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

by

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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. chilensis 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. sachalensis Regel, Megalopanax rex Ekman ex Harms, Pentapanax ulei Harms, and Sciadodendron excelsum Griseb.


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

by

J. Wen†

**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*

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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., Haleníus 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

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 adnate 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 5merous 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 *Pentapanax*. 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-arculated 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. bicornata*. 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 bicornata* 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 connation 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 PAUPT* (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-
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.
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. gintungensis, 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).

**Pedicel articulation**

Pedicel articulation has been regarded as an important taxonomic character in Araliaceae. In Aralia, there is a secondary loss of pedicel 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. Multiseriate (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. *Digitatipanica* 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).
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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).

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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 sepal, 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 delimitcd (*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 apertural endexine thickened at the colpi, sometimes (partially) filling the arch of the ectexine, sometimes with a gap or marked thinning 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
Fig. 11. Pollen morphology of *Aralia*. A-D. *A. nudicaulis* (Moyer s.n., Pennsylvania, US). E-H. *A. californica* (Robbins 2066, US)
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*,
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.
INFRA GENE RIC 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*

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
   Japan & Korea
5. *Aralia schmidtii* Pojark.
   E Russia
   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
    China
    Japan
14. *Aralia henryi* Harms
    China.

II. *Aralia* sect. *Humiles*

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* Brandegeee
   Baja California

III. *Aralia* sect. *Nanae* Harms

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**


Unarmed shrubs or trees, branched, glabrous or with simple trichomes. Leaves pinnate, rarely bipinnate or tripinnate (*A. wilsonii* and *A. plumosa*), stipulate to extipulate. Umbels or occasionally racemes (*A. gigantea*, *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
   - 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. *Araliastellata* (King) J. Wen
   - China & N Thailand
9. *Aralia castanopsisicola* (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
    - China
    - 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.


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.
**Systematics of Aralia**

*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.**


Armed shrubs or trees, andromonoecious or hermaphroditic. Leaves bipinnate, sometimes 3- to 4-pinnate (e.g., *A. armata*, *A. finlaysoniana* and *A. ferox*), stipulate, trichomes simple. Umbels numerous, aggregated into a paniculate to umbrellate 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
   China
4. *Aralia gintungensis* C. Y. Wu  
   China
   China
   China
7. *Aralia debilis* J. Wen  
   China
   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 dasypylloides* (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
    China & Indochina
    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
    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. *Aralia vietnamensis* T.-D. Ha  
China & Indochina

27. *Aralia searelliana* Dunn  
China & N Vietnam

SE Asia

29. *Aralia urticifolia* Miq.  
Java

**KEY TO SECTIONS OF ARALIA**

1. Herbs or sometimes with woody rhizomes .............................................................. 2
2. Shrubs or trees .............................................................................................................. 3

2. Acaulescent dioecious herbs with long horizontal woody rhizomes ............................... Sect. *Nanae*
3. Shrubs or trees with short and thick rhizomes ......................................................... Sect. *Aralia*

3. Shrubs or trees with prickles on stems ................................................................. Sect. *Dimorphanthus*
4. Shrubs or trees with unarmed stems ..................................................................... 4
5. Trichomes on lower leaflet surface branched ......................................................... Sect. *Humiles*
6. 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*
7. 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 ichneumon-flies and wasps visited the flowers.

The reproductive biology of *Aralia nudicaulis* (sect. *Nanae*) has been well studied (e.g., Barrett and Helenurm 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_.


**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 Carribean 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


Trees, shrubs, lianas or herbs with rhizomes, armed or unarmed; leaves alternate, 14-pinnate, rachis articulated, mostly stipulate; inflorescence terminal, paniculate or corymbose or umbellate, usually consisting of umbels, capitula or racemes, occasionally umbels solitary; flowers 5-12-merous, with pedicels articulated below, only occasionally non-articulated; sepals 5-12; petals 5-12, imbricate; stamens 5-12, recurved in buds; ovary inferior, 5-12 locular, occasionally abortive into 3, with a floral disk, styles distinct or connate at the base or completely connate; fruit a berry, 5-12-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


Branched unarmed herbs with rhizomes. Leaves alternate, stipulate, ternately bi- or tripinnae 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*

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, 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.


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); 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 along creek, 15 Sep 1990, J. Wen 758 (OS); Humboldt Redwoods State Park, Lower Bull Creek, along Bull Creek Road, inside Rockfeller 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. Blankenship 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. Bleeke 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 & Biolley s.n. (NY, 2 sheets); road west of Geronimo, following creek at a 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, Pine 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 elder-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, shaly 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); canoån 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., Lyre 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 Canán, ca. 5700 ft, R. F. Thorpe 35425 (UC); on La Porte Rd., 10 km S of jet 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 m 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 NW of Santa Cruz (jct. of Empire Grade Rd. and Hellyer 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); 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). Sanoma 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 Umpqua 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).


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 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...
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.

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.
**Common names**: spikenard, American spikenard, Indian root, spignet, spiceberry, pettomorrel, 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 broncho-pulmonary 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.

Systematics of Aralia

**Color Plate 1**

A-F. *Aralia californica* S. Watson

A & B - Wen 758;
C-F - L. Janeway 10133

Arrow in F indicates leafy stipule
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 - *Won 8542*
B - *Wen 2456*

D & E. *Aralia schmidtii* Pojark.
D & E - photo by
M. Hasebe
Color Plate 5

A-H - Wen 9424
A-E. *Aralia continentalis* Kitag.
A - *Wen 11550*, D - *Wen 8138*;
B, C & E - *Wen 5545*
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
A-F. *Aralia fargesii* Franch.
A-E - Wen 5446;
F - Wen 3079
A-H. *Aralia atropurpurea* Franch.
A, B, E-G - Wen et al. 926;
C & D - Wen 3057
A, C, E-G - Wen et al. 2382;
B & D - Wen et al. 1241;
B - photo by Z.-L. Nie
A-G. *Aralia nudicaulis* L.
A, B & E - Wen 10440;
C & F - Wen 6269;
D & G - Wen 186
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


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.


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, ovate, acuminate to acute at apex, truncate, broadly acute to subacute 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 pinnately 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, 1.5-5 cm long, 0.4-3 cm wide, the lanceolate to linear true bracts 5-12 mm long, 1-3 cm wide, pilose, ciliate at margin; bracteoles 5.0-6.0 mm long and wide, 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 Bocoyana, Rio Oteros, ca. 10 mi W of Creel, near bend in river at stand of *Picea*...
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); Chuichuiach, Aug-Sep 1936, fr, H. LeSueur 940 (F, MO); Salto de Bapuvara, 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, 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 Jardín 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 Jardín, 8 km E of Rancho El Jardín 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 jet 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. Mc Cleary 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 Foresr Road 713, along a creek, N31°52.758', W109°14.920', 1975 m, moist rocky habitat in Pseudotsuga-Pinus-Juglans mixed forest, associated with Pseudotrupga, 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. Leiberg 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, Humilus, Acer glabrum, Robinia pseudoacasis, 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,
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 Creek, 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., 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.

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

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 subdeterminate 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 nudicaulis Blume, Bijdr.: 870. 1826, nom. illeg.
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 stylodium. 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, Boufford & E. W. Wood 19842 and some gymnosperms, 1 Sep 1977, fl, 280 m, mixed forests of *Betula* var. *elata* part 2 of the specimen only, part 1 is *Aralia elata* var. *elata*; Prov. Kitami, Esashi-gun, Umagawa-machi, along a small tributary of the Higashi-gawa River, 230 m, mixed deciduous – coniferous forests, edges of forests, roadsides near forests; 50-1500 (-2000) m.

**Systematics of *Aralia***

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

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

**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, Boufford & E. W. Wood 19842 and some gymnosperms, 1 Sep 1977, fl, 280 m, mixed forests of *Betula* var. *elata* part 2 of the specimen only, part 1 is *Aralia elata* var. *elata*; Prov. Kitami, Esashi-gun, Umagawa-machi, along a small tributary of the Higashi-gawa River, 230 m, mixed deciduous – coniferous forests, edges of forests, roadsides near forests; 50-1500 (-2000) m.

Fig. 23. Map of Japan showing the distribution of Aralia cordata Thunb.
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 authenticicum ad florum japonicum conficiendam adribitum,” Siebold s.n. [in fl.];
- L 0171192 (L-898,125-0052), 1829, “specimen sahentica ad florum jap. conficiendam adribita,” Siebold s.n. [in fl. buds];
- L 0326339 (L-898,125-0049), L 0326340 (L-898,125-0050), F. Schmidt s.n. [leaf only];
- L 0326341 (L-898,125-0060), Burger s.n. [in fl.];
- L 0326342 (L-898,125-0061), Beyer 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-898,125-0064), Burger s.n. [in fl.];
- L 0423961 (L-898,125-0057), Dosen – Shaw, Mohrike s.n. [in fl.];
- L 0423962 (L-898,125-0055), Textor s.n. [in fl.];
- L 0423963 (L-898,125-0058), Dosen, Mohrike 51 [in fl.];
- L 0423964 (L-898,125-0050), Siebold 1055 [leaf only];
- L 0423965 (L-898,125-0056), Textor s.n. [infl.]


The isotypelectotype 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.


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, petiololes 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 racemose 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 stylodium. Fruits 3-3.2 mm long and wide,
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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); Sakhalin, Dolinsk, 11 Aug 1952, fl, E. Motorina (MW). Southern Sakhalin, 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); Sakhalin, 1861, F. Schmidt 18202 (BM); Sakhalin, Korsakov, 20 Aug 1986, N. Shvedtchikova s.n. (MW); Sakhalin, Kuril Islands, Kunashir Islet, 24 Jul 1986, floral buds, M. Stolarskaya & M. Maschkova s.n. (MW);

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.
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* as a new species (not a new name), and treated *Aralia racemosa* var. *sachalinensis* Reg. 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.


**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 racemosey 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, Huaiilien, Ilan, Miaoli, Nantou and Taichung) (Fig. 26).

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

Fig. 26. Map of Taiwan showing the distribution of *Aralia taiwaniana* Y. C. Liu & F. Y. Lu.
Cryptomeria and broadleaf forest, ca. 2 m tall, 8 Sep 2000, young fr. Y.-Y. Huang 99 (MO); Tsuifeng – Mei-feng, 2100-2350 m, 16 Aug 1984, fl & young fr. Y. Tateishi et al. 17783 (MO); Tsuifeng – Mei-feng, 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); Mei-feng – Chingchung 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); Juiyehsi, 24°08′0″N, 121°12′0″E, 1800 m, 29 Jun 1999, floral buds, Y.-P. Cheng 2664 (TAIF, 4 sheets); Mei-feng, 24°06′0″N, 121°10′56″E, M.-J. Lin 285 (TAIF); Mei-feng, 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, 24°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 Rueiyan 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., Tahtuehshan 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, Tashueishean 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.**


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 panicule, pilose, terminal inflorescence 30-65 cm long, consisting of 20-35 primary branches, paniculately or racemously 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 globose, 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.
Systematics of Aralia

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).


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, Telyakovskoy 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 praecces 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'etekiy, near Harbor Seedema, in oak deciduous forest, 18 Sep 1933, A. Poretzky 279 (LE); in the mountain of Moetzita, Pos'etekiy 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.**

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 isolecotypes: (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.


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 racemously 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 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. R. 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, 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 7931* (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. 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.
Aralia tibetana G. Hoo — Fig. 30; color plate 7: A-F.


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, tripinately 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 or sometimes doubly serrate at margin, lateral veins 7-9 on each side, sunken on adaxial surface, conspicuous on both surfaces, abaxial 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


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. Polanin 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.”
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 abortid; 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 2.5-5 mm long, 1.2-2 mm wide, 0.6-0.7 mm thick, kidney-shaped, whitish gray, smooth.

Common name: Xizang tu dang guì.

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 (8000-14,000 ft).

Additional specimens examined: Bhutan. Mindook La, 31 Jul 1884, in fl., Dungbo 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. Sherriiff 535 (BM); Belierea 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. 751043 (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, 1.1-1.5 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, 8000 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.
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, Karponong – 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); Simbu 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 aspirine, 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.


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, petioles 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, 1.1-1.1 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-loccular, 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.

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Fig. 32. Map of China showing the distributions of Aralia fargesii Franch. and A. atropurpurea Franch.
Aralia fargesii differs from Aralia 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 Aralia 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 Aralia 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 Aralia 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 Aralia 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 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, tripinnaately 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, petiolues 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 Chuntingen, 2400 m, in woods near stream, 14 Jun 1992, R. P. Maire 4536 (P, 3 sheets); woods near Ma-li-ouan, 2600 m, Aug, E. E. Maire 3518 (P, 2 sheets). Tchong-chan, 23 Aug 1905, in fl & young fr., E. Ducloux 3941 (P, 3 sheets). Bingchuan Xian, Jizhushan, Zhuhengsheng, 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 Zhuhengsheng 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-American 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, 1460 m, in sparse forest, herb 80 cm tall, 27 Aug 1988, J.-S. Yang 5042 (KUN).
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.


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 trifoliate 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 [Kanting], 8-9,000 ft, E. H. Wilson 982 (BM). Eastern Tibet, Fsukou, R. P. Soulié 1143 (P). YUNNAN: Deqin Xian, Shi-mian-chang, 3200 m, 6 Jul 1981, Kunming Institute of Botany Team 130 (KUN); Deqin, Benzihilan, Yongluobu, in *Picea* forest, streamside, common, 3300 m, 6 Jul 1981, Kunming Vegetation Team s.n. (KUN); Deqin, Qianlelongle, 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, Benzihilan Commune, Yongle Teng, 3200 m, in *Picea* forest, herb 30-50
cm, 3 Jul 1981, fl, Qinghai-Xizang Team 1850 (KUN); on the way from Deqin to Benzhalan, 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, on the road 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", 3450 m, 17 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", 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) 2283 (F, KUN, US); Xiao Zhongdian, on the road to Tianchi Lake, N27°36'52.6", E99°42'45.6", 3546 m, 23 Jun 2009, young fr, J. Wen et al. (Tibet-MacArthur Expedition) 2680 (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.


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, coriaceous, 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 0.25 (-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 8-8, 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
habitats; 1430-1810 m.

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


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, petiololes 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, 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 Xiang, Liujiapiang, Qixinggou, Toudaotaizi, in forest, 1756 m, 21 Aug 2006, young fr, Baishuijiang Expedition 2477 (PE). GUIZHOU: Bikou Xian, Heidonggou Shui Songpingshan, 1000 m, on the slope in forest, 9 Jul 2006, young fr, Baishuijiang Expedition 1661 (PE). Wen Xian, Liujiapiang, Qixinggou, Toudaotaizi, in forest, 1756 m, 21 Aug 2006, young fr, Baishuijiang Expedition 2477 (PE). GUANGDONG: Dafang Xian, Baila Qu, Juulongshan, 1950 m, 16 Aug 1959, Bi Jie Team 873 (KUN, PE, 2 sheets); Juulongshan, 1500 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).


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). Hunan: 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, Xiajiling Chang Xiang, Zhongzhai Chun, Hongshuiha, 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.

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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 HARMES


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 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!).


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.
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 salsaparilla (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).


**NEW BRUNSWICK:** Campobello Island, Jul-Aug 1888, fl, J. Donnell Smith 779 (US). Grand Manan, J. T. 111


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1986, fl, State University Property, Clear Creek, 10 May 1901, fl, along Rt 45, near Rock Creek, in forests, Ramsey Co., Devils Lake, 1 Jul 1905, fl, in shaded


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 HARS**


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 ........................................................................................................ 1
2. Leaves and leaflets glabrous ........................................................................................................... 1

1. Leaves bipinnate; inflorescence glabrous ......................................................................................... 2
2. Leaves pinnate; inflorescence pilose; endemic to Baja California .................................................. 11

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 plantarium* 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!).


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.


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 inflorescence. B. Older flower after falling off of petals and anthers. C. Flower. D. Floral buds. E. Fruit. F. Inflorescence. 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).
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, serrulateto 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.

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.
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 styles 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. 147778 (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 Rafael 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 Chiquitate, Chiquial, 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). QUICHÉ: 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: flls verdes, arbusto 4 m, sobre rucas, 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,
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. Molina 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); ffs verdes, planta 0.5-1 m, Matorrales húmedos de Quebrada Terragra, entre Tatascán y Maraita, Drainage of the Rio Yeguare, 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, arbolito 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 Amarrilla, 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 de 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 Yeguare, at about longitude 87°W and latitude 14°N, 1250 m, near Tatumbla, rocky hillside shrub, 2 m, 19 Aug 1947, floral buds, L. O. Williams & A. Molina R. 13291 (F). OCOTEPEQUE: 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 Chenekeulitik, Municipio of Totolapa, 2150 m, 16 Aug 1972, D. E. Breedlove 27076 (LL); steep-walled canyon at the head of the Río de la Venta at the Chorrerearo near Derna, tropical deciduous forest, Hauya, Ceiba, Tabebuia, and Capparis, Municipio of Ocozocuatla 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 Solistahauacán, Municipio of Pueblo Nuevo Solistahauacán, 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 “Cheneke’ 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 Solistahauacán, municipio of Pueblo Nuevo Solistahauacán, 6500 ft, 15 Aug 1967, fl, A. Shilom T. 2889 (F); 3 mi W of Pueblo Nuevo Solistahauacán, 9 Sep 1963, fr, 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 Buca, Arroyo Bakosiachi, Nov 1973, young fr, R. A. Bye 5952 (NCU); Sierra Charuco, Río 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); Río Bonito, Dec 1936, fl, H. LeSueur 1153 (F), 1154 (F); Candama River transect on road from Cruz Verde to Candama River, 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-Sassafradin* 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 Comitan, 5700 ft, 10 aug 1962, fl, G. L. Webster et al. 12906 (MO).

**MEXICO:** District of Temascaltepec, Puerto Salitre, 1300 m, 20 Sep 1932, fl, 3 m high, B. Hallberg 3144 (MEXU); Temascaltepec, 1500 m, 25 May 1987, fr, H. Díaz-Barriga 3739 (F). **GUERRERO:** Salcido, 1 Jun 1892, fr, like elder, 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).

**MICHOCAN:** oeste de Santa Gertrudis, municipio de Zacapu, matorral pedregoso, ladera de cerro, 2000 m, arbusto de 2.5 m de alto, 18 Jan 1989, fr & 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. Yolomcatl, 4.5 km de Yolomcatl, sobre la carretera de terraceria 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. Martinez 8679 (US, 2 sheets). **PUEBLA:** approx. 4 km al S de Xochitepec, 7 km al N de San Luis Atotolitlán, arbol de 2.5 m, frutos morados, 23 Mar 1982, fr, F. Chiang C. 2291 (MEXU, RSA); 6 km al E de San Luis Atotolitlán, por la terraceria rumbo a Caltepec, 18 11’N, 97 25’W, 2200 m, cerro pedregoso rojizo, con Senecio praecones, 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, a 1 km de la Carr. Fed. 16, 28°34’48”N, 109°44’42”, 750 m, 12 May 1993, fl, A. Buürquez 93-111 (MEXU); San Javier, Microondas en el Cerro El Durazno, 28°36’43", 125
109°45'25", 1075 m, A. Báurquez & 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*, *Montanae rosei*, *Guardiola platyphylla*, and *Quercus tecterculata*, 8 m tall tree with gray fissured bark and greenish 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 (ASU); Mule Mountains, west side, near Ruby, 30 Sep 1944, fl, *W. Hodgson* 6423 (ASU, DES); Dragoon Mts., Cochise Stronghold, 5000 ft, 18 Sep 1936, late fr, *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, Dasyliirion, Eragrostis, Andropogon, etc., 5600 ft, 31 Aug 1984, fl, *A. C. Sanders et al.* 5195 (TEX); Texas Canyon, 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, shrub ca. 3 m tall, *L. N. Gooding* 230-45 (ASU); 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,
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 Central 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 & Mocíño 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.


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
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 5-7 mm long; bracts of primary branches 5-7 mm long, 2-3.5 mm wide, narrowly triangular to lanceolate, ciliate at margin. Sepals 0.3-0.4 mm long and wide, rounded to triangular; petals 2.1-2.2 mm wide, 1.5-1.6 mm thick, kidney-shaped. 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, Dasilirion, 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 mojndensis 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 *Bonnetiella, Agave lechuguilla, Acacia berlandieri, Flourensia, Hechitia*, and *Spiraea*, 1800-1850 m, 10 Aug 1994, fr., *J. A. Villarreal 7807* (MEXU, TEX, 2 sheets).


**HIDALGO**: Barranca de Venados, al principio, a 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...
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.


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; petiole 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, symetrical, 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 mm 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, 28°53’N, 111°32.5’W, A. Carter & R. Ferris 3894 (BM, MEXU, MO, TEX); deep, vertical-walled canyon, Aguaje de los Encinos (S side of Cerro Giganta), 26°0-50’N, 111°35’W, 850 m, 27 Mar 1960, in young fr., A. Carter & H. Sharshsmith 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* Brandegee.  
A. Habit with leaves and inflorescence.  
B. Close-up of leaf margin and lower leaflet surface.  
C. Flower.  
D. Fruit.
Systematics of Aralia

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, 111°35’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°36.5’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 Virgenes, 1893, 1500 m, Digeut s.n. (P); La Champagna, Sierra de las Palmas, south of Santa Rosalía, 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. ½-3/4 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 Gertridis, 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.


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.


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 tripininate, 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 racemously on a main axis, primary branches 4-9 cm long, glabrous, each with 2-5 umbels, lateral
umbels often aborted or functionally male, bracts and bracteoles persistent, glabrous, primary bracts (subtending the individual panicles) 3.5-5 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, with persistent styles slightly divided at the tip, connate diameter, globose, blackish purple when mature, at the fruiting stage, conspicuous.

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


Bolivia.


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 dbh, 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 J1444 (K, 2 sheets); 5 km (by road) SE of Bermejo, along highway from Santa Cruz to Samaipata, gorge of Río Pirah, steep slopes with semi-deciduous subtropical forest with many Mimosoid legumes, 18°07′04″S, 64°56′05″W, 1380 m, to Campamento La Younga of Parque Nacional Apariúmac, 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); 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 Cereus comarapanus, Anadenanthera macrocarpa, Cnidoscolus enicodendron, Cereus comarapanus, and Portleria 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 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 haenkenii, Anadenanthera macrocarpa, Cnidoscolus enicodendron, Cereus comarapanus, and Portleria 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 Río 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 106337 (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 viscose y Tipuana spp., 2400 m, 18°03′18″S, 64°39′44″W, 2 Jan 1994, fl, J. Balcazar 11 (MO, 2 sheets). Peru. 1839-1840, in floral buds, M. Cl. Gay 486 (P). Entre Cusco y Abancay, Departamento 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, fr Several, 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). HUANCAVELICA: Prov. Tayacaja, road from Pampas to Río Huanchay, 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. Wiegend et al. 5841 (BM). Central Electrica Mantaro, 4 Feb 1968, sterile, J. Soukup 5417 (US). TUMBES: Cerros de Amotape 15-25 km SE of Cherreligue, 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.


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


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, 6-6 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, petioloulate 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.

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


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 at 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.


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.


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 calyptrae 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 oblanceolate; 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, stylar 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 Distacción, sitio Las Casitas-El Socorro, bosque a 2 km, sitio moderno 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 Bahia El Coco, Bahia 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. Aguilera 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, S. Calderón 2171 (US).


**Honduras.** DEPT. COMAYAGUA: Matorrales humedos y cafetales cerca de Quebrada la Jutera, 3 km de la Libertad, 20 May 1956, 600 m, A. Molina R. 7039 (NY).
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. 111 (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 límite 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 Matare, 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 Turbo, 18 Apr 1962, 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 Tecuam, 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); Altagracia de Orituco-Aimará, Mar 1966, fl, L. Aristeguieta 6047 (NY, US); Hacia San Francisco de Macaira, entre Altagracia 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. Romírez 367 (K).

N. Romírez 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. (Leeaceae) 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.


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 racemosely 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-calyptrate, 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, stylar 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).

= 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).
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