcock, A. S. 12017 (15)
 Hitchcock, C. L. 17716 (15); 24019 (15)
 Hitchcock, C. L. & J. S. Martin 5191 (1)
 Ho 561 (6)
 Hobson s.n. (9)
 Hodgson 3230 (3); 6433 (16); 8121 (18); 8148
 (18)
 Hogan 3835 (15)
 Hong et al. 33.318 (7); 34.433 (7)
 Hooker s.n. (8)
 Hoolpson s.n. (4)
 Horr 4243 (2)
 Hotchkiss & Jones 4068 (2)
 House 27588 (2); 28182 (2); 29957 (2)
 Howard 13 (1)
 Howe, C. D. 1338 (15)
 Howe, C. D. & W. F. Lang 1307 (15)
 Howell 786 (1); s.n. (1)
 Hsu 3190 (13)
 Hu, W.-H. 1435 (6); 2821 (6)
 Hu, S. Y. 1242 (see discussion in 9); 1933 (10);
 2075 (10); 2591 (10)
 Huang, C.-I. 2343 (6)
 Huang, D.-A. 61322 (7)
 Huang, S. F. & S. Y. Yang 3765 (6)
 Huang, Y.-Y. 99 (6)
 Huang, Z. P. et al. 1743 (9); 1854 (9)
 Huang, Z. Q. 164 (11)
 Huang Tu Team 5939 (10)
 Hubbard s.n. (3)
 Hui 75-512 (9); 75-896 (9); 75-1051 (9)
 Hutchins 3492 (3); 4597 (3)
 Hutchinson 7321 (16)
 Hyypio 596 (15)
 Igotov s.n. (5)
 Imdorf 988 (3)
 Iseley 1262 (15)
 Ismael C. 23891 (16)
 Izaguirre 131 (16)
 Jacquemont 717 (8); 718 (8); 913 (8); s.n. (8)
 James, F. C. 10196 (15)
 James, H. E. M. s.n. (7)
 Janke 3815 (15)
 Janssen 257 (2); 498 (2)
 Jenkins 3227 (2)
 Jiangxi Team 537 (7)
 Jiménez et al. 1085 (22); 1358 (22)
 Jing Fu Shan Team 1741 (14)
 Johansen 15 (22); 43 (22)
 Johnson, R. T. 419 (2)
 Johnston, M. C. et al. 11149 (17); 11466 (17);
 11484 (17); 11819 (3)
 Jones, G. N. 7842 (1); 32369 (15)
 Jones, M. E. 25 (16); 139 (15); 2375 (1); 13414
 (1); 24945 (3); 27094 (18); s.n. (2); s.n. (16),
 25 Aug 1903; 4 Sep 1903; s.n. (3), 21 Sep
 1903; s.n. (16); s.n. (16), 24 Sep 1903; s.n.
 (3), 26 Sep 1903; s.n. (3), 18 Jul 1922; s.n.
 (16), 19 Sep 1931
 Jørgensen 3254 (20)
 Kane 2481 (15)
 Kao 4153 (6); 9477 (6)
 Karges 2002-08095-6 (3)
 Karwinsky 777 (17); 1248 (17)
 Kearney, T. H. Jr. 148 (2)
 Kearney, T. H. & R. H. Peebles 9901 (3)
 Keckard et al. 5683 (1)
 Keil 17760 (15)
 Kellerman 5828 (see excluded names)
 Kerber 266 (16)
 King, A. 22 (15)
 King, G. 4436 (9)
 Kitz 6 (15)
 Kleeberger s.n. (2)
 Kluge 50 (22)
 Knobloch 5802 (16)
 Knowlton s.n. (2)
 Ko et al. 1382 (6)
 Kologiski & Perino 190 (15)
 Komarov 1152 (7)
 Kong 41889 (7); 42009 (7)
 Kral 10274 (15); 50610 (2); 51004 (2); 51097
 (2)
 Krautter s.n. (1)
 Krishna 2238 (9)
 Krotkov 9263 (2)
 Kryshstofovich s.n. (5); 171 (5)
 Kuhlmann 54822 (20)
 Kumar & Singh 9562 (9)
 Kunming Institute of Botany Team 130 (12)

- Kunming Work Station 23918 (11)
 Kunming Vegetation Team s.n. (12), 14 Jun 1981; s.n. (12), 6 Jul 1981
 Kusche s.n. (3)
 Lace 1476 (8)
 Lai, S. S. et al. 01450 (7)
 Lai, S. S. & M. X. Nie (7)
 Laing 102 (15)
 Lakela 1407 (15)
 Lammers 10297 (2)
 Lammers & Vincint 9018 (15); 9927 (15)
 Lanping Herbal Medicine Co. s.n. (12)
 Lansing Jr. 891 (15)
 Lathrop 7656 (1)
 Leavenworth, W. & M. 1898 (16)
 Leavenworth, W. C. & H. Hoogstraal 1684 (16)
 Lee 284 (15)
 Lehto 2154 (16)
 Leiberger 5883 (3)
 Lemieux 9837 (15)
 Lemmon 564 (1)
 Lemmon Herb. 2616 (16); 2716 (16)
 León 3560 (18)
 Leonard 1699 (2); 2101 (2); 3973 (15)
 LeSueur 940 (3); 1153 (16); 1400 (3)
 Levy s.n. (2)
 Lewis 49158 (1)
 Li, B. G. & S. B. Wan 750219 (14)
 Li, G. F. 62967 (14)
 Li, G. Z. 15425 (7)
 Li, H. J. 3446 (14); 3577 (7); 5264 (7); 5744 (7); 5754 (14)
 Li, M. K. 0720 (11)
 Li, Q. 73940 (10); 73998 (10); 78132 (10)
 Li, Q. X. 422 (10)
 Lian et al. 93-339 (10)
 Liebmann 33 (16); 12135 (16)
 Liesner 17208 (2)
 Lillo 163 (19)
 Lin, C.-H. 617 (6)
 Lin, C. Q. 961 (7); 1048 (7)
 Lin, M.-J. 154 (6); 285 (6)
 Lingriff 788 (4)
 Liou 3112 (7); 3607 (7); 3850 (7); 5019 (7)
 Liou & P. C. Tsoong 2175 (10); 2616 (7)
 Liu 11808 (7); 11836 (7)
 Lorentz & Hieronymus 214 (19); 1173 (19)
 Lott 964 (22); 1055 (22); 3802 (22)
 Louis-Marie s.n. (2)
 Lowry II et al. 4969 (6)
 Lu, F. Y. & C. H. Ou 1507 (6); 1836 (6)
 Lu, S. Y. 5971 (6); 12676 (6); 14919 (6)
 Lucien & Louis-Marie 1202 (2)
 Lucy 8779 (2)
 Ludlow, F. et al. 21302 (9)
 Ludlow, F. & G. Sherriff 535 (9); 7831 (8); 9366 (8)
 Lund et al. 263 (3)
 Lundell s.n. (15), 1 Jul 1905; s.n. (15), Ramsey Co.
 Luo, Y. B. 2487 (7); 2769 (7)
 Luo, Z. C. 07 (14); 1661 (7)
 Macbride et al. 882 (1)
 MacDougal 465 (3)
 MacFadden s.n. (1)
 Mackenzie 429 (2); 1607 (2); 3895 (2); s.n. (15)
 Macon s.n. (2)
 Magallanes 1110 (23); 777 (22)
 Maire, E. E. s.n. (11), Jul 1913; s.n. (11), Oct 1913; s.n. (11), Ma-li-ouan; 294 (11)
 Maire, R. P. s.n. (11), 10 Aug 1921; s.n. (11), near Ma-li-ouan
 Makino s.n. (4), 14 Aug 1900; s.n. (4), 4 Oct 1926; s.n. (4), 2 Nov 1931; s.n. (4), 19 Sep 1937
 Malte 700/22 (2)
 Mandon 570 (19)
 Mao 207 (11)
 Marulanda & Betancur 2128 (22)
 Marcelline 2269 ½ (3); 1905 (3)
 Marie-Victorin, et al. 48990 (2); 56252 (2)
 Marie-Victorin & Rolland-Germain 18507 (15); 55285 (15); 56602 (15)
 Marie-Victorin, Rolland-Germain & Meilleur 44562 (2)
 Marin 88 (16)
 Marley 912 (3)
 Marsh Jr. 828 (3)
 Martin et al. 78 (16)
 Martineau 359 (1)
 Mason 5759 (1)
 Matsushita 196 (4)
 Matsumura s.n. (13)
 Matuda-Eizi s.n. (6)
 Maysilles 10 (15)
 Maximowicz s.n. (4); s.n. (7), 1860
 Maximowicz, C. J. 10960 (4)
 Maxon 6181 (15)
 McCallum s.n. (1)
 McClatchie s.n. (1)
 McCleary s.n. (3)
 McCoy 585 (2)

- McDonald Jr. 18 (15); s.n. (15)
 McDougall 1413 (2)
 McGill & Lehto L20373 (16)
 McVaugh 8794 (2); 10348 (17)
 McMurphy 4 (1)
 Mead 2628 (15)
 Mearns 23 (15)
 Mell 130 (2)
 Melvin 3393 (2)
 Merrill 583 (2)
 Metcalfe 303 (3)
 Meyer, C. V. s.n. (1), 30 Jul 1968
 Meyer, F. s.n. (19), 15 Sep 1967
 Michener & Bioletti s.n. (1)
 Miller, G. S. 2101 (2)
 Miller, J. S. et al. 8889 (2)
 Miller, J. S. & N. Snow 8345 (2)
 Milligan s.n. (2)
 Mills s.n. (7), 25 Jul 1911; s.n. (7), 3 Aug 1911
 Millspaugh s.n. (2); 3552 (15)
 Minott s.n. (15)
 Minshall 106 (15)
 Miranda 8820 (22)
 Miranda 9068 (16)
 Mittleman 550 (16)
 Miyamoto et al. 10271 (9); 20169 (9)
 Mohr s.n. (2)
 Moir 4221 (15)
 Moldenke, A. L. & H. N. 30238 (1); 31095 (2)
 Moldenke, H. N. 2395 (15); 8741 (2); 9558 (15);
 13532 (2); 19455 (15); 20270 (2)
 Molina R., A. 4077 (16); 5414 (16); 7039 (22);
 12849 (16); 15228 (16); 22478 (16); 31748
 (16)
 Molina R., A. & A. R. Molina 27963 (16);
 30843 (16)
 Monetti 1748 (19)
 Mooar 8003 (15)
 Moodie 2 (15); 36 (15); 930 (15)
 Moore, J. K. 2488 (2)
 Moore, J. W. & M. F. 11032 (15)
 Moran 11545 (18); 11554 (18); 11586 (18);
 20405 (18); 23846 (18)
 Moreno 25344 (22)
 Morton 1903 (15); 11608 (15)
 Motorina s.n. (5)
 Mt. Jolmo Lungma Exped. Team 758 (9)
 W. C. Muenscher & Bechtel 477 (2)
 Mühlbauer 01 (19)
 Mullen II 590 (2); s.n. (2)
 Murata, G. 16727 (13)
 Murata, J. 10106 (4)
 Murat, J. et al. 5993 (4)
 Murdoch, J. 1367 (2)
 Murdoch Jr., J. 4143 (15)
 Mustard 319 (15)
 Nan Shui Bei Diao Team 9245 (12)
 Nash, G. V. s.n. (15)
 Nash, L. & E. Lehto L19400 (16)
 Nee, M. 10784 (22); 33832 (19); 40304 (19)
 Nee, M. & J. Wen 53807 (19); 53845 (19);
 53878 (19)
 Nee, M. et al. 53714 (19)
 Neill 1082 (22); 3458 (22)
 Nelson, A. 2140 (15); 9456 (15)
 Nelson, D. G. 633 (1)
 Nelson, E. H. s.n. (1)
 Nelson, E. W. 1435 (16); 1952 (16); 3237 (16);
 3451 (16); 4463 (17); 6141 (3)
 Nelson, E. W. & E. A. Goldman 7189 (18)
 Nicely 3126 (2)
 Nichols s.n. (15)
 Nie et al. 788 (9); 938 (9); 1023 (9)
 Norris 72 (15)
 Northeast Yunnan Team 677 (7)
 Northwest Yunnan Jingshaji Team 6546 (11)
 Nourse 34 (1)
 Ohashi s.n. (4)
 Ohba 680914 (4); 69828 (4)
 Ohlendorf 4154 (2)
 Ohwi s.n. (4)
 Oldham 310 (4); 837 (4); s.n. (4), 1862
 Olds s.n. (2)
 Omer & Qaiser 2748 (8)
 Oosting 34303 (15)
 Ortega 5051 (16); 5388 (16)
 Ou, C. H. 2909 (6)
 Ou, C. H. et al. s.n. (6), 20 Jun 1990; s.n. (6), 24
 Aug 1990
 Over 1790 (15); 1951 (2); 14415 (2)
 Ownbey & Meyer 2221 (1)
 José Padilla 16 (16)
 Palczewsky s.n. (7)
 Palmer, E. 110 (16); 2408 (1)
 Palmer, E. J. 34334 (3)
 Palmer, W. & W. H. King 126 (2); 142 (2)
 Pammel & Ball 740 (15)
 Parfitt, B. D. 4387 (16)
 Parfitt, B. D. & C. M. Christy 4696 (16); 4698
 (16)
 Parish, S. B. s.n. (1)
 Parish, S. B. & W. F. 437 (1)

- Parks, H. E. 710 (1)
Parks, H. E. & S. E. 24030 (1)
Parmelee 687 (2); 1769 (2); 1911 (2)
Parmelee & Hyypio 155 (15)
Parodi 4/83 (20)
Pase, C. P. 1413 (3)
Pase, C. & D. Keil 3461 (3)
Patterson 37 (15)
Peattie 1212A (2); 1244 (2)
Peck 8914 (1)
Peebles et al. 4486 (3)
Peirce s.n. (2)
Peng 7263 (6); 14460 (6)
Pérez 111 (22); 958 (22); 1770 (22)
Pérez & Pérez 834 (22)
Petrov s.n. (7)
Pfeifer 1531 (16); 1753 (16)
Phelps 721 (15)
Phillips 2467 (3)
Pinfold 252 (8)
Pinkava et al. 16143 (3)
Pinto & Bautista 91/83 (23)
Pittillo, D. 346 (2); 3161 (2)
Pittillo, J. D. 2877 (2)
Plant Chemistry Voucher 683 (7)
Plowman 13862 (2); 10536 (15)
Pollard s.n. (1)
Polunin 56/606 (8); 1639 (9)
Polunin et al. 5045 (8)
Popov s.n. (5)
Poretzky 279 (7)
Powell & Powell 3921 (3)
Preble & Cary 127 (15)
Presl s.n. (16)
Price s.n. (2)
Prince & Atwood 764 (2)
Pringle 4366 (16); 5144 (16); 6173 (16); 6237 (16); s.n., 28 Sep 1891 (16)
Pucha Team 20325 (7)
Purpus 5010 (17); 5011 (17); 9160 (16); 9232 (16); s.n. (18);
Qi 612694 (11)
Qinghai-Xizang Team 1071A (12); 1850 (12); 2663 (12); 6340 (9); 6856 (12); 7597 (12); 8574 (12); 10555 (12); 74-2149 (9); 74-2440 (9); 75-34 (9)
Qinghai-Xizang Additional Collections Team 751563 (9); 751842 (9)
Qiu, B.-Y. 50212 (11); 50428 (11); 54837 (11); 54965 (11); 57877 (11); 596355 (11)
Qiu, P. X. 1873 (7)
Radford & Stewart 1769 (2)
Radford, A. E. 6258 (2); 17228 (2)
Raizada 7263 (8)
Raju 4128 (9)
Ramseur 4655 (15)
Rand s.n. (2)
Randall 6 (1)
Rattan s. n. (1)
Ratter et al. 5047 (20)
Raup, H. M. 6142 (15)
Raup, H. M. & E. C. Abbe 4561 (15)
Rea et al. 74 (19)
Rebman et al. 1420 (18)
Rebman 2372 (18)
Redden s.n. (1)
Redfearn Jr & Weber 27516 (2)
Redfield s.n. (2); 2036 (2)
Reed s.n. (1)
Reeves 3889 (3)
Reko 4977 (16)
Rich 1239 (8)
Ricksecker s.n. (2)
Rixford s.n. (1)
Robbins 2066 (1)
Robinson 221 (15)
Rodin 311 (1)
Valerio Rodriguez 480 (16); 1531 (16)
Rolland-Germain 3200 (2)
Roller 348 (2)
Romírez 367 (22)
Rosales 787 (22); 1279 (22)
Rose 3049 (16)
Rose & Painter 8145 (15)
Rose et al. 13097 (16)
Rose 38304 (1); 49158 (1); 66045 (1)
Ross, T. S. & A. H. Ross 6025 (1)
Rothrock s.n. (2); s.n. (15)
Rousseau & Rouleau 5 (15)
Roy 1203 (2)
Royle s.n. (8)
Rudd 685 (15); 802 (15); 807 (15)
Rutter s.n. (15)
Rydberg 732 (15); 733 (15)
Safford 94 (15)
Salinas T., A. et al. F-3144 (16)
Salinas, N. 3471 (19)
Sandberg 772 (15)
Sanders 11212 (22)
Sanders et al. 5195 (16)
Sandino 3492 (22)
Saravia et al. 35A (19)

- Sasaki s.n. (6)
 Sather & Caddell 2479 (4); 4914 (4); 5544 (4);
 6605 (4)
 Savatier 523 (4); 3835 (4)
 Savernin 107 (7)
 Scamman 3082 (15)
 Schaeffer Jr. 34359 (2); 37866 (2)
 Scheruk s.n. (2)
 Schlagintweit 3796 (8)
 Schmidt, F. s.n. (5), 1860; s.n. (5), Aug 1860;
 18202 (5)
 Schmidt, H. H. & M. Merello 1082 (2)
 Schneider 758 (15); 1648 (15)
 Schott s.n. (2)
 Schreiber 685 (1)
 Schreiter 11380 (19)
 Schuel 189 (19)
 Schuette s.n. (2), 3 Aug 1886; s.n. (2), 31 Jul
 1887; s.n. (2), 2 Aug 1887
 Schwerdtfeger 3644 (8); 14783 (8)
 Scoggan, H. J. 12795 (2); 13255 (2)
 Scoggan, H. J. & D. Erskine 12953 (2)
 Seibert s.n. (1)
 Seler 3030 (16)
 Senn, H. A. 1385 (15); 1786 (15)
 Senn, H. A. et al. 1073 (2)
 Seymour, F. C. 52 (2); 26295 (2)
 Seymour, F. C. & W. D. Countryman 22569 (2)
 Seymour, F. C. & H. K. Svenson 25868 (2)
 Shanxi Team 02243 (7)
 Sharsmith, C. W. 4038 (15)
 Sharsmith, H. K. 3721 (1)
 Sheldon s.n. (15)
 Sherff s.n. (2)
 Shetler & Stone 3061 (15)
 Shilom T. 2692 (16); 2889 (16)
 Shimek s.n. (2), 1 Jul 1918; s.n. (15), 21 Aug
 1920; s.n. (2), 8 Aug 1921; s.n. (2), 18 Jul
 1927;
 Short s.n. (15)
 Shrieve 5087 (3)
 Shui et al. 43014 (14)
 Shvedtchikova s.n. (5), 19 Jul 1985; s.n. (5), 20
 Aug 1986; s.n. (5), 26 Aug 1986
 Shyu 635 (6)
 Sichuan Economic Botany Liangshan Team
 0801 (see 9 for discussion); 1510 (see 9 for
 discussion); 1674 (7)
 Sichuan Economic Plants 4304 (10)
 Sichuan Economic Plants Liangshan 1526 (14)
 Siebold 107 (4)
 Singh & Long 17851 (9)
 Small s.n. (2), 9 Aug 1888; s.n. (15), 21 May
 1890; s.n. (2), 19-23 Aug 1890; s.n. (15), 25
 May 1892; s.n. (2), 23 Jul 1892; s.n. (2), 5
 Aug 1892; s.n. (2), 7 Sep 1892
 Smith, A. J. 80 (15)
 Smith, C. L. 898 (16)
 Smith, G. L. & C. R. Wheeler 7288 (1)
 Smith, H. H. 1595 (22); 3942 (1); 5357 (1)
 Smith, J. F. s.n. (2)
 Smith, L. 45 (2)
 Smith, L. B. & A. R. Hodgdon 3935 (2)
 Smith, L. B. & R. M. Klein 14120 (20)
 Smith, W. R. 22148 (15)
 Soejarto 5446 (2); 5133 (2); 5034 (2)
 Solomon & M. Nee 18122 (19)
 Soong 38957 (11); 38937 (7); 39067 (7); s.n.
 (12)
 Sorrie 9845 (2)
 Soukup 5417 (19)
 Soulié 1143 (12)
 Soza, Grijalva & Aranda 81 (22)
 Sperry T198 (3)
 Stainton, J. D. A 5147 (9)
 Stainton et al. 3474 (9); 7904 (9)
 Standley, P. C. 6136 (3); 10160 (16); 12067 (16);
 12252 (16); 12621 (16); 14698 (3); 16765
 (16); 18277 (15); 20829 (22); 20932 (22);
 22409 (16); 25481 (22); 25558 (22); 25892
 (22); 27023 (22); 27858 (22); 28218 (22);
 28941 (22); 29415 (22); 30706 (22); 31813
 (22); 32104 (22); 40062 (22); 76513 (16);
 76837 (16); 76887 (16); 77119 (16); 81503
 (16); 82862 (16)
 Standley, P. C. & H. C. Bollman 9982 (2); 10700
 (3); 11875 (15)
 Standley, P. C. & L. O. Williams 435 (16)
 Steele 25 (2)
 Stevens, A. F. s.n. (15)
 Stevens, O. A. & D. R. Moir 1690 (2)
 Stevens, W. D. 6192 (22); 10139 (16); 14925
 (16); 22963 (22)
 Stewart s.n. (8); s.n. (15)
 Steyermark, J. A. 1017 (2); 4115 (2); 5946 (2);
 22371 (15); 25258 (2); 26090 (2); 28689
 (15); 29555 (16); 30322 (16); 30647 (16);
 32024 (16); 50543 (16); 51650 (16); 63558
 (15); 72377 (2); 72525 (2); 74610 (15);
 89765 (22)
 Steyermark, J. A. , R. Smith, S. Nehlin & M.
 Lobo 109907 (22)

- Stiles 409 (2)
St. John 312 (1)
Stolarskaya & Maschkova s.n. (5)
Storms s.n. (15)
Stutz O. 2280 (20)
Suksdorf 484 (1)
Swift 40 (1)
Swink 1465 (2); 1587 (2); 2083 (15); 2268 (2)
Tagawa 224 (4)
Takahashi, H. 2853 (4)
Takahashi, H. et al. 6599 (4)
Takahashi, T. et al. 1393 (4)
Tan 63652 (7)
Tang 23346a (10)
Taquet 138 (7); 891 (7)
Tateishi et al. 4489 (4); 16089 (4); 17783 (6); 40570 (4)
Taylor, J. & C. 18659 (15)
Taylor, M. S. & R. Wessel 5028 (1)
Taylor, N. & R. C. Schneider 0619 (2)
Ten s.n. (11)
Tenorio L. 1881 (16); 14778 (16)
Thieret 1578 (2); 1590 (2); 2427 (2);
Thomas, J. H. 2439 (1); 3467 (1)
Thomas, R. D. et al. 141164 (2)
Thomas, R. D. & B. R. Thomas 149978 (2)
Thompson, J. W. 9207 (15); 12422 (1)
Thompson, J. W. & E. M. 661 (15)
Thomson s.n. (8), 28 Aug 1849; s.n. (8), 28 Sep 1848; s.n. (8), Garhwal; s.n. (8), 10 Aug 1851
Thornber 182 (16)
Thone 97 (2)
Thorne, R. F. 13220 (2); 31188 (2); 35425 (1)
Thorne, R. F. et al. 35137 (1); 42376 (1)
Thunberg 7577 (4)
Tierney & Foxx 17 (3)
Togashi et al. s.n. (4)
Tonduz 13823 (22)
Torres 45 (16)
Townsend & Barber 183 (3)
Tracy 3320 (1); 416 (1)
True, G. H. 8455 (1)
True, G. H. & J. T. Howell 2453 (1)
Tryon Jr. 1935 (2)
Tsai 50227 (7)
Tsoong, P. G. 3538 (14)
Tsugaru & Takahashi 16775 (4)
Tucker, G. C. 36 (2)
Tucker, H. H. s.n. (2)
Tuhy 2326 (3)
Ule 7073 (20)
Umbach 776 (15); s.n. (2), 27 Jul 1899; s.n. (2), 21 Aug 1897; s.n. (15)
Valasek 889 (2)
Vargas C. 14342 (19)
Vasey 233 (1); s.n. (1), 1875
Vega et al. 2645 (16)
Ventura & Lopez 7998 (17); 8241 (17); 9217 (see discussion in 17)
Venturi 1081 (19); 1081b (19)
Vervoorst & Cuezze 7632C (19)
Villarreal 4377 (17); 4388 (17); 7807 (17)
Visher s.n. (15)
Wagner 264 (3)
Waldo s.n. (2)
Walker, E. H. 2301 (15); 2677 (2); 2746 (15); 3212 (2)
Walker, H. A. 401 (1); s.n. (1)
Walker, J. B. et al. 872 (1)
Wallich 4934 (9)
Walpole 57 (1)
Walther s.n. (1)
Wan, B. B. & K. S. Chow 81106 (7)
Wan, X. B. 283 (7)
Wang & Wen 694 (see discussion in 9)
Wang, C. M. 01714 (6); 08185 (6)
Wan, C. S. et al. 3858 (7); 3859 (7)
Wang, C. W. 60812 (7); 63731 (12); 63870 (12); 64935 (12); 71583 (11)
Wang, J. C. et al. 10093 (6)
Wang, J. C. & K. C. Yang 4895 (6)
Wang, K.-Y. s.n. (6)
Wang, T. P. 9674 (7)
Wang, W. C. 2473 (7)
Wang, W. S. 652 (6)
Wang, Z. B. 14444 (10); 14625 (10)
Warming s.n. (20)
Warnock, B. H. 7511 (3); 21518 (3)
Warnock, M. J. 926 (15)
Warrington 373 (2)
Weberbauer 5668 (19); 5840 (19)
Webster, G. L. 26161 (18); 26312 (18)
Webster, G. L. et al. 12906 (16); 12725 (16)
Wei 390 (10)
Welsh 23829 (3)
Wells s.n. (2)
Wen, J. 83 (15); 84 (2); 85 (15); 87 (2); 95 (2); 100 (15); 109 (2); 148 (2); 149 (2); 518 (11); 522 (11); 548 (11); 610 (7); 625 (2); 626 (15); 747 (1); 748 (1); 751 (1); 752 (1); 753 (1); 755 (1); 756 (1); 757 (1); 758 (1); 759 (1); 762 (1); 763 (1); 764 (1); 765 (1); 766

- (1); 774 (1); 775 (1); 776 (1); 771 (1); 772 (1); 773 (1); 783 (2); 796 (2); 817 (2); 818 (15); 833 (15); 849 (15); 855 (2); 880 (2); 883 (2); 895 (2); 906 (2); 1071 (2); 1216 (11); 1362 (14); 1442 (10); 1514 (2); 1526 (15); 1535 (15); 1800 (2); 1810 (15); 1824 (2); 2456 (4); 2476 (4); 2487 (15); 3048 (11); 3057 (11); 3079 (10); 3129A (7); 4704 (15); 4714 (2); 4717 (15); 4735 (15); 4739 (15); 4743 (15); 4885 (7); 4972 (3); 4974 (16); 4977 (3); 4979 (3); 4980 (3); 4981 (3); 4982 (3); 4983 (3); 5426 (7); 5446 (10); 5455 (10); 5545 (7); 6234 (15); 6250 (2); 6269 (15); 6270 (2); 7104 (1); 7250 (3); 8138 (7); 8196 (14); 8542 (4); 9300 (7); 9330 (7); 9424 (6); 9697 (2); 9840 (15); 9841 (2); 9931 (2); 9940 (15); 9949 (2); 10440 (15); 10466 (15); 10482 (2); 10483 (2); 10489 (2); 10507 (2); 10640 (14); 11550 (7)
- Wen, J. et al. 130 (2); 131 (15); 132 (2); 133 (15); 134 (2); 136 (15); 138 (2); 139 (2); 179 (15); 182 (2); 186 (15); 787 (15); 982 (2)
- Wen, J. et al. (Tibet-MacArthur Expedition) 926 (11); 1241 (12); 1446 (12); 1487 (11); 1917 (11); 2283 (12); 2382 (12); 2680 (12)
- Wen, J. & R. Aguilar 6779 (22)
- Wen, J. & T. Lammers 88 (2)
- Wen, J. & X. P. Li 599 (11)
- Wen, J. & E. Martínez 384 (17); 8679 (16), 8707 (16)
- Wendt, T. & A. Adamcewicz 462 (3)
- Wendt, T. & F. Chiang 185 (17)
- Wharton 5177a (2); 4992 (2)
- Wheeler 7626 (1)
- White 2728 (16)
- Whitford 210 (15)
- Wiegand et al. 5841 (19)
- Wiggins 5489 (18); 7415 (16); 13455 (1)
- Wilbur 4592 (2)
- Wilcox 309 (16)
- C. Wilford s.n. (4), 1859; s.n. (4), Jul 1859
- Williams, L. H. J. 903 (9)
- Williams, L. O. & A. Molina R. 10659 (16); 10712 (16); 10889 (16); 13236 (16); 13291 (16)
- Williams, L. O. et al. 22369 (16)
- Williams, T. A. s.n. (2), Aug 1889; s.n. (2), 23 Aug 1892
- Wilson, E. H. 982 (12); 3698 (10); 3710 (see discussion in 9); 4285 (see discussion in 9)
- Windham 95-268 (3)
- Winton, A. L. s.n. (2)
- Winton, Jr., A. L. s.n. (15)
- Wolf 3060 (1); 3071 (3); 5831 (1); 9047 (1)
- Wood 10637 (19); 11444 (19)
- Woodbury 27 (3)
- Woody Oil Plants Team 65-0329 (11); 65-0429 (11)
- Woolston 1260 (20)
- Wooton s.n. (3)
- Worthington 12276 (3)
- Wright, C. 8 (22)
- Wright, T. 92-332 (3)
- Wright, W. F. 163 (2)
- Wu, C. Y. et al. 75-531 (9); 75-1043 (9)
- Wu, S. G. 151 (11); 771 (11); 2061 (7)
- Wu, Z. H. 90-808 (14)
- Wuyi Expedition Team 00210 (7); 00482 (7)
- Wuyishan Team 80-0118 (7)
- Xiong, J. 2873 (7)
- Xiong, J. H. & Z. L. Zhou 92161 (14)
- Xiong, J. H. et al. 42236 (14)
- Xu 960329 (10)
- Kana & Yamashita 8963 (13)
- Yamazaki, T. 3740 (13); 9779 (4)
- Yamazaki, T. & F. 5069 (4)
- Yamazaki, T. & K. Asano 7518 (4)
- Yanbian Group I 416 (7)
- Yanbian Group II 962 (7)
- Yang, B.-P. 74 (6)
- Yang, G. H. 59114 (14)
- Yang, J.-S. 5042 (11)
- Yang, J. X. 681 (10); 01603 (7);
- Yang, T. Y. 89 (6)
- Yang, T. Y. A. 11188 (6)
- Yang, T. Y. A. & Y. B. Cheng 06356 (6)
- Yang, T. Y. A. et al. 13875 (6)
- Ye 3310 (7); 2002 (7)
- Yi et al. 0234 (14)
- Ying et al. 0135 (7)
- Yoshitake & Kaneda s.n. (4)
- Young s.n. (8)
- Yu 222 (7)
- Yü, T. T. 2368 (7); 9913 (12); 14050 (11); 22458 (12)
- Yue et al. 4253 (7)
- Yuncker, E. C. & T. G. 5440 (15)
- Yuncker, T. G. et al. 5800 (16)
- Yuncker, T. G. & E. C. 6709 (15)
- Yunnan Tropical Biological Resources Team 60-160 (11); s.n. (12)
- Zamora 194 (19)

-
- Zerny s.n. (8)
Zhang 1056 (7)
Zhi Yun Shan Team 360 (14); 388 (14); 920 (14);
929 (14); 931 (14); 931A (14); 933 (14); 962
(14)
Zhmylev s.n. (7)
Zhong 5929 (9)
- Zhongdian Team 1018 (11); 2289 (11); 63-3193
(11); 632539 (12)
Zhou, G. S. et al. 469 (7); 106 (7)
Zhou, T. Y. & G. J. Xu 466 (10)
Zhu et al. 2435 (10)
1984 Sino-Amer. Bot. Exped. 928 (11)

INDEX TO SCIENTIFIC NAMES

(Accepted names are in **bold**; synonyms are in *italics*; main entry for each is in **bold**;
and figures and plates are in parentheses)

- Abies** 70, 71, 72, 75, 79, 92, 94, 102, 103, 113
Acacia berlandieri 129
Acacia crassifolia 129
Acanthophora Merr. 34
Acer 38, 40, 42, 44, 47, 48, 66, 70, 71, 72, 75, 85, 86, 113, 114, 115, 116, 117
Acer rubrum 48, 117
Acer saccharum 44, 66, 115
Agave lechuguilla 129
Agave macroculmis 129
Agave parryi 126
Anadenanthera macrocarpa 136, 138
Andropogon 126
Apiaceae 5
Aralia L. 5, 22, 34
Aralia apioides Hand.-Mazz. 13, 28, 36, **100**, 102, 103, (15, 58, 101, 102)
Aralia arizonica Eastw. 68
Aralia armata (Wall. ex Don) Seem. 22, 30, 93
Aralia atropurpurea Franch. 10, 13, 22, 28, 36, **96**, 99, 100, 103, (16, 57, 95, 97)
Aralia bahiana J. Wen 14, 30, 33, 34, 134, **149**, (137, 150)
Aralia bicrenata Wooton & Standl. 8, 9, 28, 32, 33, 35, **68**, 73, (24, 51, 69, 71)
Aralia bipinnata Blanco var. **bipinnata** 30
Aralia bipinnata Blanco var. **apoensis** (Elmer) J. Wen 30
Aralia brevifolia Marchal 9, 118
Aralia cachemirica Decne. 6, 10, 28, 33, 36, **87**, 90, 93, (88, 89)
Aralia caesia Hand.-Mazz. 29
Aralia californica S. Watson 6, 8, 9, 22, 28, 33, 35, **36**, (23, 37, 39, 49)
Aralia californica S. Watson var. *acuminata* S. Watson ex Howell 36
Aralia castanopsicola (Hayata) J. Wen 29
Aralia chilapensis Sessé & Moc. 9, 118, 127
Aralia chinensis L. 10, 22, 30
Aralia continentalis Kitag. 10, 28, 33, 35, **83**, 87, (54, 79, 84)
Aralia cordata Thunb. 6, 8, 10, 13, 28, 33, 36, **73**, 80, 83, 151, (52, 74, 76)
Aralia cordata Thunb. var. *continentalis* (Kitag.) Y. C. Zhu 83
Aralia cordata Thunb. var. *sachalinensis* (Regel) Nakai 77
Aralia dasyphylla Miq. 7, 31
Aralia dasyphyloides (Hand.-Mazz.) J. Wen 7, 13, 22, 30
Aralia debilis J. Wen 13, 30
Aralia decaisneana Hance 13, 30
Aralia delavayi J. Wen 29
Aralia dumetorum Hand.-Mazz. 96, 99, 100
Aralia echinocalis Hand.-Mazz. 30
Aralia edulis Siebold & Zucc. 10, 73, 77
Aralia elata (Miq.) Seem. var. **elata** 26, 30, 75, (14)
Aralia elata (Miq.) Seem. var. **mandshurica** (Rupr. & Maxim.) J. Wen 26, 30
Aralia elata (Miq.) Seem. var. **ryukyuensis** J. Wen 30
Aralia elata (Miq.) Seem. var. **inermis** (Yanagita) J. Wen 30
Aralia excelsa (Griseb.) J. Wen 14, 22, 29, 30, 33, 34, 134, **142**, 148, 149, (63, 145, 147)
Aralia fargesii Franch. 4, 8, 10, 15, 28, 33, 36, **94**, 96, 99, 105, (56, 95)
Aralia ferox Miq. 30
Aralia finlaysoniana (Wall. ex Don) Seem. 30
Aralia fluminensis Glaziou 140, 142
Aralia foliolosa Seem. ex C. B. Clarke 22, 30
Aralia franchetii J. Wen 27, 29
Aralia frodiniana J. Wen 30
Aralia gigantea J. Wen 17
Aralia gantungensis C. Y. Wu 14, 30
Aralia glabra Matsum. 4, 6, 10, 28, 33, 36, **103**, 105, (104, 105)
Aralia glabrifoliolata (C. B. Shang) J. Wen 29
Aralia henryi Harms 10, 22, 28, 33, 35, **106**, 108, 109, (64, 107, 108)
Aralia hiepihana J. Wen & Lowry 30
Aralia hispida Vent. 9, 13, 22, 26, 30, 32
Aralia humilis Cav. 9, 13, 22, 28, 32, 33, **118**, 127, 131, (14, 19, 21, 25, 60, 119, 120, 121, 123)
Aralia hypoglaucula (C. J. Qi & T. R. Cao) J. Wen & Y.-F. Deng 29
Aralia kansuensis G. Hoo 94, 96
Aralia kingdon-wardii J. Wen, Lowry & Esser 29
Aralia laevis J. Wen 29
Aralia leschenaultii (DC.) J. Wen 22, 27, 29
Aralia lihengiana J. Wen, L. Deng & X. Shi 29
Aralia macrophylla Lindl. 87, 90
Aralia malabarica Bedd. 22, 30
Aralia melanocarpa (H. Lév.) Lauener 96, 99, 100
Aralia merrillii C. B. Shang 30
Aralia montana Blume 30
Aralia nudicaulis L. 8, 9, 11, 13, 22, 29, 31, 47, 73, **109**, 117, 118, (14, 21, 23, 59, 110, 112)
Aralia nudicaulis f. *prolifera* (Apgar) 109
Aralia nudicaulis var. *prolifera* Apgar 109
Aralia nudicaulis var. *elongata* Nash 109
Aralia nudicaulis f. *depauperata* Marie-Vict. 109
Aralia nutans Franch. & Sav. 10, 73
Aralia officinalis Z. Z. Wang 14, 30
Aralia parasitica (D. Don) J. Wen 27, 29
Aralia pilosa Franch. 10, 106
Aralia pinnata Sessé & Moc. 9, 118
Aralia plumosa H. L. Li 29
Aralia pubescens DC. 9, 32, 118, 127
Aralia racemosa L. 6, 7, 8, 9, 28, 31, 32, 33, 34, 35, **42**, 67, 68, 73, 90, 114, (14, 18, 20, 43, 45, 50)
Aralia racemosa var. *foliosa* Vict. & J. Rousseau 42, 67
Aralia racemosa L. f. *foliosa* (Vict. & J. Rousseau) Scoggan 42, 67
Aralia racemosa subsp. *bicrenata* (Wooton & Standl.) S. L. Welsh & J. T. Atwood 68

- Aralia racemosa* L. var. *sachalinensis* Regel 77, 80
Aralia regeliana Marchal 9, 28, 33, 118, **127**, 131, (26, 61, 128, 130)
Aralia rex (Ekman ex Harms) J. Wen 30, 33, 134, **142**, (143, 144)
Aralia sachalinensis Hort. ex Sieb. et Voss 77
Aralia scabra C. Presl ex DC. 9, 118
Aralia scaberula G. Hoo 30
Aralia schmidtii Pojark. 6, 10, 28, 33, 35, **77**, 80, 83, (52, 78, 79)
Aralia scopulorum Brandegee 9, 11, 22, 28, 33, 118, 127, **131**, (27, 61, 130, 132)
Aralia searelliana Dunn 22, 31
Aralia shangiana J. Wen 29
Aralia sololensis Donnell-Smith 15
Aralia soratensis Marchal 19, 30, 33, 34, **134**, (20, 24, 62, 135, 137)
Aralia spinifolia Merr. 7, 22, 30
Aralia spinosa L. 6, 8, 9, 13, 14, 22, 27, 30, 34
Aralia stellata (King) J. Wen 29
Aralia stipulata Franch. 6, 13, 14, 30
Aralia subcordata (Don) J. Wen 29
Aralia taiwaniana Y. C. Liu & F. Y. Lu 6, 10, 28, 33, 35, **80**, 82, 83, (17, 53, 81)
Aralia thomsonii Seem. ex C. B. Clarke 13, 30
Aralia tibetana G. Hoo 10, 28, 33, 36, **90**, 93, 94, (55, 91, 93)
Aralia tomentella Franch. 29
Aralia tripinnata Blanco 90
Aralia undulata Hand.-Mazz. 8, 14, 30
Aralia urticifolia Miq. 7, 31
Aralia verticillata (Dunn) J. Wen 29
Aralia vietnamensis T.-D. Ha 31
Aralia warmingiana (Marchal) J. Wen 8, 9, 30, 33, 34, 134, **138**, 142, 149, (25, 139, 141)
Aralia? weberbaueri Harms 8, 19
Aralia wilsonii Harms 29
Aralia yunnanensis Franch. 96, 99
Aralia sect. *Anomalae* Harms 8, 15, 28, 34
Aralia sect. *Aralia* 5, 6, 10, 13, 26, 28, 31, 33, 34, **35**, 109
Aralia sect. *Arborescentes* Harms 30
Aralia sect. *Capituligerae* Harms 30
Aralia sect. *Digitatipanicula* Hoo 30
Aralia sect. *Dimorphanthus* (Miq.) Miq. 6, 13, 22, 30, 33, 34
Aralia sect. *Echinatae* C. B. Shang & X. P. Li 7
Aralia sect. *Genuinae* Harms 28, 34
Aralia sect. *Glabrae* Z. Z. Wang 7
Aralia sect. *Humiles* Harms 13, 28, 33, **118**, 127
Aralia sect. *Nanae* Harms 28, **119**
Aralia sect. *Pentapanax* (Seem.) J. Wen 6, 13, 29, 99
Aralia sect. *Sciadodendron* (Griseb.) J. Wen 13, 22, 29, 33, **133**, 134
Aralia sect. *Undulatae* C. B. Shang & X. P. Li 7
Araliaceae 5, 7, 8, 9, 10, 14, 22, 26, 31, 100, 148, 151
Arctostaphylos 114, 126, 129, 130
Azorella 5
Cercocarpus mojadensis 129
Cereus comarapanus 138
Cnidioscolus cnicodendron 138
Coemansia Marchal 34, 133
Coemansia warmingiana Marchal 9, 138
Cornus 40, 47, 70, 71, 113, 114
Corylus cornuta 47, 114
Coudenbergia Marchal 8, 29, 34, 133
Coudenbergia angelicifolium (Griseb.) C. B. Shang 8, 134
Coudenbergia ulei (Harms) C. B. Shang 138
Coudenbergia warmingiana (Marchal) Marchal 8, 29, 34, 133, 138
Cwangayana Rauschert 34
Cwangayana scandens (Merrill) Rauschert 34
Dasyliirion 126, 130
Dendropanax Decne. & Planch. 5, 9
Dimorphanthus Miq. 34
Dimorphanthus edulis (Siebold & Zucc.) Miq. 73
Dimorphanthus elatus Miq. 34
Eleutherococcus melanocarpus H. Lév. 96, 99
Eragrostis 126
Flourensia 129
Fraxinus 47, 114, 116
Fraxinus americana 117
Garrya 125, 126, 129
Hechitia 129
Hydrophyllum virginicum 117
Impatiens 47, 66, 117
Kalopanax 79, 86
Lindleya mespiloides 129
Maianthemum 115
Megalopanax Ekman ex Harms 9, 29, 34, 133
Megalopanax rex Ekman ex Harms 9, 29, 34, 133, 142
Neoacanthophora Bennet 34
Neoacanthophora scandens (Merr.) Bennet 34
Onoclea sensibilis 117
Oreopanax Decne. & Planch. 5, 9
Osmorhiza claytonii 47, 114
Osmorhiza longistylis 47, 114
Panax L. 5
Panax tripinnatum Wall. ex Don 90
Parapentapanax Hutch. 29, 34
Parapentapanax racemosus (Seem.) Hutch. 29, 34
Parthenocissus quinquefolia **47, 114**
Pentapanax Seem. 29, 34
Pentapanax angelicifolius Griseb. 9, 134
Pentapanax granatensis Rusby 9, 144
Pentapanax leschenaultii (DC.) Seem. 29, 34
Pentapanax mexicanus C. B. Shang & X. P. Li 118, 127
Pentapanax scopulorum (Brandegee) C. B. Shang 131
Pentapanax ulei Harms 9, 138
Pentapanax warmingianus (Marchal) Harms 138
Picea 48, 68, 72, 85, 100, 102, 103, 113
Pinus 40, 70, 71, 72, 85, 92, 98, 113, 123, 124, 125, 126, 130
Polyscias J. R. Forst. & G. Forst. 5, 10
Porlieria microphylla 138
Prunus 47, 70, 79, 114
Prunus serotina 47, 73, 114
Pseudopanax K. Koch 5
Pteridium 42, 115
Quercus emoryi 126
Quercus rubra 115, 116
Reynoldsia americana Donn.Sm. 9, 144
Rhus virens 129
Rubus 38, 44, 70, 72, 117
Sambucus 42, 66
Sambucus simpsonii Rehder 151
Schefflera J. R. Forst. & G. Forst. 5

Schinopsis haenkena 138

Schizeilema 5

Sciadodendron Griseb. 8, 9, 29, 34, 133

Sciadodendron excelsum Griseb. 9, 29, 34, 133, 144, 148

Spiraea 129

Stilbocarpa (Hook. f.) Decne. & Planch. 5

Tilia 47, 70, 86, 114

Tilia americana 44, 47, 114, 117

Trillium 47, 114

Ulmus americana 65, 117

Vaccinium 114, 115

Vauquelinia californica 129

Viburnum 42, 48, 70