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## CLIMBING HYDRANGEAS AND THEIR RELATIVES

THE climbing habit is relatively rare in the family Saxifragaceae, the majority of the species being shrubs, All the climbing species, which are found in four genera, *Hydrangea* Linnaeus (hereafter abbreviated as L.), *Schizophragma* Siebold & Zuccarini, *Decumaria* L., and *Pileostegia* Hooker & Thomson, utilize the same method of climbing, i.e., attachment to a supporting substrate by means of fine rootlets arising directly from the upright stems (a method of climbing similar to that of poison ivy, *Rhus toxicodendron* L.). In nature, climbing is accomplished on tree trunks, which implies that the plants are adapted, of necessity, to growing under conditions of low light intensity. This combination of peculiar characteristics enhances the horticultural possibilities of these plants by permitting the growth of fine specimens on shaded walls or trees. The beauty of the foliage of plants grown under such conditions (not to mention the relative freedom from insect damage) is reason enough to warrant the serious consideration of the homeowner. Moreover, in many of the species, showy inflorescences add to the beauty of the plants to such a degree that one wonders why they have not been more widely grown.

The family Saxifragaceae has yielded many plants with extensive horticultural uses. Certain genera, such as *Astilbe* Buchanan-Hamilton, *Deutzia* Thunberg, *Heuchera* L., *Hydrangea* L., *Philadelphus* L., and *Ribes* L., have found particular favor because of their great variety and the relative ease with which they may be grown. The Saxifragaceae includes not only the ornamental genera mentioned above but also about 70 others.

The family is distinguished from related families (Rosaceae, Crassulaceae, Cunoniaceae) on the basis of technical characteristics such as the leaves usually lacking stipules, the relatively few stamens and pistils (primarily two carpels), and the abundant endosperm in the seed. These characters may seem to be relatively esoteric to the layman; that they appear so to some taxonomists as well is reflected in various taxonomic schemes designed to divide the family into a series

of smaller families, in order to obtain greater morphological cohesiveness in each. The outstanding example of this viewpoint is that of Hutchinson who divided the family into eleven: Baueraceae, Donatiaceae, Eremosynaceae, Escalloniaceae, Francoaceae, Grossulariaceae, Hydrangeaceae, Philadelphaceae, Pterostemonaceae, Saxifragaceae, and Vahliaceae. It is not my intention to discuss the merits of this alternate and extreme system but to maintain the family in the broad sense and to discuss the climbing species in particular.

Botanists, regardless of field of specialization, tend to study and discuss natural groups of plants, such as families, genera, or closely related species. There is no question that this is the most satisfactory approach, both for the botanist and the layman. In this paper, I prefer to discuss only those species of Saxifragaceae which have in common the scandent habit. Such grouping by growth form may be considered unnatural or artificial, but the similarity of possible horticultural application has prompted me to present these plants as a group. The names used are those currently accepted, and for each I have added the original literature citation. Synonyms and their equivalents are treated in a name-finding list at the end of the paper. Those interested in the intricacies of the nomenclature are referred to the recent studies cited in the bibliography.

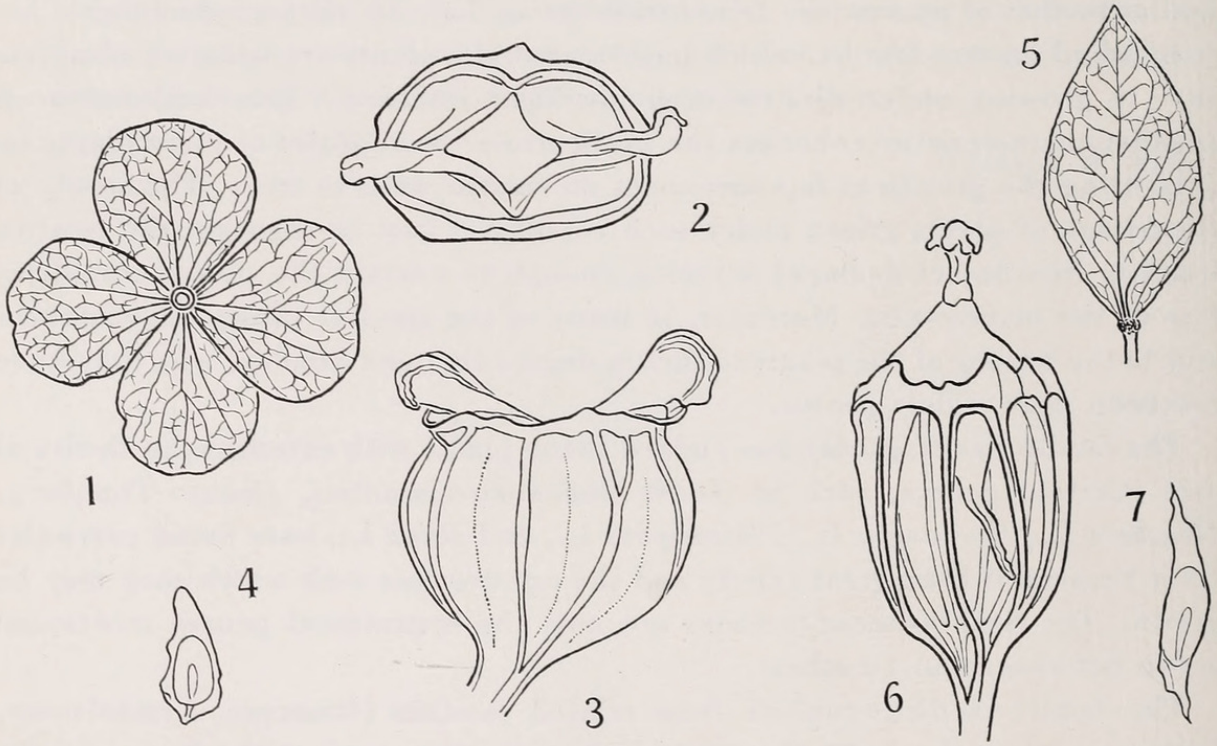


**PLATE III**

Figs. 1–4. *Hydrangea anomala* subspecies *petiolaris*. 1, Sterile flower showing petal-like development of the four calyx lobes, ×1. 2, Top view of capsule, ×7. 3, Side view of capsule, ×7. 4, Seed, ×7. Figs. 5–7. *Schizophragma hydrangeoides*. 5, Sterile flower showing petal-like development of a single calyx lobe, ×1. 6, Side view of capsule, ×7. 7, Seed, ×7.

a. Inflorescences with fertile flowers and with or without showy sterile flowers, the sterile flowers with 4 calyx lobes much enlarged and petal-like, the fertile flowers with 2–4 or rarely 5, completely free, recurved styles; fruit opening by a terminal pore between the styles. . . . . I. *Hydrangea*

a. Inflorescences with fertile flowers and with or without showy sterile flowers, the sterile flowers with 1 calyx lobe enlarged and petal-like, the fertile flowers with the styles erect and fused; fruit opening by the disintegration of tissue between the conspicuous ribs.

b. Leaves deciduous; fertile flowers with free petals; sterile flowers either present or absent.

c. Fertile flowers with 8–10 stamens, 4 or 5 petals; sterile flowers (usually present) with 1 calyx lobe enlarged and petal-like. . . . . II. *Schizophragma*

c. Fertile flowers with 20–30 stamens, 7–10 petals; sterile flowers never present. . . . . III. *Decumaria*

b. Leaves persistent, the plants evergreen; fertile flowers with fused petals which fall off together as a cap (calyptra); sterile flowers absent. . . IV. *Pileostegia*

## I. HYDRANGEA *L.*

The name *Hydrangea* is derived from Greek *hydor*, water, and *angeion*, vessel or container, an allusion to the shape of the mature capsules. This genus has been the subject of a lifetime study by the noted horticulturist Haworth-Booth and of a scientific monograph (1957) by Dr. Elizabeth McClintock. The following treatment is based largely on McClintock's study which readers are urged to consult if more detailed information is desired. She recognizes the genus as being composed of two sections, HYDRANGEA and CORNIDIA, containing eleven and twelve species respectively. The horticulturally important species are all members of Sect. HYDRANGEA. The scandent species, however, have one representative in Sect. HYDRANGEA and twelve in Sect. CORNIDIA. Therefore, a total of thirteen species are climbing, or at least have this potentiality under suitable conditions, and so are of particular interest.

### KEY TO THE SECTIONS

a. Leaves deciduous; immature inflorescences usually not enclosed by bracts; petals (in fertile flowers) free or (in our species) connate (fused) and falling together as a cap. . . . . Sect. *Hydrangea*

a. Leaves persistent; immature inflorescences always enclosed by bracts; petals (in fertile flowers) free and falling separately. . . . . Sect. *Cornidia*

### SECTION HYDRANGEA

Only one species of this section, *Hydrangea anomala* D. Don, is scandent. In addition, it also has fused petals which fall together as a cap and winged seeds. These technical characteristics distinguish it from all other species of the genus. McClintock has treated *H. anomala* as being composed of two subspecies, although previous authors have recognized these as two distinct species. She points out,

quite correctly, that the variation within the species is slight and that only a single character, in conjunction with geographic distribution, can be used to separate the two subspecies. Of the two, subspecies *petiolaris* seems more hardy, but there is no other significant horticultural difference between them. My later comments apply equally to both subspecies.

1. **Hydrangea anomala** D. Don, Prodromus Florae Nepalensis. 211. 1825.

KEY TO THE SUBSPECIES

a. Stamens 9–15; plants of the Himalaya and western and central China.
1a. *H. anomala* subsp. *anomala*

a. Stamens 15–20; plants of Japan, Formosa, and associated islands.
1b. *H. anomala* subsp. *petiolaris* (Siebold & Zuccarini) McClintock, Journal of the Arnold Arboretum **37:** 373. 1956.

This species, known as the "climbing hydrangea," was introduced into horticulture in the United States in 1865 by Mr. Thomas Hogg, who was consul to Japan, and together with his brother James, operated a nursery in New York. In addition to their own nursery, these gentlemen distributed seed to Parson's Nursery of Flushing, New York. The introductions were made under the incorrect name *Schizophragma hydrangeoides* which led to the mistaken belief that the Arnold Arboretum (rather than Messrs. Hogg) was responsible for the first introduction of *Hydrangea anomala*. In 1876, the Arboretum received seed from Japan (presumably subspecies *petiolaris*) and has grown the species since that time. According to Haworth-Booth, *Hydrangea anomala* subsp. *anomala* was introduced into Great Britain in 1839, with subsp. *petiolaris* following in about 1878. To the best of my knowledge, subspecies *anomala* was introduced into the United States by the Arnold Arboretum in 1923. Our plant flowered in 1961 and 1964 and remains relatively small.

The dark-green glossy leaves of *Hydrangea anomala* unfold in the spring, becoming fully expanded prior to those of other deciduous climbers (such as *Parthenocissus* Planchon or *Campsis* Loureiro). The leaves, in general, are heart-shaped, smooth, long-petiolate, and with serrate margins. The density of the leaves seems to vary from plant to plant, depending on the immediate growing conditions. Lateral branches tend to grow at right angles from the main climbing shoots, their length being irregular but seldom exceeding three feet, forming an uneven leafy pattern which is unobtainable with standard climbers such as *Parthenocissus tricuspidata* (Siebold & Zuccarini) Planchon and *Hedera helix* L.

The lateral branches bear terminal inflorescences which open in June, coming into full bloom before the other hydrangeas hardy in our area. The inflorescences, usually six inches or more in diameter, are composed of several hundred small fertile flowers surrounded by a corona of a dozen or more sterile ones. The latter, are white and borne on long pedicels which accentuate their peripheral position. When compounded by several hundred inflorescences the results are more than

**PLATE IV**

Tree-grown specimen of *Hydrangea anomala* subspecies *petiolaris* during flowering period.

gratifying. The calyx lobes of the sterile flowers are much enlarged, being $\frac{1}{2}$ to $\frac{3}{4}$ inches long and nearly as broad, rounded in outline. The white color is retained long after the fertile flowers have passed, creating the impression of an extraordinarily long blooming period.

The fruit, technically a capsule, is small (about $\frac{3}{8}$ inch long), opening by a pore formed at the base of the spreading styles. The number of styles varies in this species from two to three in individual flowers: the majority have two styles, although the larger tend to be 3-stylar. The significance of this variation is not understood. The fruits are not attractive, nor is there any notable leaf coloration in the fall. During the winter, the stems and lateral branches are interesting because of their growth pattern and the yellowish-orange bark which peels irregularly into large, thin flakes.

Plants of this species are found in nature, not only as powerful tree climbers, but also as scramblers in shaded rocky ravines. Their diverse horticultural applications are based, at least in part, on their adaptation to these environments. The species may be used effectively as a ground cover in difficult places, such as rock-piles or rocky outcrops, even in shaded areas. Likewise, it does very well on stone fences or brick walls, although the rate of growth is retarded in such places; but it is most vigorous and spectacular when grown as a tree climber.

Several precautions should be taken when growing the plant as a climber. In a wall situation, particularly on a building, it should be grown on a shaded side. The actual exposure depends on the area, but in the vicinity of Boston it does best with a northerly or northeasterly exposure. If grown in a southern exposure it may be damaged by the winter sun and do very poorly. One should keep in mind that the entire inflorescence is shed as a single unit, usually in early winter, and may present a problem in cleaning up. Planting it against a wall behind existing plantings, such as *Rhododendron* L. and *Enkianthus* Loureiro, should, therefore be avoided. *Hydrangea anomala* climbs, as mentioned previously, by means of secondary rootlets which penetrate the substrate, causing damage apparently no greater than that of other woody climbers. Haworth-Booth suggests growing the species in conjunction with *Tropaeolum speciosum* Poeppig & Endlicher, a spectacular climbing "Nasturtium" with orange-red flowers, an excellent suggestion which applies, unfortunately, only to warm climates or, perhaps, a large greenhouse. An excellent example of wall-grown *Hydrangea anomala*, raised from seed in 1892, may be seen on the northeast corner of the Administration Building in Jamaica Plain.

A tree-grown specimen should be started on a mature tree, for growth will become more vigorous with time. Branches eventually will encircle the tree, although not girdle it, and may even reach the crown of very large specimens. When tree and *Hydrangea* are mature the inflorescences will cover the tree trunk and large secondary branches at flowering time. During the height of flowering, the fertile flowers are worked heavily by honey bees, welcome to some but not to others. A

**PLATE V**

Close-up of inflorescences of *Hydrangea anomala* subspecies *petiolaris*. Note dissimilarity between the central fertile and peripheral sterile flowers.

fine tree-grown specimen may be seen at 380 South St., adjacent to the Arboretum grounds, in Jamaica Plain.

The future possibilities for this plant rest, I believe, simply in growing it more widely. It is obtainable from many nurserymen, who should not hesitate to recommend it. New introductions probably are in order, even though a large part of the natural range (mainland China) is not open to us at present, for one finds, in the herbarium, specimens with very large sterile flowers (up to 2 inches or more in diameter), with flowers with deckled edges instead of smooth ones, and with orange-green to pinkish flowers. All or any of these variations would be welcome additions to horticulture. Occasionally, a plant with 5-lobed sterile flowers is found, but the condition seems unstable, and 4-lobed flowers may occur on the same plant.

A haploid chromosome number of 18 has been reported by Sax (1931) from cultivated material of *Hydrangea anomala* subsp. *petiolaris*. This is consistent with reports of other members of the genus, excepting the more spectacular clones of *H. paniculata* Siebold, such as 'Pee Gee' which have a haploid number of 36. The beauty of this cultivar is due to the increased number of sterile flowers, suggesting that interesting results might be obtained by raising the chromosomal level of *H. anomala*.

## Section Cornidia

The name Cornidia, derived from *cornu*, refers to the horn-like recurved styles in the mature fruit. This section is characterized, in part, by the development of large bracts which enclose the immature inflorescence. These bracts often are colored and add to the general interest of the group. All the plants are evergreen in their native habitat, and all are climbers under proper conditions. Any or all of them could be used in gardens as climbers, either for themselves or as potential breeding stock. In the latter category, it should be noted that hybrids between species are relatively rare in *Hydrangea* and up to now no chromosome counts have been reported for members of this section of the genus. Results of a proper breeding program, even though difficult to obtain, could be well worth the effort. Haworth-Booth has pointed out that it should be possible " . . . to produce a red-flowered, evergreen, self-clinging climber hardy enough for fairly general use on shaded walls."

The tropics and the temperate regions of the Southern Hemisphere have contributed extraordinarily few plants to the horticulture of the North Temperate Zone. The reasons for this may be obvious for tropical plants, but are much less so for plants originating in the Temperate Zone of the Southern Hemisphere. Indeed, the situation is a real puzzle which probably does not have any simple biological explanation.

All the members of Sect. Cornidia are native to the tropics of the South Temperate Zone. I have listed the species (according to McClintock's classification) alphabetically, together with the characters which may be of horticultural importance.

2. **Hydrangea asterolasia** Diels, Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem. **15:** 370. 1941.

Native in Costa Rica, Panama, Colombia, and Ecuador at elevations of 3600–7500 feet; shrubs or climbers; fertile flowers white; sterile flowers present, about 1 inch in diameter, white; bract color unknown.

I have seen no material referable to this species.

3. **Hydrangea diplostemona** (Donnell Smith) Standley, Journal of the Washington Academy of Sciences. **18:** 160. 1928.

Native in Costa Rica and Colombia, at altitudes of 1800–4500 feet; shrubs or climbers; fertile flowers pink to rose; sterile flowers absent or rarely present; bracts green.

This species is poorly known at this time, but the general lack of sterile flowers is disadvantageous from a horticultural point of view.

4. **Hydrangea integrifolia** Hayata, Journal of the Faculty of Science, University of Tokyo. **22:** 131. 1906.

Native in the Philippine Islands and Formosa at high altitudes; strong climbers; fertile flowers white; sterile flowers many, about $1\frac{1}{2}$ inches in diameter; bracts large, but color undetermined.

There is a marked seasonal fluctuation in stem elongation in this species, and the plants might be deciduous under more arduous climatic conditions. It is, however, worthy of further investigation for ornamental use. McClintock has placed it in Sect. Cornidia, but I suspect that its proper relationship is with Sect. Hydrangea, specifically near *H. involucrata* Siebold.

5. **Hydrangea jelskii** Szyszylowicz, Rozprawy Akademija Umiejetnosciwydzial Matematyczno-Przyrodniczy II. **9:** 215. 1895.

Native in Ecuador and Peru at an altitude of about 6000 feet; climbers; fertile flowers white; presence or absence of sterile flowers unknown; bract color unknown.

Known only from two collections, both well past their prime.

6. **Hydrangea mathewsii** Briquet, Annuaire du Conservatoire et du Jardin botaniques de Genève. **20:** 413. 1919.

Native in northern Peru; climbers; fertile flowers white; sterile flowers absent; bract color unknown.

Known only from two collections, but because of lack of sterile flowers apparently unworthy of serious consideration as an ornamental plant.

7. **Hydrangea oerstedii** Briquet, Annuaire de Conservatoire et du Jardin botaniques de Genève. **20:** 407. 1919.

Native in Costa Rica, Panama, Colombia, Ecuador, and Peru at altitudes of 3600–9000 feet; shrubs to strong climbers; fertile flowers pink to dark magenta; sterile flowers numerous, $\frac{3}{4}$–$1\frac{1}{2}$ inches in diameter, pink to dark magenta; bract color pink, becoming greenish with age.

This seems to be the most promising species, of Sect. Cornidia, in terms of showiness and should be tried in a southern garden.

8. **Hydrangea peruviana** Moricand *in* De Candolle, Prodromus. **4:** 14. 1830.

Native of Costa Rica, Panama, Colombia, Ecuador, and Peru, usually at altitudes of 3600–9600 feet; shrubs or climbers; fertile flowers pink; sterile flowers few to many, $\frac{1}{2}$–1 inch in diameter, pink; bracts pink, becoming greenish with age.

This plant is very closely related to the preceding species, *Hydrangea oerstedii*, and, according to McClintock, the two perhaps may represent forms of a dimorphic species. In my opinion, they may be conspecific, with a tendency toward dioecism (male and female flowers on separate plants) such as one finds in the Hawaiian genus *Broussaisia* Guadichaud. This might prove to be a very valuable ornamental species because of its colorful sterile flowers.

9. **Hydrangea preslii** Briquet, Annuaire du Conservatoire et du Jardin botaniques Genève. **20:** 409. 1919.

Native in Costa Rica, Panama, Colombia, Ecuador, and Peru at altitudes of

300–7500 feet; shrubs or climbers; fertile flowers pink to wine-red; sterile flowers absent; bract color unknown.

This species has large inflorescences but always lacks sterile flowers. It might be useful as a stock for breeding towards a large inflorescence.

10. **Hydrangea seemannii** Riley, Kew Bulletin. **1924:** 207. 1924.

Native of the Sierra Madre of Durango, Mexico, at altitudes of 6000–7800 feet; strong climbers; fertile flowers white; sterile flowers relatively few, about $1\frac{1}{2}$ inches in diameter and assumed to be white; bract color unknown.

This species is known from only a few collections, and its horticultural value cannot yet be judged.

11. **Hydrangea serratifolia** (Hooker & Arnott) Philippi f., Plantarum Vascularium Chilensium. 97. 1881.

Native in Chile and Argentina at altitudes of 2400–4500 feet; shrubs or robust climbers; fertile flowers white; sterile flowers generally absent but about 1 inch in diameter when present; bract color unknown.

This southernmost *Hydrangea* normally is exposed to the coldest environment of any species of this section. It would seem to be the logical choice of the whole section to grow, and is being cultivated, in Great Britain. Introduced there by H. F. Comber (*Comber 564*) in 1927, it is grown on walls, particularly with a southern exposure, where the temperature may reach 15° F. for short periods, unfortunately, it generally lacks sterile flowers in its large compound inflorescences. According to a personal communication from Edinburgh, the Comber material is unisexual.

12. **Hydrangea steyermarkii** Standley, Publications of the Field Museum, Botanical Series. **22:** 233. 1940.

Native in Guatemala at an altitude of 4500–9000 feet; climbers; flowering material unknown. Known only from juvenile plants and one mature fruiting specimen.

13. **Hydrangea tarapotensis** Briquet, Annuaire du Conservatoire et du Jardin botaniques de Genève. **20:** 415. 1919.

Native in Colombia, Peru, and Bolivia at altitudes of 2400–4500 feet; shrubs or climbers; fertile flowers creamy white; sterile flowers absent; bract color unknown.

Closely related to *Hydrangea serratifolia* but less likely to be successful in cultivation as it is probably less hardy.

## II. SCHIZOPHRAGMA *Siebold & Zuccarini*

The name *Schizophragma* is derived from Greek *schizo*, to divide, and *phragma* a fence or screen, in allusion to the skeleton-like mature capsules. Unlike cap-

**PLATE VI**

Wall-grown specimen of *Schizophragma hydrangeoides* during flowering period.

sules in most of the Saxifragaceae, these open, not by an apical pore, but by disintegration of the tissue between the calyx ribs. This adaptation apparently is a consequence of the development of fused styles which prevented the normal dehiscence mechanism. Capsules of this type are characteristic of *Schizophragma*, *Decumaria*, and *Pileostegia*.

All of the plants of *Schizophragma*, which I am treating as three species in this paper, are climbers similar to *Hydrangea anomala*. All are deciduous, and in two species there is an interesting development of a single calyx lobe of each sterile flower into an enlarged petaloid structure. This is equivalent to one of the four enlarged calyx lobes of *Hydrangea* or the single enlarged lobes of *Mussaenda* L., *Pseudomussaenda* Wernham, and several other genera of the family Rubiaceae. As in *Hydrangea*, the sterile flowers are the primary source of beauty of the plants.

### Key to the Species of Schizophragma

a. Sterile flowers present.
  b. Leaves coarsely dentate; plants of Japan and Korea. . . . . 1. *S. hydrangeoides*
  b. Leaves entire to sparingly dentate: plants of China, Tibet, and Burma. 2. *S. integrifolium*
a. Sterile flowers absent; plants of Burma and China. . . . . 3. *S. crassum*

1. **Schizophragma hydrangeoides** Siebold & Zuccarini, Florae Japonicae. 60. *tab. 26*. 1835.

At the time of the introduction of *Schizophragma hydrangeoides* into horticulture, it was so often confused with *Hydrangea anomala* that it is not definitely known when it did come into cultivation. In *The Garden* 1879 there is an illustration, but it is hard to be certain whether this was prepared from life. A plant definitely flowered in Great Britain in 1905, but this seems a very late date. Plants of *Schizophragma* and *Hydrangea* were sometimes illustrated together under the latter name, although a few observant growers indicated that two varieties might be represented. In retrospect, it is not difficult to imagine how this confusion came about, for the plants are superficially alike. What is puzzling is the long delay in correcting the error, for casual examination of fertile flowers should have been sufficient, the styles being free in *Hydrangea* but fused in *Schizophragma*. In addition, the mature capsules are quite distinctive.

Known to occur naturally in Japan and Korea, *Schizophragma hydrangeoides* commonly is found as a tree climber, although it also occurs on rocks and sandstone cliffs. Its uses are therefore similar to those noted previously for *Hydrangea anomala*, with the same precautions applicable. It seems to be more difficult to find a location in which the plants will thrive than for the *Hydrangea*. Our best plant at the Arboretum is grown on the northeast-facing wall of the Administration Building, where it is perfectly hardy.

The light-green leaves opening early in the spring, although not as early as those of *Hydrangea anomala*, are quite attractive. They are ovate to heart-shaped

**PLATE VII**

Close-up of inflorescence of *Schizophragma hydrangeoides*. Note striking dissimilarity between the central fertile flowers and peripheral sterile ones.

in outline, with a coarsely dentate margin, and are somewhat reminiscent of the cottonwood leaf. Under proper conditions, the leaf blade may become six inches long and broad. The lateral branches usually grow at right angles to the main climbing shoots and seldom exceed three feet in length. The foliage is oriented towards the light and forms an interesting mosaic. Insect damage appears to be minimal.

The lateral branches also bear the terminal inflorescences, which open in July and August. Seldom exceeding six inches in diameter, each inflorescence is composed of several hundred small fertile flowers and up to a dozen sterile flowers. As in the hydrangeas, the sterile flowers are arranged about the periphery of the inflorescence and are borne on long pedicels. A single calyx lobe of each sterile

flower is enlarged and petaloid. Curiously, the lobe which develops is the one oriented away from the central axis of the inflorescence. In *Schizophragma hydrangeoides*, it is ovate or sometimes lanceolate, $\frac{1}{2}$ to 4 inches long, $\frac{1}{2}$ to 3 inches broad, and white. None of the flowers are shed, and, as a result, the blooming period appears to be quite long. The entire inflorescence is either dropped in early winter or retained as long as the following winter. In this respect, *S. hydrangeoides* is a cleaner plant than *Hydrangea anomala*.

There is no fall coloration, nor are the small laterally dehiscing capsules attractive. The tight bark is dull gray in color and not particularly interesting.

On the basis of herbarium material from wild sources, the species seems to be relatively uniform with very little geographic variation. New selections would have to be made on the basis of individual plants which might have desirable characteristics; for additional introductions, on a broad scale, should not be expected to yield more spectacular plants than those which we now have.

A haploid chromosome number of 14 had been reported by Sax (1931) and others for *Schizophragma hydrangeoides*. On the basis of chromosome number only, two possibly fruitful experiments are suggested. One would be to raise the chromosome level in hopes of obtaining a greater percentage of more robust sterile flowers. The second is to attempt to cross this species with *Decumaria barbara*, of the southeastern United States, to obtain information regarding the relationship of the two genera.

2. **Schizophragma integrifolium** Oliver, Hooker's Icones Plantarum. **20:** *tab. 1934.* 1890.

This species, *Schizophragma integrifolium*, was introduced into cultivation in Great Britain in 1901 from seed collected the previous year by E. H. Wilson in Hupeh, China. Wilson was also responsible for bringing it into cultivation in this country via the Arnold Arboretum in 1909. The Arboretum's material, collected in Szechuan, presumably has been lost since. This species is not available commercially in this country at present. A voucher specimen (*Wilson 1068*) deposited in the herbarium of the Arnold Arboretum substantiates the identification and the introduction. *Schizophragma integrifolium* has not been grown widely here, perhaps because it is less hardy than *S. hydrangeoides*. It has, however, as an ornamental plant an extraordinary potential which has not yet been realized.

Known in the wild from Formosa, central and south China, *Schizophragma integrifolium* is found generally at high elevations. It sometimes takes the form of a free-standing shrub but most often clambers or climbs over, or up, steep rocky places or trees. The climbing mechanism, again, is by adventitious roots arising from the main climbing stems. The uses and precautions given for *Hydrangea anomala* apply also to this plant.

The growth form of this species is essentially the same as that of *Schizophragma hydrangeoides*. While *S. hydrangeoides* is marked by little variability, *S. integrifo-*

*lium* is extremely variable in a number of important characteristics such as size, shape, serration of the margin, and pubescence of the leaves; size of inflorescence; and size and shape of sterile flowers.

The light green leaves, darker above than beneath, range in shape from ovate to broadly elliptic. Leaf size varies from $2\frac{1}{2}$ to 8 inches in length, and $1\frac{3}{4}$ to 5 inches in breadth. The margin may be entire, minutely denticulate, or sinuate-dentate. The leaf undersurface varies from glabrous to densely woolly or felted.

The lateral branches bear terminal inflorescences which, with a few exceptions, are much more showy than those of *Schizophragma hydrangeoides*. The inflorescences are at least six inches in diameter but may be up to a full foot across. There are several hundred fertile flowers with a dozen or so sterile flowers arranged about the periphery. A single calyx lobe of each sterile flower is enlarged. It varies from ovate to broadly elliptic in shape, is $\frac{3}{4}$ to $3\frac{1}{4}$ inches long, $\frac{3}{8}$ to 2 inches broad, and yellow to cream or white in color. All flowers are retained on the inflorescence, with the entire structure being shed in early winter to late spring.

There is little fall coloration and the small capsules are unattractive. The bark is an uninteresting dull gray color.

Some readers may realize that the varieties which Rehder described in this species are swamped in the welter of variability which I have mentioned very briefly. On the basis of the material now available, I believe that these varieties lack any distinct biological basis. The varieties must have appeared more distinct to Rehder as he had very few specimens. It is interesting to note that the type specimen of each of his varieties represents almost the extreme expression of a particular variable character.

My general remarks concerning this species may have misled some into believing that this is just another species similar to *Schizophragma hydrangeoides*. This is not my intent, for *Schizophragma integrifolium* is the most spectacular of all the species considered here. It has not been grown much in this country because it is tender and does not over-winter well. It is a magnificent plant that should be introduced into our warmer areas.

At this time, it is impossible to make additional selections from native plants, but if it were, the prime area for source material would be Szechuan Province, in western China. The plants in this particular province show tremendous variability in all characteristics and would be a breeder's delight. However, all of the material in cultivation in Europe, is not the result of a single introduction, so that a breeding program could be devised and based on available materials. A diploid chromosome number of 72 has been reported by Hamel (1953) for *S. integrifolium*, a number which is especially interesting in light of the diploid count of 28 for *Schizophragma hydrangeoides*.

3. **Schizophragma crassum** Handel-Mazzetti, Anzeiger der Kaiserlichen Akademie der Wissenschaften, Wien, Mathematisch-Naturwissenschaftliche Klasse. **59:** 247. 1922.

This species is native in southwestern China and Burma and is readily distinguished from others of the genus by the lack of sterile flowers. It is, however, strikingly similar in gross morphological characters to *Schizophragma integrifolium* and may represent only another extreme in variation of that diverse species. This is a question which I hope to clarify in the near future. To the best of my knowledge, it has never been in cultivation nor, because of the lack of sterile flowers, does there seem to be any future for it.

## III. DECUMARIA *L.*

The name *Decumaria*, is derived from Latin *decimarius*, relating to tenths, an allusion to the often 10-parted flowers. Today, such a derivation may seem tenuous, but the classification of Linnaeus was based upon his so-called "sexual system" which system rested primarily on the number of parts in the flower. The species of this genus are woody deciduous climbers having fertile flowers with 7–10 petals, and 20–30 stamens, and lacking sterile flowers. Only two species are known, one from the southeastern United States, the other from China.

### Key to the Species of Decumaria

a. Leaves deciduous; leaf blade ovate to elliptic, 1½–4¾ inches long, 1–3½ inches broad, the apex acute, abruptly short-acuminate, or rarely obtuse; stigma borne on a well-developed stylar column; plants of the southeastern United States. . . . . 1. *D. barbara*

a. Leaves persistent or semipersistent; leaf blade elliptic to oblanceolate, 1¼–2¾ inches long, ½–1 inch broad, the apex obtuse; stigma subsessile; plants of China. . . . . 2. *D. sinensis*

1. **Decumaria barbara** L. Species Plantarum ed. 2. 1663. 1763.

This species has a tangled background of considerable interest, but I am not prepared to explain fully all of the more interesting aspects. It was described by Linnaeus in 1763, from a specimen grown in the botanic garden at Uppsala, Sweden. Linnaeus was the first to apply a binomial name to the plant, although it was known from earlier works in which it was believed to be a *Clusia* (family Guttiferae). Linnaeus apparently lost track of, or never knew the origin of this particular material, for his specific epithet *barbara* indicates the native origin as the Barbary Coast. He says "*Habitat an in Africa?*" Thus, it joins a host of other plant species first described from material in cultivation, and like so many of them there is some doubt about its original source. Rehder gives the date of introduction into cultivation in this country, as 1785.

This species, *Decumaria barbara*, is found as a tree climber and rock climber in very moist habitats in Louisiana, Mississippi, Alabama, Tennessee, Florida, Georgia, North and South Carolina, and Virginia where it is sometimes known as "wood vamp." The inflorescences of fragrant, white, fertile flowers are relatively small (generally about three inches in diameter). The flowering period

lasts several weeks; with the time of flowering, varying geographically, from April 1 through early June.

In this country, these plants have been cultivated primarily as a greenhouse curiosity. There is no question that they are not as showy as either *Hydrangea anomala* or *Schizophragma hydrangeoides*. I have no information, however, concerning their heat tolerance, and they may prove unsatisfactory in the south. The use of *Decumaria barbara* may also be restricted in the south because of its high water requirements. If these can be met, however, the plants are handsome enough to warrant growing them. If, however, these same plants are grown farther north the water requirement is not critical. Plants of *D. barbara* grown out of doors in this area have not proven winter hardy, but new selections from Georgia (particularly Lumpkin, Rabum, and Habersham counties) might be sturdier.

Sax (1931) has recorded a meiotic chromosome number of 14 for this species. Two interesting experiments listed under *Schizophragma hydrangeoides* are also applicable here.

2. **Decumaria sinensis** Oliver, Hooker's Icones Plantarum. **18:** *tab. 1741*. 1888.

Native in Honan, Hupeh, and Szechuan provinces of China, this species is similar to the preceding but has shorter and narrower persistent leaves. The plants tend to be less robust and so have denser foliage than *D. barbara*. As in the latter species, the small inflorescences lack sterile flowers, a character partially offset by its evergreen or semi-deciduous nature. This characteristic would be of some importance in considering the species for cultivation in our southern states.

This species is grown out of doors as a wall climber in the Royal Botanic Gardens, Kew, where it seems to be perfectly hardy. It is also grown in other gardens of western Europe, flowering in late May. The Arboretum grew this species many years ago, as a pit-house plant. Our plants, the first introduction in the United States, were grown from seed collected by Wilson in China, in 1908. So far as I know this species is no longer available in this country.

## IV. PILEOSTEGIA *Hooker f. & Thomson*

The name *Pileostegia* is derived from *pilos*, meaning cap, and *stegnus*, meaning drawn together, probably in allusion to the petals, which are fused into a cap-like structure. This petal cap falls as a unit when the fertile flowers open. The plants are evergreen with elliptic, leathery leaves with petioles very much shorter than the leaf blades. The resulting leaf mosaic is unlike that formed by the plants described previously. The relatively large inflorescences are composed entirely of fertile flowers and, therefore, not as showy as they might be. Except for minor differences in size and shape, the fruiting capsules are of the same type as in *Schizophragma* and *Decumaria*.

The evergreen nature of these plants may limit their use in cold-temperate areas such as ours, but they could be extremely useful in our warmer climates. I believe the water requirements would prove to be less difficult to meet than those of our native *Decumaria barbara*.

KEY TO THE SPECIES OF PILEOSTEGIA

a. Lower leaf surface smooth (glabrous); plants of India, China, Formosa, Hong Kong, and the Ryukyu Archipelago. . . . . 1. *P. viburnoides*
a. Lower leaf surface with rust-colored stellate hairs; plants of southeastern China. . . . . 2. *P. tomentella*

1. **Pileostegia viburnoides** Hooker f. & Thomson, Journal of the Linnean Society of London. Botany. **2:** 57, 58, 76, *tab. 2.* 1858.

Tree and rock climbers of relatively small stature, native to India, China (Anhwei, Chekiang, Fukien, Hunan, Hupeh, Kiangsi, Kwangsi, Kwantung, Kweichow, Szechuan, and Yunnan provinces), Formosa, Hong Kong, and reported from the Ryukyu Archipelago. The leaves are elliptic in shape, glabrous, dark-green above, and light-green beneath. The margin is entire or sometimes slightly serrate. It is of interest that the plant described to establish the genus was thought at first, to be a holly (*Ilex*) because of the leaf shape. Some years later, the reverse confusion occurred when a plant from Mexico described as a *Pileostegia*, later had to be transferred to *Ilex*. The fertile white flowers are borne on huge inflorescences (up to seven inches long, and eleven inches in diameter)! The floral odor is described either as "fragrant" or "ill smelling." The flowering period, in the native habitats, seems to be in August.

This species was introduced into cultivation by E. H. Wilson, in 1908. At present it is grown as an ornamental in western Europe and in southern California where it is employed as a wall climber. It is not available commercially in this country.

2. **Pileostegia tomentella** Handel-Mazzetti, Anzeiger der Kaiserlichen Akademie des Wissenschaften, Wien, Mathematisch-Naturwissenschaftliche Klasse. **59:** 55. 1922.

Tree and rock climbers, of small stature, occurring wild in Fukien, Hainan, Kiangsi, Kwangsi, and Kwangtung provinces of China. The oblong or elliptic leaves are somewhat bicolorous because of the rust-colored, stellate hairs on the lower surface. The fertile, fragrant, white flowers are borne on large inflorescences (to eight inches long and eleven inches in diameter) in September and October. The small fruiting capsules generally are yellow, although I have seen one report of black.

This plant has tremendous possibilities as an ornamental because of the interesting evergreen leaves and very large inflorescences. The most advantageous characteristic, however, the late flowering period, would greatly improve its po-

tential. It seems to be limited in its cold tolerance and may be satisfactory only under warm conditions. I do not believe it is available at the present.

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**Name Finding List**

Names in **bold face** type are names accepted here as correct and used in the text Names in *italics* are considered synonyms and each is followed by its accepted equivalent. Names of authorities appear in roman type. Generic names are abbreviated (**D.**=**Decumaria; H.**=**Hydrangea; P.**=**Pileostegia; S.**=**Schizophragma**).

*Cornidia*
*integerrima* Hooker & Arnott=**H. serratifolia**
*peruviana* (Moricand) Small=**H. peruviana**
*radiata* Oersted=**H. oerstedii**
*serratifolia* Hooker & Arnott=**H. serratifolia**
*umbellata* Ruiz & Pavon=**H. preslii**

**Decumaria**
**barbara** L.
*forsythia* Michaux=**D. barbara**
*prostrata* Loddiges ex Loudon=**D. barbara**
*radicans* Moench=**D. barbara**
*sarmentosa* Bosc=**D. barbara**
*scandens* (Walter) Salisbury=**D. barbara**
**sinensis** Oliver

*Forsythia*
*scandens* Walter=**D. barbara**

*Gilibertia*
*diplostemona* Donnell Smith=**H. diplostemona**

**Hydrangea**
*altissima* Wallich=**H. anomala** subsp. **anomala**
**anomala** D. Don subsp. **anomala**
**anomala** D. Don subsp. **petiolaris** (Siebold & Zuccarini) McClintock
*antioquiensis* Engler=**H. tarapotensis**
**asterolasia** Diels
*bangii* Engler=**H. tarapotensis**
*bracteata* Siebold & Zuccarini=**H. anomala** subsp. **petiolaris**
*briquetii* Engler=**H. preslii**
*caucana* Engler=**H. peruviana**
*cordifolia* Siebold & Zuccarini=**H. anomala** subsp. **petiolaris**
*cuneatifolia* Elmer=**H. integrifolia**
**diplostemona** (Donnell Smith) Standley

*durifolia* Briquet=**H. oerstedii**
*ecuadorensis* Briquet=**H. preslii**
*epiphytica* Morton ex Haworth-Booth=**H. asterolasia**
*glabra* Hayata=**H. anomala** subsp. **petiolaris**
*glandulosa* Elmer=**H. integrifolia**
*goudotii* Briquet=**H. oerstedii**
*integra* Hayata=**H. integrifolia**
*inornata* Standley=**H. diplostemona**
*integerrima* (Hooker & Arnott) Engler=**H. serratifolia**
**integrifolia** Hayata
**jelskii** Szyszylowicz
*lehmannii* Engler=**H. peruviana**
**mathewsii** Briquet
**oerstedii** Briquet
*panamensis* Standley=**H. peruviana**
**peruviana** Moricand
*petiolaris* Siebold & Zuccarini=**H. anomala** subsp. **petiolaris**
*petiolaris* Siebold & Zuccarini γ. *bracteata* (Siebold & Zuccarini) Franchet & Savatier=**H. anomala** subsp. **petiolaris**
*petiolaris* Siebold & Zuccarini β. *cordifolia* (Siebold & Zuccarini) Franchet & Savatier=**H. anomala** subsp. **petiolaris**
*petiolaris* Siebold & Zuccarini var. *cordifolia* Maximowicz forma *formosana* Miyushima=**H. anomala** subsp. **petiolaris**
*petiolaris* Siebold & Zuccarini α. *ovalifolia* Franchet & Savatier = **H. anomala** subsp. **petiolaris**
*platyphylla* Briquet=**H. oerstedii**
**preslii** Briquet
*scandens* Maximowicz=**H. anomala** subsp. **petiolaris**
*scandens* Poeppig=**H. serratifolia**
*scandens* Maximowicz β. *cordifolia* Maximowicz=**H. anomala** subsp. **petiolaris**
*scandens* Maximowicz α. *petiolaris* Maximowicz=**H. anomala** subsp. **petiolaris**
*schlimii* Briquet=**H. oerstedii**
**seemannii** Riley
**serratifolia** (Hooker & Arnott) Philippi f.
*sprucei* Briquet=**H. diplostemona**
**steyermarkii** Standley
*taquetii* Lèveillè=**S. hydrangeoides**
**tarapotensis** Briquet
*tilaefolia* Lèveillè=**H. anomala** subsp. **petiolaris**
*trianae* Briquet=**H. peruviana**
*umbellata* (Ruiz & Pavon) Briquet=**H. preslii**
*volubilis* Hort. ex Rehder=**H. anomala** subsp. **petiolaris**
*weberbaueri* Engler=**H. peruviana**

**Pileostegia**
*obtusifolia* (Hu) Hu=**D. sinensis**
**tomentella** Handel-Mazzetti
*urceolata* Hayata=**P. viburnoides**
**viburnoides** Hooker f. & Thomson
*viburnoides* Hooker f. & Thomson var. *parviflora* Oliver ex Maximowicz=**P. viburnoides**

*Sarcostyles*
*peruviana* Presl = **H. preslii**

**Schizophragma**
**crassum** Handel-Mazzetti
*crassum* Handel-Mazzetti var. *elliptica* Anthony = **S. crassum**
*fauriei* Hayata = **S. integrifolium**
**hydrangeoides** Siebold & Zuccarini
*hydrangeoides* Siebold & Zuccarini var. *formosa* Nakai = **S. hydrangeoides**
*hydrangeoides* Siebold & Zuccarini var. *integrifolium* Franchet = **S. integrifolium**
*hypoglaucum* Rehder = **S. integrifolium**
**integrifolium** Oliver
*integrifolium* Oliver var. *denticulatum* Rehder = **S. integrifolium**
*integrifolium* Oliver var. *fauriei* Hayata = **S. integrifolium**
*integrifolium* Oliver var. *glaucescens* Rehder = **S. integrifolium**
*integrifolium* Oliver var. *minus* Rehder = **S. integrifolium**
*integrifolium* Oliver var. *molle* Rehder = **S. integrifolium**
*obtusifolium* Hu = **D. sinensis**
*tomentellum* (Handel-Mazzetti) Stapf = **P. tomentella**
*viburnoides* (Hooker f. & Thomson) Stapf = **P. viburnoides**

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