

THE GENERA OF CONVULVULACEAE IN THE
SOUTHEASTERN UNITED STATES¹

KENNETH A. WILSON

CONVOLVULACEAE Jussieu (MORNING-GLORY FAMILY)

Annual or perennial herbs or woody plants, climbing or prostrate, rarely erect [or shrubby (more rarely trees)] without tendrils, the stem usually twining and with milky sap. Leaves alternate, simple, without stipules, rarely reduced to scales (*Cuscuta*). Flowers solitary or in cymes subtended by two opposite or subopposite bracts. Sepals 5 [rarely 4] free (rarely united at the base), imbricate. Corolla sympetalous, entire, 5-lobed or 5-parted [rarely 4], induplicate-valvate or contorted in bud. Stamens 5 (rarely fewer), inserted on the corolla tube, alternate with the corolla lobes; pollen spherical and spinulose, or spherical and smooth, or ellipsoid with parallel folds. Gynoecium syncarpous, the style solitary and simple or forked, or styles 2 (rarely 3 or 4), the ovary superior, 2- or 1-locular or at times subdivided by false partitions into 4 locules, rarely 3-locular. Ovules erect, anatropous, sessile, 2 in each locule (rarely solitary). Fruit a capsule, 2- or 3-locular with 1 or 2 seeds in each locule, usually dehiscent by valves or circumscissile, irregularly dehiscent, or indehiscent. Embryo straight, cotyledons folded or spirally coiled, rarely small or absent.

A world-wide family, primarily of the tropics and subtropics, but extending also into the temperate regions, and best represented in Asia and the Americas. Characterized by the presence of milky sap, bicollateral vascular bundles, plaited corollas, axile placentation, basal erect ovules, and folded cotyledons, the family consists of about 50 genera and 2000 species and is represented in our area by 10 genera.

On the basis of the structure of the pollen grains Hallier divided the family into two groups, the Psiloconiae with smooth pollen and the Echinoconiae with spinulose pollen (rank not designated) and into nine

¹Prepared for a biologically oriented generic flora of the southeastern United States, a joint project of the Gray Herbarium and the Arnold Arboretum made possible through the support of George R. Cooley and the National Science Foundation, and under the direction of Reed C. Rollins and Carroll E. Wood, Jr. The scheme follows that outlined at the beginning of the series (Jour. Arnold Arb. 39: 296-346. 1958). Other published portions of these studies will be found in Jour. Arnold Arb. 40, 41. 1959, 1960. The area covered in this, as in former treatments, is bounded by and includes North Carolina, Tennessee, Arkansas, and Louisiana. Material included in descriptions which is inapplicable to our species is placed in brackets. References which have not been checked are marked by an asterisk.

tribes. Van Ooststroom has recently divided the family into two sub-families (Cuscutioideae and Convolvuloideae), three tribes, and nine sub-tribes which are equivalent to Hallier's tribes.

Generic lines are difficult to draw in this family, and treatments vary with different authors depending upon the emphasis placed on the taxonomic characters used (e.g., pollen, bracts, corolla, style, stigmas, and fruit). Hallier's studies on the members of this family form the basis for the system of classification that is most generally followed. This system has found support in the studies of Van Ooststroom and of Meeuse, based on the Malaysian and the South African species respectively. Other studies (e.g., Roberty), discount the value of Hallier's conclusions but add little new information to our knowledge of the family. It is evident that the entire family is in need of intensive study, and that all characters must be thoroughly re-evaluated.

Both flowering and fruiting material is necessary for the correct determination of most of the genera of Convolvulaceae. It is in general not possible to determine species which are sterile. Collectors should therefore make every effort to collect material in both flowering and fruiting condition, to record the shape of the corolla and its color; and to press opened corollas carefully between waxed paper or facial or other similar tissue.

REFERENCES:

- ALLARD, H. A. The direction of twist of the corolla in the bud, and twining of the stems in Convolvulaceae and Dioscoreaceae. *Castanea* 12: 88-94. 1947.
- BAILLON, H. Convolvulacées. *Hist. Pl.* 10: 305-331. 1891.
- BENTHAM, G., and J. D. HOOKER. Convolvulaceae. *Gen. Pl.* 2: 865-881. 1876.
- CHOISY, J. Convolvulaceae. *DC. Prodr.* 9: 323-462. 1845.
- HALLIER, H. Bausteine zu einer Monographie der Convolvulaceae. *Bull. Herb. Boiss.* 5: 366-387, 736-754, 996-1013, 1021-1052. 1897; 6: 714-724. 1898; 7: 408-418. 1899.
- . Versuch einer natürlichen Gliederung der Convolvulaceen auf morphologischer und anatomischer Grundlage. *Bot. Jahrb.* 16: 453-591. 1893.
- . Convolvulaceae africanae. *Ibid.* 18: 81-160. 1893.
- . Zur Convolvulaceenflora Amerika's. *Jahrb. Hamburg. Wiss. Anst.* 16 (Beih. 3): 19-56. 1899.
- HOUSE, H. D. Notes on Convolvulaceae. *Muhlenbergia* 5: 65-72. 1909. [Notes and new species in *Convolvulus*, *Jacquemontia*, *Oeperculina*, *Ipomoea*, and *Rivea*.]
- JOHNSTON, M. C. Convolvulaceae in southern coastal Texas. *Tex. Jour. Sci.* 11: 191-206. 1959.*
- KNIGHT, R. J. An examination of certain evolutionary trends in the Convolvulaceae. *Diss. Abs.* 19: 1175, 1176, 1958.*
- . Characters differentiating common morning-glories occurring in Virginia. *Va. Jour. Sci.* 10: 63-69. 1959. [Species of *Ipomoea* and *Convolvulus*.]
- MACBRIDE, J. F. Flora of Peru. *Publ. Field Mus. Bot.* 13(5¹): 1-536. 1959. [Convolvulaceae, 455-536.]
- MEEUSE, A. D. J. The South African Convolvulaceae. *Bothalia* 6: 641-792. 1957.

- O'DONELL, C. A. Convolvuloideas de Uruguay. *Lilloa* 29: 349-376. 1959.
- . Convolvuláceas argentinas. *Ibid.* 87-348. *pls.* 1-5.
- OOSTSTROOM, S. J. VAN. The Convolvulaceae of Malaysia. I. The genera *Cuscuta*, *Dichondra*, *Evolvulus*, *Bonamia*, *Neuropeltis* and *Porana*. *Blumea* 3: 62-94. 1938; II. The genera *Jacquemontia*, *Aniseia*, *Convolvulus*, *Calyptegia*, *Shuterea*, *Merremia*, *Oepiculina* and *Decalobanthus*. *Ibid.* 267-371. 1939; III. The genus *Ipomoea*. *Ibid.* 481-582. 1940; IV. The genera *Mina*, *Lepistemon*, *Stictocardia* and *Argyreia*. *Ibid.* 5: 339-411. 1943; V. Key to the genera. *Ibid.* 689-691. 1945. VI. The genus *Argyreia* in the Philippine Islands. *Ibid.* 6: 337-348. 1950.
- . Convolvulaceae. In D. G. G. J. VAN STEENIS. *Flora Malesiana* I. 4: 388-512. 1953.
- PARULEKAR, N. K. Stem anatomy of Convolvulaceae. *Proc. Indian Sci. Congr. Assoc.* 42(3, abs.): 229. 1955.*
- PETER, A. Convolvulaceae. *Nat. Pflanzenfam.* IV. 3a: 1-40, 375-377. 1897.
- RAO, K. V. R. Gametogenesis and embryogeny in five species of the Convolvulaceae. *Jour. Indian Bot. Soc.* 19: 53-69. 1940. [Species of *Ipomoea*, *Evolvulus*, *Argyreia*.]
- ROBERTY, G. Genera Convolvulacearum. *Candollea* 14: 11-65. 1952. [An unsatisfactory new system of classification of the family.]
- SAYEEDUD-DIN, M. Observations on the anatomy of some of the Convolvulaceae. *Proc. Indian Acad. Sci. B.* 37: 106-109. 1953.*
- SHARMA, A. K., and A. K. CHATTERJI. A cytological investigation of some Convolvulaceae as an aid in understanding their lines of evolution. *Phyton Buenos Aires* 9: 243-257. 1957.
- VERDCOURT, B. Notes from the East African Herbarium — VI. Notes on African Convolvulaceae (Part 2). *Kew Bull.* 1958: 185-197. 1958. [*Merremia*, *Stictocardia*, *Astripomoea*.]; (Part 3). *Ibid.* 199-217. [*Ipomoea*, *Turbina*.]
- . Some notes on tropical African Convolvulaceae. *Webbia* 13: 321-330. 1958.*
- WOLCOTT, G. B. Chromosome numbers in the Convolvulaceae. *Am. Nat.* 71: 190-192. 1937. [Undocumented.]

KEY TO THE GENERA OF CONVULVULACEAE

- A. Leaves scale-like or absent; plant without chlorophyll (parasitic); corolla bearing scales at base of stamens; embryo coiled, without cotyledons. 1. *Cuscuta*.
- A. Leaves well developed; plants green (autotrophic); corolla without scales; embryo straight or merely curved; cotyledons large, generally folded.
- B. Styles 2, gynobasic, corolla deeply 5-lobed, ovary and capsule deeply 2-lobed, the carpels distinct or only slightly fused; creeping vines rooting at the nodes with minute flowers. 2. *Dichondra*.
- B. Style 1 or 2, terminal; ovary and capsule not 2-lobed, the carpels united.
- C. Styles 2, free or fused near the base.
- D. Styles free, each 2-cleft, stigmas 4, linear-filiform; leaves small, plants never twining. 3. *Evolvulus*.
- D. Styles united near the base, stigmas 2, peltate. 4. *Bonamia*.
- C. Style solitary.

- E. Capsule valvate, irregularly dehiscent or the pericarp basally circumscissile.
 - F. Stigmas 2.
 - G. Stigmas elliptic or oblong, flattened. 5. *Jacquemontia*.
 - G. Stigmas filiform or subulate. 6. *Convolvulus*.
 - F. Stigmas 1, capitate or 2- or 3-lobed.
 - H. Pollen smooth; stigmas 2-lobed, globose; fruit a 4-valved capsule or the pericarp basally circumscissile. 7. *Merremia*.
 - H. Pollen spinulose; stigma 1, capitate or 2- or 3-lobed, globose; fruit a 4-6-valved capsule. . . . 8. *Ipomoea*.
- E. Capsule indehiscent, pericarp leathery or woody.
 - I. Ovary 2-locular, fruit woody, mostly 1-seeded; leaves glabrate. 9. *Turbina*.
 - I. Ovary 4-locular, fruit leathery, mostly 4-seeded; leaves densely sericeous on the lower surface. . . . 10. *Argyreia*.

1. *Cuscuta* Linnaeus, Sp. Pl. 1: 124. 1753; Gen. Pl. ed. 5. 60. 1754.

Parasitic yellowish, orange or reddish (rarely greenish) twining plants with filiform stems and alternate scale-like leaves; stems attached to the host by small haustoria. Flowers in cymose clusters, white. Calyx of 5 (rarely 4) united (rarely free) sepals. Corolla of 5 (rarely 4) petals, imbricate, with fimbriate scales at the base of the tube, as many as and below and opposite the stamens [or rarely lacking]. Pollen ellipsoid, smooth. Gynoecium of 2 (rarely 3) carpels; ovary 2 (rarely 3)-locular, each locule with 2 basal, anatropous ovules; styles distinct or united. Fruit an indehiscent, irregularly dehiscent, or circumscissile capsule. Embryo spirally coiled, without cotyledons. Endosperm fleshy. TYPE SPECIES: *C. europaea* L. (Derivation of name uncertain, perhaps from Arabic.) — DODDER (also LOVE VINE, STRANGLE WEED, DEVIL'S GUT, GOLD THREAD, PULL DOWN, HELLBINE, HAIRWEED, DEVIL'S HAIR, HAILWEED).

A world-wide genus of over 150 species centered primarily in the Americas where they occur from southern Canada south to Chile and Argentina; about 32 native and 18 introduced species in the United States; represented in our area by at least 19 species in two of the three subgenera. None of the species seems to be limited to a single host although certain ones are serious agricultural pests, particularly of clover and alfalfa (*C. Epithymum* Murray, *C. indecora* Choisy, and *C. Gronovii* Willd.).

Subgenus GRAMMICA (Loureiro) Engelm. (flowers with distinct styles and globose, peltate or convoluted stigmas) includes most of the native American species and about sixteen of our species. Subgenus MONOGYNA (Engelm.) Yuncker (flowers with united styles) is primarily Old World in its distribution and is represented in our area by one native (*C. exaltata* Engelm.) and one introduced species (*C. japonica* Choisy). The species of subg. CUSCUTA (flowers with distinct styles and elongate cylindrical stig-

mas) are all native to the Old World, although several of them, including *C. Epithymum* and *C. Epilinum* Weihe, have been introduced into North America. *Cuscuta Epithymum* may perhaps occur in our area on leguminous crops.

Cuscuta is at times treated as a separate family Cuscutaceae, primarily on the basis of its parasitic habit and imbricate corolla with scales. Embryological details, such as the absence of parietal cells in the nucellus, the persistence of one of the synergids, and the spirally coiled embryo without cotyledons and without tissue differentiation, have been cited in support of this separation. Both floral structure and embryology seem to be very similar to those of the Convolvulaceae, however. Such differences as do exist support the separate tribe Cuscuteae Benth. & Hook. or perhaps even the subfamily Cuscutoideae Peter.

Since the generative cell divides before the pollen is shed, the mature pollen grain is three-celled. All species which have been studied have a monosporic embryo sac of the "Polygonum" type, with the exception of *Cuscuta reflexa* Roxb., which has a bisporic, "Allium" type embryo sac. The ovule has a single integument which is differentiated in the seed into an epidermis, two layers of palisade-like cells, and several layers of small, thin-walled, starch-filled cells. Keys have been prepared for the identification of the seeds of various species, but the seeds require a considerable amount of sectioning in order to show the layers of the seed-coat.

The seed can germinate as soon as it matures, or it may remain viable in the soil for five or more years. The seedling is leafless with a very small root which dries up as soon as the plant becomes established on a suitable host. In order to control and eradicate *Cuscuta* from agricultural fields it is recommended that it be prevented from seeding during its first season's appearance.

Diploid chromosome numbers of 14, 28, 32, 42, 56, and 60 have been found. Both self-fertile and self-sterile species are known. It is possible, however, that the self-sterility of *C. suaveolens* Ser. and *C. subinclusa* Durand & Hilgard is a result of abnormal meiosis, such as has been demonstrated in *C. reflexa* Roxb. ($2n = 28, 32, 42$), rather than of self-incompatibility.

REFERENCES:

- (For a more extensive bibliography see DEAN 1936, 1937, and YUNCKER 1921, 1927.)
- BENNETT, C. W. Studies of dodder transmission of plant viruses. *Phytopathology* 34: 905-932. 1944.
- BEZRUCHENKO, N. Z. Biology of dodders. (In Russian) *Soviet. Bot.* 15: 213-217. 1947.
- BUNNING, E., and R. KAUTT. Über den Chemotropismus der Keimlinge von *Cuscuta europaea*. *Biol. Centralb.* 75: 356-359. 1956.*
- DEAN, H. L. Dodder overwintering as haustorial tissues within *Cuscuta*-induced galls. *Proc. Iowa Acad. Sci.* 61: 99-106. 1954.
- . *Cuscuta* as a parasite on pteridophytes. *Ann. Bot.* 50: 823-825. 1936.

- . An addition to bibliographies of the genus *Cuscuta*. Univ. Iowa Stud. Nat. Hist. 17: 191–197. 1937.
- FEDORTSCHUK, W. Embryologische Untersuchung von *Cuscuta monogyna* Vahl und *Cuscuta Epithymum* L. Planta 14: 94–111. 1931.
- FINN, V. V. Vergleichende Embryologie und Karyologie einiger *Cuscuta*-Arten. (In Ukrainian; German summary.) Zhur. Inst. Bot. URSR 12(20): 83–99. 1937.
- FOGELBERG, S. O. The cytology of *Cuscuta*. Bull. Torrey Bot. Club 65: 631–645. 1938.
- FRITSCHÉ, E., M. BOUILLENNE-WALRAND, and R. BOUILLENNE. Quelques observations sur la biologie de *Cuscuta europaea* L. Bull. Sci. Acad. Roy. Belg. V. 44: 163–187. 1958.
- GAERTNER, E. E. Studies of seed germination, seed identification, and host relationships in dodders, *Cuscuta* spp. Mem. Cornell Univ. Agr. Exp. Sta. 294: 1–56. 1950.
- LACKEY, C. F. Reaction of dodders to stems of other dodders and to their own stems. Phytopathology 36: 386–388. 1946.
- LEE, W. O., and F. L. TIMMONS. Dodder and its control. U. S. Dep. Agr. Farmers' Bull. 2117: 1–20. 1958.
- LOO, S. W. Cultivation of excised stem tips of dodder in vitro. Am. Jour. Bot. 33: 295–300. 1946.
- MACPHERSON, G. E. Comparison of development in dodder and morning glory. Bot. Gaz. 71: 392–398. 1921. [*C. Gronovii* and *Convolvulus sepium*.]
- NARAYANA, H. S. Diffuse type of parasitism in *Cuscuta hyalina* Roth. Sci. Cult. 21: 447–450. 1956.*
- PAZOUREK, J. Anatomical observations of the parasitism of *Cuscuta*. Preslia 30(2): 121–125. 1958.
- RAGHAVAN, R. S. Chromosome numbers in Indian medicinal plants. Proc. Indian Acad. Sci. B. 45: 294–298. 1957. [*C. reflexa*, $n = 16$.]
- SMITH, B. E. A taxonomic and morphological study of the genus *Cuscuta*, dodders, in North Carolina. Jour. Elisha Mitchell Sci. Soc. 50: 283–302. 1934.
- SOUÈGES, R. À propos de l'embryogénie des *Cuscuta*. Bull. Soc. Bot. Fr. 100: 28–34. 1953. [*C. hyalina* Roth, *C. planiflora* Tenore, *C. reflexa* Roxb.]
- STEVENS, O. A. Dodder (*Cuscuta*) on cultivated plants. N. Dak. Agr. Exp. Sta. Bimonthly Bull. 15: 80, 81. 1952.*
- TIAGI, B. A contribution to the morphology and embryology of *Cuscuta hyalina* Roth and *C. planiflora* Tenore. Phytomorphology 1: 9–21. 1951.
- TRONCHET, J. Action de l'acide 2,4-dichlorophénoxyacétique à 0,2% sur de jeunes plantules de *Cuscuta gronovii* Willd: élongation intense, géotropisme inversé et développement d'entre-nœuds. Compt. Rend. Acad. Sci. Paris 244: 1811–1813. 1957.
- . Mise en évidence de l'hydrotropisme des plantules de *Cuscuta gronovii* Willd. Ibid. 245: 979–981. 1957.
- . Variations périodique de masse fraîche des plantules de *Cuscuta gronovii* Willd. cultivées en conditions constantes éventualité d'un rythme endogène. Bull. Soc. Fr. Physiol. Veg. 4(3): 88, 89. 1958.*
- TRUSCOTT, F. H. On the regeneration of new shoots from isolated dodder haustoria. Am. Jour. Bot. 45: 169–177. 1958.
- VALENTA, V. A new yellows virus causing flower proliferations in the dodder, *Cuscuta campestris* Yunck. Phytopath. Zeitschr. 33: 316–318. 1958.
- YUNCKER, T. G. Revision of the North American and West Indian species of

- Cuscuta*. Ill. Biol. Monogr. 6(2/3): 1-141. pls. 1-13. 1921. [Includes bibliography.]
- . Additions to a bibliography of the genus *Cuscuta*. Proc. Indiana Acad. Sci. 36: 259-262. 1927.
- . The genus *Cuscuta*. Mem. Torrey Bot. Club 18: 113-331. 1932.
- . *Cuscuta americana* in Florida. Torreya 35: 60. 1935.
- . Convolvulaceae Lindl. 1. *Cuscuta* (Tourn.) L. In Fl. Texas 3: 123-150. South. Methodist Univ. 1943.
- . Nomenclatural changes in the genus *Cuscuta*, and notes on some American species. Bull. Torrey Bot. Club 70: 61-67. 1943.
- . *Cuscuta japonica* Choisy, an Asiatic species new to America. Torreya 44: 34, 35. 1944. [Florida and Texas.]
- . Observations on the presence of stomata in some species of *Cuscuta*. Proc. Indiana Acad. Sci. 53: 100-104. 1944.

2. *Dichondra* J. R. & G. Forster, Char. Gen. Pl. 39. pl. 20. 1776.

Creeping, perennial, pubescent herbs with reniform to orbicular alternate leaves, the stems rooting at the nodes. Flowers small, inconspicuous, solitary in the axils of the leaves, the peduncle subtended by a minute bract. Calyx of 5 sepals, free or united only at the base. Corolla 5-parted, broadly campanulate to rotate. Styles 2, gynobasic, the stigmas capitate; ovary deeply 2-lobed, each lobe with 2 basal, anatropous ovules. Fruit a 2-lobed, indehiscent or irregularly dehiscent capsule, each lobe 1 (rarely 2)-seeded. TYPE SPECIES: *D. repens* Forst. (Name from Greek, *di*, two, and *chondros*, a grain, in reference to the fruit.)

A genus of perhaps five species, primarily of the Americas, but with one pantropical species (*Dichondra repens* Forst.) which is very variable, especially in the length and shape of the petals, the shape of the leaves, and in the pubescence. In our area the genus is represented by *D. repens* var. *carolinensis* (Michx.) Choisy which occurs on roadsides, in pinelands, hammocks, and as a weed in lawns from Florida to Virginia, west to Texas and Arkansas. *Dichondra repens* is also grown as a ground cover, often as a lawn plant. Although the genus is small and the species are relatively common, the group has not been well collected and is poorly understood. A thorough study is needed to determine the nature and variation of the species and to evaluate the present classification. The differences evident in the size of both plants and leaves of var. *carolinensis* may be in response to the habitat or the difference may be more fundamental.

There seem to be no characters other than the gynobasic style and the two nearly separate carpels of *Dichondra* to support the segregate family Dichondraceae, and the genus otherwise agrees well with the genera of the Convolvulaceae. However, additional studies, both morphological and cytological, should provide evidence with respect to the relationships of this genus. *Dichondra* is most nearly related to *Falkia* L. f., a small genus of about four species of Africa, which is characterized by a 4-lobed ovary and a gamosepalous calyx.

REFERENCES:

- DREW, W. B. Dew drop "grass" as a lawn plant in central Missouri. *Ecology* 25: 246, 247. 1944. [*Dichondra repens*.]
HOUSE, H. D. A new species of *Dichondra*. *Muhlenbergia* 1: 130, 131, 1906. [*D. occidentalis* in California.]
HOWELL, J. T. A ground cover. *Leafl. West. Bot.* 2: 174. 1939. [*D. occidentalis*.]
PARODI, D. Nota sobre una nueva especie del género *Dichondra*. *Ann. Soc. Cient. Arg.* 13: 5-10. 1882. [*D. villosa*.]

3. *Evolvulus* Linnaeus, *Sp. Pl.* ed. 2. 1: 391. 1762.

Diffuse herbs or suffrutescent plants with prostrate or ascending branches, never twining, bearing entire leaves. Flowers sessile or pediceled, solitary in the axils of the leaves [or in terminal cymes]. Calyx of 5 free sepals. Corolla white, blue or purple, funnelform to rotate, the limb 5-angled or distinctly 5-lobed. Stamens 5, inserted on the corolla tube, exserted or included. Pollen globular, smooth. Styles 2, free or united at the base, each 2-cleft, the stigmas linear-filiform; ovary 2-locular, each locule with 2 ovules. Fruit a 1-4-seeded capsule. Seeds smooth or minutely verrucose. TYPE SPECIES: *E. nummularius* L. (Name from Latin *evolvere*, to unroll, in reference to the nontwining habit.)

A primarily tropical genus of perhaps 100 species, all of the Americas, from southern United States south to Argentina, but with two (*E. alsinoides* L. and *E. nummularius* L.) extending into tropical areas in the Old World. The genus, characterized by its distinct, 2-cleft styles, has been divided into eight sections, primarily on the basis of the inflorescence, the length of the peduncles, and the habit of the plant. Five species occur in our area, all members of sect. ALSINOIDES Meissn.

Evolvulus alsinoides L. is distributed throughout the tropical regions of the world and occurs in waste places and in hammocks in the Florida Keys. It is a polymorphic species in which 15 varieties have been described, although none seems to be very clear-cut; var. *Grisebachianus* Meissn. is reported from our area. Our other species are *E. glaber* Spreng., *E. sericeus* Sw., *E. Grisebachii* Peter (*E. Wrightii* House), *E. Nuttallianus* Roemer & Schultes (*E. argenteus* Pursh, *E. pilosus* Nutt.). *Evolvulus macilentus* Small, described from the lower Florida Keys, may represent a glabrous form of *E. sericeus*.

REFERENCES:

- OOSTSTROOM, S. J. VAN. A monograph of the genus *Evolvulus*. *Meded. Bot. Mus. Utrecht* 14: 1-267. 1934.
PERRY, L. M. *Evolvulus pilosus* an invalid name. *Rhodora* 37: 63. 1935. [= *E. Nuttallianus* Roemer & Schultes.]
SAYEEDUD-DIN, M. Some common Indian herbs with notes on their anatomical character. VIII. *Evolvulus alsinoides* Linn. *Jour. Bombay Nat. Hist. Soc.* 42: 816-818. pls. 1-3. 1941.

VARADAN, K. S. S., T. S. VAIDYANATHAN, and M. V. R. RAO. Phytochemistry of *Evolvulus alsinoides* Linn. Indian Jour. Pharm. 20(4): 100-105. 1958.*

4. **Bonamia** DuPetit-Thouars, Hist. Vég. Isl. France Réunion, Madagascar 1: 33. *pl.* 8. 1804, nom. cons.

Perennial, herbaceous [or woody], prostrate or twining vines [rarely erect undershrubs] with alternate, herbaceous or subcoriaceous entire leaves. Flowers axillary, solitary, or in cymes. Sepals 5, equal or subequal. Corolla 5-lobed, blue or white, campanulate or funnelform. Stamens 5, inserted on the corolla tube, included or slightly exerted; pollen smooth. Style deeply 2-cleft (or styles free, 2, rarely 1), stigmas peltate, ovary 2-locular, each locule with 2 ovules. Fruit a 2-, 4- or 8-valved capsule. (Including *Breweria* R. Br., *Stylisma* Raf.; not *Bonamya* Neck., nom. rejic.) TYPE SPECIES: *B. madagascariensis* Poir. (Named in honor of François Bonami, 1710-1786, French physician and botanist.)

A genus of 40 or more species widely distributed in the tropics of the world, represented in our area by seven species. The genus includes species of very different habit but it may be distinguished by the bifid style and the capitate stigmas. Various attempts have been made to split the genus, and, as a result, our species, with the exception of *Bonamia grandiflora* (Gray) Hallier, have been placed in *Stylisma* Raf., primarily on the basis of their more slender stems and more herbaceous habit. This group does not seem to be clearly separable from *Bonamia*, although it may represent a natural group within the genus. The problem of the generic limits of *Bonamia* is further complicated by *Seddera* Hochst. of the Old World, and a detailed study of all these species with a view of clarifying the genera would be highly desirable.

All of our species, except *Bonamia Pickeringii* (Torrey in M. A. Curtis) Gray, occur in Florida in sandy soil or in dry pinelands. Of these *B. humistrata* (Walt.) Gray extends into eastern Texas and north into southeastern Virginia, *B. aquatica* (Walt.) Gray (*Stylisma trichosanthes* of Small) north to Alabama and North Carolina, *B. Michauxii*² (*Stylisma aquatica* of Small) west to Texas and north to North Carolina. *Bonamia villosa*³ and *B. angustifolia*⁴ are both limited to Florida. *Bonamia Pickeringii* is represented in the sandhills of Georgia and from Wilmington, North Carolina, by plants which have been interpreted as two different varieties. Additional variants of this species occur in the pine barrens of New Jersey, and from Texas north to Iowa and Illinois.

² ***Bonamia Michauxii*** (Fern. & Schubert) K. A. Wilson, comb. nov. *Breweria Michauxii* Fern. & Schub., *Rhodora* 51: 37. 1949.

³ ***Bonamia villosa*** (Nash) K. A. Wilson, comb. nov. *Breweria villosa* Nash, Bull. Torrey Bot. Club 22: 154. 1895.

⁴ ***Bonamia angustifolia*** (Nash) K. A. Wilson, comb. nov. *Breweria angustifolia* Nash, Bull. Torrey Bot. Club 22: 155. 1895.

REFERENCES:

- See family references, HALLIER (1893, 16: 527, 528), VAN OOSTSTROOM (1938, 75-80; and 1953).
- FERNALD, M. L., and B. G. SCHUBERT. Some identities in *Breweria*. *Rhodora* 51: 35-43. pls. 1121-1129. 1949. [Reprinted as Contr. Gray Herb. 169. 1949.]
- HOUSE, H. D. Studies in the North American Convolvulaceae. III. *Calycobolus*, *Bonamia* and *Stylisma*. Bull. Torrey Bot. Club 34: 143-149. 1907.

5. *Jacquemontia* Choisy, Mém. Soc. Phys. Genève 6: 476. 1833.

Herbaceous or woody, prostrate or twining vines [rarely erect undershrubs] with entire or lobed leaves. Flowers axillary in cymes or dense terminal clusters [rarely solitary], with or without an involucre. Sepals 5, equal or unequal. Corolla entire, 5-toothed or 5-lobed, funnelform or campanulate. Stamens 5, inserted on the corolla tube, included; pollen smooth. Style simple, included; stigmas 2, elliptic or oblong, flattened; ovary 2-locular, each locule with 2 ovules. Fruit a 4- or 8-valved capsule. (Including *Thyella* Raf.) TYPE SPECIES: *J. ferruginea* (Steud.) Choisy. (Name in honor of Victor Jacquement, 1801-1832, French botanical explorer.)

About 120 species in 4 sections, primarily of the American tropics and subtropics, but also with a few species in the Old World; represented in our area by five species in two sections. Sections ANOMALAE Meissn. (flowers 1-3, or in loose, many-flowered inflorescences) and CAPITULIFLORAE Ooststr. (flowers in the axils of the upper leaves, aggregated into dense globose or ovoid terminal spikes) are apparently limited to the American tropics in their distribution; neither occurs in our area.

Sect. CAPITATAE Meissn. (inflorescence many-flowered, flowers in dense terminal clusters usually surrounded by bracts) is represented in the southeastern United States by *Jacquemontia tamnifolia* (L.) Griseb. (*Thyella tamnifolia* (L.) Raf.) which occurs in fields and thickets, often as a weed in cultivated areas, from Florida north to southeastern Virginia and west to Louisiana, Arkansas, and Texas. Our other species are in sect. CYMOSAE Meissn. (inflorescence 5-many-flowered loose dichasia), and in our area are found only in southern Florida. *Jacquemontia jamaicensis* (Jacq.) Hallier and *J. pentantha* (Jacq.) G. Don are known also in the West Indies, while *J. Curtissii* Peter ex Hallier and *J. reclinata* House are found only in southern peninsular Florida.

REFERENCES:

- See family references, HOUSE (1909), and VAN OOSTSTROOM (1939, p. 266; 1953).
- FOX, W. B., R. K. GODFREY, and H. L. BLUMQUIST. Notes on distribution of North Carolina plants — III. *Rhodora* 54: 165-182. 1952. [*Jacquemontia tamnifolia* in North Carolina.]
- SMALL, J. K. *Jacquemontia reclinata*. *Addisonia* 18: 35, 36. pl. 594. 1934.

6. *Convolvulus* Linnaeus, Sp. Pl. 1: 153. 1753; Gen. Pl. ed. 5. 76. 1754.

Herbaceous or more or less woody, perennial [or annual], prostrate, twining or erect plants with ovate to oblong leaves, cordate, sagittate or hastate at the base. Flowers axillary, solitary or in peduncled cymes. Calyx of 5 subequal sepals, the bracts minute, linear, and remote from the calyx, or persistent and enveloping the calyx. Corolla campanulate to funnel-form, white or pink. Stamens 5, included, unequal in length; pollen smooth, ellipsoid and tricolpate or globular and polyforate. Ovary 1-locular, 2-locular or imperfectly 2-locular; stigmas 2, ovoid to ellipsoid, linear or filiform. Fruit a 4-valved capsule with 4 or fewer seeds. (Including *Strophocaulos* Small, *Calystegia* R. Br.) TYPE SPECIES: *C. arvensis* L. (The name from the Latin *convolvere*, to entwine.) — BINDWEED.

A genus of about 250 species in the temperate and tropical regions of both hemispheres, represented in our area by four or perhaps more species. The genus is interpreted here in the broad sense to include species frequently segregated as *Calystegia* R. Br., here maintained as a section.

Section CONVOLVULUS (*Strophocaulos* Small) is represented in our area by the single weedy species *C. arvensis*, field bindweed ($2n = 50$), native to Eurasia but now widespread in the temperate areas throughout the world and often becoming a serious pest. The species occurs in our area in fields, roadsides, and waste places from northern Florida, north and west throughout our area and beyond it. It is very variable in the shape of its leaves, and at least three of the forms have been named.

Section CALYSTEGIA (R. Br.) Gray, which includes about 25 species of both hemispheres, is represented in our area by three or perhaps more species. Members of this section are distinguished by the two large bracts which subtend the calyx and envelop it, the generally larger flowers, the 1-locular or incompletely 2-locular ovary, the ovoid or ellipsoid stigmas, and the globose, polyforate pollen. *Convolvulus sepium* L. ($2n = 22, 24$), a very variable species distributed throughout most of the temperate areas of the world, is represented in the Southeast by at least three named varieties based primarily on the shape of the leaves. *Convolvulus sepium* var. *sepium* (including *C. americanus* (Sims) Greene), with broadly ovate leaves with angulate, truncate or rounded basal lobes and a U- or V-shaped leaf sinus, is the European form and is now distributed in eastern North America as far west as Missouri and Illinois, and also in New Mexico and Oregon. Varietas *fraterniflorus* Mack. & Bush (leaves with quadrangular sinuses) is reported from Pennsylvania to North Dakota, south to Virginia, Kentucky, and Arkansas, growing on roadsides and in fields and wasteplaces. Varietas *repens* (L.) Gray (leaves lance-ovate to lanceolate, mostly longer than broad) occurs on shores, beaches, and dunes along the coast from Florida north to New Brunswick, west to Texas, and also north to Ohio, Indiana and Wisconsin. *Convolvulus sericatus* House, closely allied to *Convolvulus sepium*, was described from the mountains of Georgia and has also been reported from the mountains of North Carolina.

Convolvulus spithameus L. ($2n = 22$) (including *C. Purshianus* Wherry) occurs on sandy or rocky soil, shale barrens, road cuts, rocky woods and dunes from southeastern Canada south to Georgia and Alabama and west to Minnesota and Iowa. The variation of this species is complex and needs careful study on a population basis. Two to four varieties or subspecies have been recognized.

Convolvulus pellitus Ledeb. forma *anestius* Fern. (*Convolvulus japonicus* Thunb. of Small), with double flowers and sterile, has been introduced as a cultivated plant and is now naturalized from Maine to Michigan, south to Virginia, Tennessee, and Missouri.

REFERENCES:

- See family references, HOUSE (1909), KNIGHT (1959), VAN OOSTSTROOM (1939, pp. 282-286; 1953).
- BROWN, E. O. Notes on some variations in field bindweed (*Convolvulus arvensis* L.). Iowa State Coll. Jour. Sci. 20: 269-276. 1946.
- CALL, L. W., and R. E. GETTY. The eradication of bindweed. Kansas Agr. Exp. Sta. Circ. 101: 1-18. 1923.*
- CRAFTS, A. S., and P. B. KENNEDY. The physiology of *Convolvulus arvensis* (morning-glory or bindweed) in relation to its control by chemical sprays. Pl. Physiol. 5: 329-344. 1930.
- FEHÉR, J. Kleistopetalie bei *Calystegia sepium* und *Pharbitis purpurea*. (Hungarian; German summary.) Bot. Közlem. 27: 38-42. 1930.
- FERNALD, M. L. Studies of eastern American plants. 4. Emendations in the order Tubiflorae. Rhodora 51: 70-85. 1949. [Notes on *C. spithameus*, *C. sepium*, and *C. pellitus*.]
- . Errors in citation in *Agrostis* and *Convolvulus*. Rhodora 51: 192, 193. 1949. [Correction in citation of *C. sepium* var. *repens*.]
- FRAZIER, J. C. Nature and rate of development of root system of *Convolvulus arvensis*. Bot. Gaz. 104: 417-425. 1943.
- . Amount, distribution and seasonal trend of certain organic reserves in the root system of field bindweed, *Convolvulus arvensis* L. Pl. Physiol. 18: 167-184. 1943.
- . Food reserve depletion and synthesis in field bindweed, *Convolvulus arvensis* L., as related to 7-day and 14-day intervals of cultivation. Ibid. 315-323.
- HAMILTON, R. D., C. J. WHITFIELD, and H. E. REA. Soil treatments for field bindweed (*Convolvulus arvensis*) eradication in northwest Texas. Tex. Agr. Exp. Sta. Prog. Rep. 1304: 1-4. 1950.*
- . Control of extensive infestation of bindweed (*Convolvulus arvensis*) in northwest Texas. Tex. Agr. Exp. Sta. Prog. Rep. 1392: 1-5. 1951.*
- HOUSE, H. D. A new southern *Convolvulus*. Torreya 6: 149, 150. 1906. [*C. sericatus* from Georgia.]
- MACKENZIE, K. K., and B. F. BUSH. New plants from Missouri. Missouri Bot. Gard. Ann. Rep. 16: 102-108. 1905. [*C. fraterniflorus*.]
- MACPHERSON, G. E. Comparison of development in dodder and morning glory. Bot. Gaz. 71: 392-398. pls. 25-27. 1921. [*C. sepium*.]
- PALMER, S. C. *Convolvulus Wallichiana* at Swarthmore, Pennsylvania. Rhodora 47: 332. 1945.
- PERSY, J. Nouvelles observations sur le comportement du nucléole dans la

- caryocinèse somatique de *Calystegia sepium* R. Br. (*Convolvulus sepium* L.) et sur sa néoformation. Bull. Soc. Bot. Belg. 68: 222-233. 1936.
- PRYOR, M. R. Morning glory: a progress report. Calif. Weed Conf. Proc. 8: 116-118. 1956.* [*Convolvulus arvensis*.]
- PURER, E. A. Growth behavior in *Convolvulus Soldanella* L. Ecology 17: 541-550. 1936.
- SOUÈGES, R. Embryogénie des Convolvulacées. Développement de l'embryon chez le *Convolvulus arvensis* L. Compt. Rend. Acad. Sci. Paris 205: 813-815. 1937.
- TORREY, J. G. Endogenous bud and root formation by isolated roots of *Convolvulus* grown in vitro. Pl. Physiol. 33: 258-263. 1958.
- TRYON, R. M., JR. The varieties of *Convolvulus spithameus* and of *C. sepium*. Rhodora 41: 415-423. pls. 557, 558. 1939.
- WHERRY, E. T. Four shale-barren plants in Pennsylvania. Proc. Penn. Acad. Sci. 7: 160-164. 1933. [*C. Purshianus* Wherry, p. 163.]
- . Our dwarf bindweeds. Bartonica 28: 32, 33. 1957. [*Convolvulus spithameus*; recognizes four subspecies.]

7. *Merremia* Dennstaedt ex Hallier, Bot. Jahrb. 16: 581. 1893.

Herbaceous or woody twining vines [or plants prostrate, rarely erect] with entire, dentate, or palmately lobed or compound leaves. Flowers axillary, solitary or in few- to many-flowered cymose [or variously branched] inflorescences. Calyx of 5 subequal sepals, coriaceous to herbaceous, accrescent in several species. Corolla campanulate or funnel-form, white or yellow to orange, slightly 5-lobed. Stamens 5, included, unequal in length, the anthers often contorted; pollen smooth. Ovary 2- or 4-locular, stigma 2-lobed, globose. Fruit a 1-4-seeded, 4-valved capsule or an irregularly dehiscent capsule with the pericarp circumscissile at the base. (*Operculina* of Small.) TYPE SPECIES: *M. hederacea* (Burm. f.) Hallier. (Named in honor of Blasius Merrem, 1761-1824, professor at Marburg.)

About 80 species in five sections widely distributed in the tropics of both hemispheres. Characterized by its bilobed, globose stigmas and its 4-valved or irregularly dehiscent capsule, the genus is represented in our area by four species in two sections. Section XANTHIPS (flower bud obtuse or subacute; midpetaline bands indistinctly defined, never with dark lines) is known in our area by only *Merremia umbellata* (L.) Hallier (*Ipomoea polyanthes* Roem. & Schult.), a very variable species of the tropics of the world represented in the Americas by the yellow-flowered var. *umbellata*. Section STREPTANDRA (flower buds mostly acute; midpetaline bands in the dried state often with 5 dark lines) is represented in our flora by three species. *Merremia tuberosa* (L.) Rendle (*Operculina tuberosa* (L.) Meissn.), $2n = 30$, a glabrous vine with yellow flowers and entire-margined leaf segments, is reported from pinelands, hammocks, and waste places in Florida and Texas (fide Small) and is known also from the West Indies, tropical America, tropical Africa, India, and Ceylon. This species has been placed in the genus *Operculina* S. Manso because the

pericarp of the irregularly dehiscent capsule separates from the receptacle, thereby forming an operculum. Van Ooststroom, however, has pointed out that this manner of dehiscence is clearly different from that of *Operculina* in which the pericarp is two layered and only the outer layer, not the entire pericarp, is circumscissile, while the inner layer remains attached. *Merremia dissecta* (Jacq.) Hallier (*Operculina dissecta* (Jacq.) House), $2n = 30$, a pubescent vine with white flowers and coarsely toothed leaf segments which occurs on roadsides and in hammocks and waste grounds from Florida to Georgia and Texas, ranges from the southeastern United States south to Argentina. It is also cultivated in other tropical areas where it occasionally escapes. The capsule of *M. dissecta* is 4-valved and the pericarp does not loosen from the receptacle as it does in *M. tuberosa*. *Merremia tridentata* (L.) Hallier ssp. *angustifolia* (Jacq.) Ooststr. (*Ipomoea angustifolia* Jacq.), a common African species, now occurs in waste places on the Coastal Plain and in other scattered localities.

REFERENCES:

- See family references, MACBRIDE (1959), VAN OOSTSTROOM (1939, p. 292; 1953), VERDCOURT (1958).
 FALCÃO, J. I. A. Contribuição ao estudo das espécies brasileiras do gênero *Merremia* Dennst. *Rodriguesia* 16-17: 105-125. 1954.
 HOUSE, H. D. Studies in the North American Convolvulaceae, II. The genus *Operculina*. *Bull. Torrey Bot. Club* 33: 495-503. 1906.
 O'DONELL, C. A. Las especies argentinas del genero "Merremia." *Lilloa* 5: 35-64. pls. 1-3. 1940.
 ———. Revision de las especies americanas de "Merremia." *Ibid.* 6: 467-554. pls. 1-9. 1941.

8. *Ipomoea* Linnaeus, Sp. Pl. 1: 159. 1753; Gen. Pl. ed. 5. 76. 1754.

Herbaceous or shrubby, annual or perennial, twining, prostrate or erect plants with entire, lobed or divided leaves. Flowers axillary, solitary or in few- to many-flowered cymes. Bracts variable. Calyx of 5 sepals, herbaceous or subcoriaceous. Corolla campanulate or funnelform, rarely salverform, with distinct midpetaline bands. Stamens 5, alternate with the corolla lobes, inserted on the corolla tube, included or rarely exserted; pollen globular, spinulose. Ovary 2- or 4-locular, rarely 3-locular, with 2 anatropous ovules in each locule. Style solitary, the stigma entire, 2 (or 3)-lobed, globular, included or exserted. Fruit a 4-6-valved capsule with 4-6 or fewer seeds. (Including *Batatas* Choisy, *Quamoclit* Moench, *Pharbitis* Choisy, *Exogonium* Choisy, *Calonyction* Choisy.) TYPE SPECIES: *I. Pestigridis* L. (Name from Greek *ips*, a worm, and *homoios*, resembling, in reference to the twining habit.) — MORNING-GLORY.

A large genus of the tropics and subtropics with about 500 species and perhaps 30 or fewer in our area. The limits of the genus and its subdivision have been matters of considerable disagreement. Following Van Ooststroom, who adopted the system of Hallier with but little modification, the genus

is divided into eight sections on the basis of the habit, inflorescence, flower, and seed characters, and includes a number of groups sometimes recognized as separate genera. Several other subdivisions of the genus have been proposed (cf. Choisy, Bentham, Peter, House) but the system most widely accepted is that of Hallier, although often with some minor modifications. A truly satisfactory generic treatment, however, must await a thorough monographic revision.

Section IPOMOEA (§ *Pharbitis* (Choisy) Griseb.) (mostly high-twining plants, hispid or lanate; flowers mostly showy; sepals herbaceous, oblong, lanceolate or linear; seeds glabrous, puberulent or shortly arachnoid) is represented in our area by about five species including *Ipomoea purpurea* (L.) Roth ($2n = 30$), introduced from tropical America as an ornamental, and now a pernicious weed along roadsides, waste places and in cultivated grounds throughout our area and also northward and westward. *Ipomoea hederacea* (L.) Jacq. ($2n = 30$), introduced from tropical America, is equally weedy on roadsides and waste places, and *I. Nil* (L.) Roth ($2n = 30$), a native of Africa has spread from cultivation into hammocks and cultivated grounds in Florida and Louisiana. *Ipomoea barbigera* Sweet and *I. congesta* R. Br. (*Pharbitis cathartica* (Poir.) Choisy) also occur in our area.

Section BATATAS (Choisy) Hallier (flowers mostly small, axillary in umbellate cymes; sepals mostly subcoriaceous, oblong or lanceolate; corolla funnellform; seeds glabrous) includes the widely cultivated *I. Batatas* (L.) Lam. ($2n = 90$), the sweet potato, with a large number of cultivars. The origin of the sweet potato has been the subject of considerable discussion and study. Present cytological evidence seems to indicate that it is an allopolyploid, resulting from the hybridization of a tetraploid and a diploid species. *Ipomoea trichocarpa* Ell. (*I. trifida* (HBK.) G. Don), *I. tiliacea* (Willd.) Choisy, and *I. triloba* L. are members of this section, and *I. pandurata* (L.) G. F. W. Meyer ($2n = 30$) and *I. lacunosa* L. may belong here.

Section LEIOCALYX Hallier (plants mostly glabrous, flowers solitary or in subumbellate dichasia, sepals mostly oblong or lanceolate, seeds mostly glabrous) is represented by *Ipomoea Pes-caprae* (L.) R. Br. in Tuckey ssp. *brasiliensis* (L.) Ooststr. ($2n = 30$) and *I. stolonifera* (Cyr.) J. F. Gmel., both of which occur on sandy beaches and coastal sand dunes from Florida to Texas and in tropical and subtropical countries of both hemispheres. Also to this section belong *I. cairica* (L.) Sweet ($2n = 30$), *I. sagittata* Lam. ($2n = 30$), and *I. heptaphylla* (Rottl. & Willd.) Voigt.

Section CALONYCTION (Choisy) Griseb. (annual or perennial twiners, mostly glabrous; flowers axillary, solitary or in a cincinnus or a dichasial cyme, nocturnal; sepals herbaceous to membranaceous, glabrous, or sometimes hirsute; corolla salverform, the tube long; stamens and style often exerted; ovary 2-locular or rarely 4-locular; capsule 4-valved; seeds glabrous) is represented with us by *Ipomoea alba* L. (*Calonyction aculeatum* (L.) House) in southern Florida where it grows in hammocks, often

luxuriously following fire. A native of tropical America, it has been widely cultivated and has now escaped in the tropics of both hemispheres.

Section QUAMOCLIT (Moench.) Griseb. (annual or perennial twiners, mostly glabrous; flowers axillary in a cyme, rarely solitary; sepals herbaceous to membranaceous, glabrous; corolla salverform, often bright red, rarely yellow or white; stamens and style exserted; ovary 4-locular; capsule 4-valved, seeds glabrous rarely puberulent) includes about 15 species of the Americas, three in our area. *Ipomoea Quamoclit* L., with pinnately dissected leaves, a native of tropical America and widely grown as an ornamental, has spread from cultivation as far north as Virginia and Missouri. *Ipomoea coccinea* L., with cordate leaves, ranging from Georgia north to Rhode Island, Pennsylvania and Illinois and west to Kansas, Oklahoma and Arkansas, is limited to the United States in its distribution. This species has often been confused with *I. hederifolia* L., which ranges from Florida, Louisiana, Georgia, and Texas, south to northern Argentina (also in Malaysia and Africa), but may be distinguished by having the inner sepals up to 3 (rarely 4) mm. wide, the cordate leaves with the blade entire, dentate, or 3–5 lobed; fruiting pedicels always erect. (See O'Donell, 1959, pp. 45–51, for extensive synonymy.) Species of this section are adapted to pollination by hummingbirds.

Section ERIOSPERMUM Hallier (very variable perennial plants; sepals mostly obtuse; seeds with long-bearded edges, or rarely the whole surface villose) is known in our area by three species. *Ipomoea Tuba* (Schlecht.) G. Don (*Calonyction Tuba* (Schlecht.) Colla = *C. grandiflorum* (Jacq.) Choisy) grows along beaches and in saline situations in coastal hammocks in southern Florida and is distributed throughout tropical America, east tropical Africa, and Asia to Polynesia. *Ipomoea crassicaulis* (Benth.) B. L. Robinson (*I. fistulosa* Mart. ex Choisy) occurs from Florida and the West Indies, Mexico and Central America southward to Brazil and Paraguay, and is cultivated in other tropical countries where it occasionally escapes. *Ipomoea microdactyla* Griseb. (*Exogonium microdactylum* (Griseb.) House) a woody vine with bright red flowers, obtuse sepals, and seeds with long hairs on the edges, occurs in southern Florida and the West Indies.

A number of species of *Ipomoea* are popular in cultivation in the United States. Two of the best known are *I. Nil* Roth 'Scarlett O'Hara' and *I. tricolor* Cav. 'Heavenly Blue.'

REFERENCES:

- Most of the extensive technical agricultural literature on *Ipomoea Batatas* has, of necessity, been omitted. See family references, HOUSE (1909), VAN OOSTSTROOM (1940, pp. 481–582; 1953), RAO (1940), and VERDCOURT (1958).
AHLES, H. E. *Ipomoea trichocarpa* Ell. and *Ipomoea trifida* G. Don. Jour. Elisha Mitchell Sci. Soc. 75: 129. 1959. [The two are conspecific.]
ALLARD, H. A. A new form of the moonvine *Calonyction aculeatum* with divided corolla limb, and length-of-day behavior and flowering of the common form. Jour. Wash. Acad. Sci. 35: 33–36. 1945. [Forma *apopetalum*.]
ASHBY, E., et al. Studies in the morphogenesis of leaves. I. New Phytol. 47:

- 153-176. 1948; II. *Ibid.* 177-195. 1948; IV. *Ibid.* 49: 23-35. 1950; V. *Ibid.* 189-192; VI. *Ibid.* 375-387; XI. *Ibid.* 55: 91-110. 1956. [Mostly experiments on *I. caerulea*.]
- BAEHNI, C. *Ipomoea heptaphylla* in Georgia and Mexico. *Rhodora* 38: 164. 1936.
- BRITTON, N. L. *Exogonium microdactylum*. *Addisonia* 1: 33, 34, *pl.* 17. 1916.
- BURKILL, I. H. Aji and Batata as group-names within the species *Ipomoea Batatas*. *Ceiba* 4: 227-240. 1954. [History of discovery and diffusion of the sweet potato by the Spaniards and Portuguese.]
- DORMER, K. J., and J. A. BENTLEY. Some complex relationships between auxin content and leaf area in *Ipomoea caerulea* Koen. *New Phytol.* 51: 116-126. 1952.
- FEDORTSCHUK, W. Entwicklung und Bau des männlichen Gametophyten bei den Arten der Convolvulaceen-Gattung *Quamoclit*. *Planta* 16: 554-574. 1932. [*I. coccinea*, *I. hederifolia*, *I. Quamoclit*.]
- FEHÉR, J. Kleistopetalie bei *Calystegia sepium* und *Pharbitis purpurea*. (In Hungarian; Germany summary.) *Bot. Közlem.* 27: 28-42. 1930.
- GREULACH, V. A. Photoperiodic after effects in *Ipomoea*. *Ohio Jour. Sci.* 43: 65-73. 1943. [*I. hederacea* and *I. purpurea*.]
- HAGIWARA, T. Genetic studies of flower-colours in Japanese morning glories. (In Japanese.) *Bot. Mag. Tokyo* 44: 573-595. 1930. [*I. Nil.*]
- HARTER, L. L. Bud sports in sweet potatoes. *Jour. Agr. Res.* 33: 523-525. *pl.* 1. 1926.
- and J. L. WEIMER. A monographic study of sweet-potato diseases and their control. U.S. Dep. Agr. Tech. Bull. 99: 1-117. *pls.* 1-26. 1929.
- HARTMAN, J. The non-flowering character of sweet potatoes of the Jersey type. *Pl. Physiol.* 22: 322-324. 1947.
- HAYWARD, H. E. The seedling anatomy of *Ipomoea Batatas*. *Bot. Gaz.* 93: 400-420. *pls.* 6, 7. 1932.
- HORNELL, J. How did the sweet potato reach Oceania? *Jour. Linn. Soc. Bot.* 53: 41-62. 1946.
- HOUSE, H. D. Studies in the North American Convolvulaceae — IV. The genus *Exogonium*. *Bull. Torrey Bot. Club* 24: 97-107. *pls.* 1, 2. 1908.
- . The North American species of the genus *Ipomoea*. *Ann. N. Y. Acad. Sci.* 18: 181-263. 1908.
- . Studies in the North American Convolvulaceae — V. *Quamoclit*. *Bull. Torrey Bot. Club* 36: 595-603. 1909.
- INAMURA, S. I., and A. TAKIMOTO. Photoperiodic responses in Japanese morning glory, *Pharbitis Nil* Chois., a sensitive short day plant. *Bot. Mag. Tokyo* 68: 235-241. 1955. (See also 68: 260-266. 1955; 69: 23-29. 289-297, 353-358, 1956; 70: 53-57. 1957; 71: 254-260. 1958.)
- ISBELL, C. L. Regeneration in leaf cuttings of *Ipomoea Batatas*. *Bot. Gaz.* 91: 411-425. 1931.
- KEHR, A. E., Y. C. TING, and J. C. MILLER. The site of carotenoid and anthocyanin synthesis in sweet potatoes. *Proc. Am. Soc. Hort. Sci.* 65: 396-398. 1955.
- KENYAN, F. M. G. A morphological and cytological study of *Ipomoea trifida*. *Bull. Torrey Bot. Club* 55: 499-512. 1929.
- KING, J. R., and R. BAMFORD. The chromosome number in *Ipomoea* and related genera. *Jour. Hered.* 28: 279-282. 1937.

- KNIGHT, R. J. Morphological variation within a Clarke County population of *Ipomoea hederacea* (L.) Jacquin. (Abs.) Va. Jour. Sci. II. 7: 288. 1956.
- . Hybridization in *Ipomoea* and its relatives. (Abs.) Va. Jour. Sci. II. 8: 291, 292. 1957.
- KUSE, G. Bud inhibition and correlative growth of petiole in sweet potato stem. Mem. Coll. Sci. Univ. Kyoto B. 21: 107–114. 1954.
- LAM, S. L., and H. B. CORDNER. Flowering hormone in relation to blooming in sweetpotatoes. Science 121: 140, 141. 1955.
- LAURITZEN, J. I. Some effects of chilling temperature on sweetpotatoes. Jour. Agr. Res. 42: 617–627. pl. 1. 1931.
- . Factors affecting infection and decay of sweet potatoes by certain storage rot fungi. Jour. Agr. Res. 50: 285–329. 1935.
- LEE, S. H., and C. H. SHEO. Developmental morphology of the tubers of sweet potatoes. (In Chinese; English summary.) Acta Bot. Sinica 5: 207–221. pl. 1, figs. 1–7. 1956.
- MCCORMICK, F. A. Notes on the anatomy of the young tuber of *Ipomoea Batatas* Lam. Bot. Gaz. 61: 388–398. 1916.
- MAHESHWARI, P. The seed structure of *Ipomoea*, a criticism. Sci. Cult. 9: 557. 1944.*
- MEDSGER, O. P. The Man-of-the-earth or wild potato vine. Torreya 24: 39–42. 1924. [*I. pandurata*.]
- MIKELL, J. J. The influence of chemical treatments on the growth and flowering of sweet potatoes. Proc. Am. Soc. Hort. Sci. 60: 295–298. 1952.*
- MILLER, J. C. Inducing the sweet potato to bloom and set seed. Jour. Hered. 28: 347–349. 1937.
- . Further studies and technic used in sweet potato breeding in Louisiana. Jour. Hered. 30: 484–492. 1939.
- NAKAJIMA, G. Cytogenetical studies on the amphidiploid of *Quamoclit*. (In Japanese; English summary.) Jap. Jour. Genetics 26: 203–209. 1951.*
- NAKAYAMA, S. Photoreversible control of flowering at the start of inductive dark period in *Pharbitis Nil*. Ecol. Rev. 14: 325, 326. 1958.*
- NJOKU, E. The effect of defoliation on leaf shape in *Ipomoea caerulea*. New Phytol. 55: 213–228. 1956.
- . The effect of mineral nutrition and temperature on leaf shape in *Ipomoea caerulea*. Ibid. 56: 154–171. 1957.
- NOHARA, S. Genetical studies on *Quamoclit* (*Ipomoea*). Jour. Coll. Agr. Univ. Tokyo 11: 21–44. pls. 3–7. 1930.
- O'DONELL, C. A. Nota sobre *Ipomoea fistulosa* Martius ex Choisy. Bol. Soc. Argent. Bot. 4: 175, 176. 1952.
- . Las especies americanas de "*Ipomoea*" L. sect. "*Quamoclit*" (Moench) Griseb. Lilloa 29: 19–86. 1959.
- RAO, N. S. Chromosome studies in the genus *Ipomoea*. Curr. Sci. Bangalore 16: 156. 1947.*
- ROSA, J. T. Mutations in the sweet potato. Jour. Hered. 17: 167, 168. 1926.
- SMALL, J. K. *Ipomoea macrorhiza*. Addisonia 13: 43, 44. pl. 438. 1928.
- STOUT, A. B. The flowers and seed of sweet potatoes. Jour. N. Y. Bot. Gard. 25: 153–168. pl. 292. 1924.
- . *Ipomoea Batatas*. Addisonia 9: 35, 36. pl. 306. 1924.
- . Further notes on the flowers and seeds of sweet potatoes. Jour. N. Y. Bot. Gard. 27: 129–135. 1926.

- TAKENAKA, Y. The genes of Japanese morning glory (*Pharbitis Nil*). (Abs.) (In Japanese.) Jap. Jour. Genetics 33: 326. 1958.
- TAKIMOTO, A., K. IKEDA, and S. I. IMAMURA. Über den lichtunempfindlichen Teilprozess in der blühinduzierenden Dunkelperiode bei *Pharbitis Nil*. Bot. Mag. Tokyo 71: 317, 318. 1958.
- THOMPSON, H. C., and J. H. BEATTIE. Group classification and varietal descriptions of American varieties of sweet potatoes. U. S. Dept. Agr. Bull. 1021: 1-30. pls. 1-8. 1922.
- TING, Y. C., and A. E. KEHR. Meiotic studies in the sweet potato (*Ipomoea Batatas* Lam.). Jour. Hered. 44: 207-211. 1953.
- , ———, and J. E. MILLER. A cytological study of the sweet potato plant *Ipomoea Batatas* (L.) Lam. and its related species. Am. Nat. 91: 197-203. 1957.
- VERDCOURT, B. Typification of the subdivisions of *Ipomoea* L. (Convolvulaceae) with particular regard to the East African species. Taxon 6: 150-152. 1957.
- . The names of the morning glories cultivated and naturalized in East Africa. *Ibid.* 231-233. [Discussion of the typification of *I. congesta*, *I. hederacea*, *I. purpurea*, and *I. Nil*.]
- WARMKE, H. E., and H. J. CRUZADO. The flowering and seed-setting of sweet potatoes in Puerto Rico. Science 109: 62, 63. 1949.

9. *Turbina* Rafinesque, Fl. Tellur. 4: 81. 1836 [1838].

Herbaceous or more or less woody, trailing or climbing, perennial vines with entire, ovate leaves, cordate at the base. Flowers in axillary peduncled cymes borne on the terminal portion of the branches. Calyx of 5 unequal, ovate or elliptic, obtuse sepals with thin margins. Corolla campanulate, white, with distinct midpetaline bands. Stamens 5, included, unequal in length; pollen spinulose. Ovary 2-locular, the stigma biglobular, the style included. Fruit a 1-locular, usually 1-seeded, indehiscent, ovoid-oblong capsule with a thin, woody pericarp. (*Legendrea* Webb & Berth.) TYPE SPECIES: *T. corymbosa* (L.) Raf. (Name from Latin, *turbinatus*, turbinate, in reference to the shape of the capsule.)

A genus of about ten or perhaps more species of the American tropics and Africa, represented in our area by a single species, *Turbina corymbosa* (*Rivea corymbosa* (L.) Hallier), which occurs throughout tropical South America, Central America, the West Indies, and Mexico, and is reported from southern peninsular Florida, the Florida Keys, and south Texas growing in hammocks and thickets. It has been introduced in various places in the Old World and in some areas has become naturalized. *T. corymbosa* was used by the Aztecs as a narcotic in divination, as a medicine, and as an ingredient in magical and analgesic ointments.

Turbina may be distinguished by the indehiscent, ovoid-oblong, mostly 1-seeded, woody capsules, and by the ovate to oblong, obtuse, spreading sepals which are not accrescent or only slightly so. *Rivea* Choisy has been shown to include species with linear-oblong stigmas and indehiscent, dry or nearly dry fruit and to be restricted to tropical Asia.

REFERENCES:

- See family references, HOUSE (1909), MEEUSE (1957, pp. 773-784), VAN OOSTSTROOM (1943, 354), and VERDCOURT (1958).
- SCHULTES, R. E. A contribution to our knowledge of *Rivea corymbosa*, the narcotic ololiuqui of the Aztecs. 45 pp. Botanical Museum, Harvard Univ., Cambridge, Mass. 1941.
- . A narcotic morning-glory (Una convolvulácea narcótica). *Revista Soc. Cub. Bot.* 10: 61-68, 101-107. 1953; 11: 14-23. 1954. [*T. corymbosa*.]
- TAYLOR, N. Come and expel green pain. *Sci. Month.* 58: 176-184. 1944. [Historical account of the narcotic uses of *T. corymbosa* and *Lophophora williamsii*.]

10. *Argyreia* Loureiro, Fl. Cochinchin. 1: 134. 1790.

Perennial, woody, twining vines with ovate to orbicular leaves, cordate at the base and densely sericeous on the lower surface. Flowers in peduncled axillary cymes. Calyx of 5 equal or subequal, coriaceous sepals. Corolla funnelform, campanulate or tubular, rose-purple, with distinct midpetaline bands. Stamens 5, included, unequal in length; pollen spinulose. Ovary [2- or] 4-locular, the stigmas biglobular, the style included. Fruit thick-walled, leathery, 4-seeded or less, indehiscent. TYPE SPECIES: *A. obtusifolia* Lour. or *A. acuta* Lour. (Name from Greek *argyreios*, silvery, in reference to the pubescence on the lower surface of the leaves.) — WOOLLY MORNING-GLORY.

A genus of about 90 species in tropical Asia, Malaysia, and Queensland. A single species of sect. PTYXANTHUS G. Don, *A. nervosa* (Burm. f.) Bojer (*A. speciosa* (L. f.) Sweet), a native of India which is cultivated in tropical areas as an ornamental and occasionally escapes, has been reported in Florida from hammocks along the Everglades (Small).

REFERENCES:

- See family references, RAO (1940) and VAN OOSTSTROOM (1950, 1953).
- HOOGLAND, R. D. The Convolvulaceae of Malaysia, VIII. The genus *Argyreia* in the Malay Peninsula. *Blumea* 7: 179-192. 1952.
- SINGH, P. Pharmacognosy of leaf of *Argyreia speciosa* Sweet. *Jour. Sci. Indus.* 16C(10): 204-206. 1957.*



Wilson, K A. 1960. "The Genera of Convolvulaceae in the Southeastern United States." *Journal of the Arnold Arboretum* 41(3), 298–317.

<https://doi.org/10.5962/p.324668>.

View This Item Online: <https://www.biodiversitylibrary.org/item/33617>

DOI: <https://doi.org/10.5962/p.324668>

Permalink: <https://www.biodiversitylibrary.org/partpdf/324668>

Holding Institution

Missouri Botanical Garden, Peter H. Raven Library

Sponsored by

Missouri Botanical Garden

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Arnold Arboretum of Harvard University

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.