

20121483

STATUS: PENDING 20060516 OCLC #: 1585732
 REQUEST DATE: 20060516 NEED BEFORE: 20060615 SOURCE: Illiad
 BORROWER: GDC RECEIVE DATE: DUE DATE:
 RENEWAL REQ: NEW DUE DATE:
 LENDERS: *EIE, SRS, LYU, PZI, CTL

CALL NUMBER:

AUTHOR: Arnold Arboretum.

TITLE: Journal of the Arnold Arboretum.

ISSN: 0004-2625

ARTICLE: Thieret, J. W.: The Martyniaceae in the southeastern United States

VOL: 58 DATE: 1977 PAGES: 25-39

LOCATIONS: CCC

VERIFIED: OCLC

SHIP TO: 300 N. Washington St./Interlibrary Loan/Gettysburg College Library/

Gettysburg, PA 17325-1493

BILL TO: same/ FEIN #23-135-2641 N

SHIP VIA: IDS #132 or L/R

MAXCOST: IFM - \$25 COPYRIGHT: CCL AFFILIATION: ACLICP, Oberlin Group, PALCI PHA#....

FAX: 717-337-7001 ARIEL : ariel.cc.getty...

BORROW NOTES: ariel.cc.getty.edu or 138.234.152.5

PATRON: :dept: :type: Amith, Jonathan

LEND CHARGES: SHIPPED DATE: SHIP INSURANCE:

THE MARTYNIACEAE IN THE SOUTHEASTERN
UNITED STATES¹

JOHN W. THIERET

MARTYNIACEAE Stapf in Engler & Prantl,
Nat. Pflanzenfam. IV. 3b: 265. 1895.

(UNICORN-PLANT FAMILY)

Strong-scented annual herbs [or perennials, sometimes with tuberous roots], pubescent with both glandular and nonglandular hairs. Leaves exstipulate, simple, long-petioled, opposite to alternate, entire to sinuate [dentate or lobed], cordate at base, sometimes inequilaterally so. Inflorescence racemose, terminal. Flowers perfect, zygomorphic, hypogynous, pediceled, each axillary to a bract. Calyx of 5 sepals, zygomorphic, bibracteolate at base, either synsepalous and spathaceous, more or less unequally 5-lobed, split abaxially to base [or of free sepals]. Corolla sympetalous, the tube cylindrical at base, this cylindrical portion about equaling [or much longer than] the calyx, the throat campanulate [or infundibular], the limb 5-lobed, somewhat 2-lipped, aestivation imbricate, the upper lobes external. Androecium of 4 [2] didynamous, fertile, alternate stamens and usually 1 [3] staminode, all inserted on the corolla near junction of tube and throat, included in throat; anthers dorsifixed, becoming more or less connate, with placentoids, 4-sporangiate, bilocular at maturity, locules dehiscent longitudinally and introrsely; pollen

¹Prepared for the Generic Flora of the Southeastern United States, a joint project of the Arnold Arboretum and the Gray Herbarium of Harvard University made possible through the support of the National Science Foundation (Grant BMS74-21469, principal investigator, Carroll E. Wood, Jr.). This treatment, the eighty-second to be published, follows the format established in the first paper in the series (Jour. Arnold Arb. 39: 296-346. 1958). The area covered includes North and South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, and Louisiana. The descriptions are based primarily on the plants of this area, with additional material in brackets [].

The length of the paper and the number of references are quite out of proportion to the representation of Martyniaceae in our flora, especially considering that *Proboscidea louisianica* cannot with certainty even be called a native of the area. I hope that the greater than usual biological interest of the family and the bringing together of much of a widely scattered literature will justify the extra pages.

I am indebted to Dr. Wood for his careful review of the manuscript and for other aid, and to the staff of the Lloyd Library, Cincinnati, for help in bibliographic matters. A Faculty Research Grant from Northern Kentucky University facilitated the acquisition of certain reference materials. The illustration was drawn by Virginia Savage, under the supervision of Dr. Wood, from material supplied by Dr. Timothy Plowman, Botanical Museum, Harvard University.

spheroidal, reticulate, apparently nonaperturate. Gynoecium syncarpous, calyels 2; stigma 2-lipped, the lips thin, broad and flat, sensitive to touch; style elongate, included in or slightly exerted from the throat; ovary unilocular, with 2 parietal intruded placentae, each placenta expanded into a broad lamella. T-shaped in cross-section; ovules many [few], unitegmic, tenuinucellar, anatropous; embryo sac development normal (Polygonum type); endosperm *ab initio* cellular, with haustoria. Fruit a 2-valved drupe, imperfectly 5- [4-] locular, terminated by an upward curved beak developed from proximal portion of the style and longer [or shorter] than the fruit body; exocarp thick, fleshy, deciduous in 2 valves; endocarp woody, sculptured [or echinate], crested along the adaxial [and sometimes abaxial] suture, dehiscing along both sutures [sometimes only distally, then more or less indehiscent proximally], the beak splitting into two elongate [or short], sharp-pointed "horns"; seeds numerous [few], relatively large, rugose-tuberculate; endosperm thin, membranaceous; embryo straight, oily, with fleshy, epigeal cotyledons. TYPE GENUS: *Martynia* L.

The Martyniaceae comprise about 20 species. Van Eseltine, the most recent monographer of the family, recognized five genera; his treatment has since been followed by most workers, although a few (e.g., Chittenden) include, in an enlarged (and more than a century old) concept of *Martynia*, the genera *Ibicella* (Stapf) Van Eseltine, *Proboscidea* Schmidel, and *Martynia* L. sensu stricto (= *M. annua* L.). Two genera (one native and one introduced) occur in the conterminous United States. One species of *Proboscidea* represents the family in the southeastern United States.² The family is indigenous to tropical and warm temperate areas of the New World from southern (southwestern?) United States to Uruguay and northern Argentina; a few species have been introduced as weeds into the Old World.

As with many "Personatae," the taxonomic status of the Martyniaceae is debatable. The family has been included in Bignoniaceae (Jussieu, Kunth), Gesneriaceae (Baillon), and Pedaliaceae (Bentham & Hooker, Decaisne, Hutchinson [1926], and, more recently, Backer, Heine, and Humbert). A close relationship between Martyniaceae and Gesneriaceae has been re-emphasized, mainly on anatomical grounds, by Cortesi. The Martyniaceae now are most commonly considered to be a separate family, the New World counterpart of the Pedaliaceae, from which they differ in their unilocular ovary and parietal placentae.

A characteristic vegetative feature of Martyniaceae is their glandular

²*Ibicella*, a South American genus of three species, has been collected as a waif in the southeastern United States, e.g., on "ballast" in Alabama (Van Eseltine). I have, however, no evidence that the genus has become established in our area, although it has been naturalized in parts of California. It can be distinguished from *Proboscidea* as follows:

- for calyx synsepalous and spathaceous, 5-lobed, split to the base abaxially; fertile stamens 4; endocarp body sculptured. *Proboscidea*.
- for calyx of 5 free sepals; fertile stamens 2; endocarp body echinate. *Ibicella*.

hairs, which consist of a several-celled head. The plants a distinctive amino acids; insects are trapped by the noted by various authors herbarium specimens. The unknown. Insectivory imbr been strongly affirmed for who reported a proteolytic locally that the plant "è una lioni got negative results i Manganaro suggested that aparato capturado de la h es seguramente xerófila."

The fruits of *Martynia* characteristic. As these fru exocarp fleshy. An upward our genus and in *Ibicella*, develops from the proximal of some Martyniaceae that At fruit maturity, in an u exocarp sloughs off in two sutures. Concurrently, the and sculptured, echinate, o sutures. The beak splits in elongate horns.

The fruits are adapted f by means of the hooked hor cattle, bison, and panthers Aided by the styler horns, fur. In our genus, seeds p about. In *Martynia*, the rotting of the endocarp.

Nomenclature for the fru The fruit has been called, exocarp and woody endocarp with deciduous pericarp" (! a "subdrupeaceous capsule," unwilling to commit themse paper on fruit classification cluded *Martynia* among "Früchte." I call the fruit does not fit into the classic fleshy or pulpy, indehiscent authors), a hard or bony, i seed. Fruits of *Prunus* best the term "drupe" is used fo

ium syncarpous,
lat, sensitive to
rom the throat;
ch placenta ex-
n; ovules many
sac development
, with haustoria.
rminated by an
style and longer
, deciduous in 2
ested along the
ng both sutures
proximally], the
1 "horns"; seeds
endosperm thin,
igeal cotyledons.

hairs, which consist of a one- to several-celled uniseriate stalk and a several-celled head. The copious, sticky secretion of the hairs gives the plants a distinctive aminoid odor and clammy feel. That many small insects are trapped by the secretion on the leaves and stems has been noted by various authors and can be seen on both living plants and herbarium specimens. The function of the hairs and their secretion is unknown. Insectivory immediately comes to mind, and this indeed has been strongly affirmed for *Martynia* [i.e., *Ibicella*] *lutea* by Mameli, who reported a proteolytic enzyme in the secretion and stated unequivocally that the plant "è una pianta insettivora." Earlier, Fermi & Buscaglioni got negative results in a search for such an enzyme in *Martynia*. Mangano suggested that the secretion of *Ibicella lutea* "se trate de un aparato capturado de la humedad atmosférico, dado que la planta . . . es seguramente xerófila."

The fruits of Martyniaceae are certainly the family's outstanding characteristic. As these fruits mature, the endocarp becomes woody, the exocarp fleshy. An upwardly-curved beak (longer than the fruit body in our genus and in *Ibicella*, shorter than it in *Craniolaria* and *Martynia*) develops from the proximal portion of the style, and it is the long beak of some Martyniaceae that evidently suggested the name "unicorn plant." At fruit maturity, in an unsurpassed example of vegetable ecdysis, the exocarp sloughs off in two valves, splitting along the abaxial and adaxial sutures. Concurrently, the endocarp, crested along one or both sutures and sculptured, echinate, or ribbed, begins to dehisce distally along the sutures. The beak splits into two sharp-pointed, hooked, and (in ours) elongate horns.

The fruits are adapted for dispersal through attachment to mammals by means of the hooked horns: the literature records sheep, mules, horses, cattle, bison, and panthers (!) as vectors but surely there are others. Aided by the stylar horns, the fruits cling to fetlock, tail, mane, or body fur. In our genus, seeds presumably drop out as the fruits are carried about. In *Martynia*, the seeds seem to be freed only by crushing or rotting of the endocarp.

Nomenclature for the fruit type of the Martyniaceae is problematical. The fruit has been called, *inter alia*, a "capsule with fleshy deciduous exocarp and woody endocarp," a "woody many-seeded capsule," a "capsule with deciduous pericarp" (!), a "ligneous drupe," a "drupaceous capsule," a "subdrupaceous capsule," a "drupaceous follicle," and a "pod." Authors unwilling to commit themselves use simply "fruit." I have seen only one paper on fruit classification that mentions Martyniaceae: Gusuleac included *Martynia* among "Steinfrüchten" in his category "Eusynkarpe Früchte." I call the fruit of Martyniaceae a drupe even if the choice does not fit into the classical definition of a drupe, which emphasizes a fleshy or pulpy, indehiscent exocarp (the exocarp plus mesocarp of some authors), a hard or bony, indehiscent endocarp, and a single carpel and seed. Fruits of *Prunus* best exemplify this concept. In practice, however, the term "drupe" is used for many fruits not fitting this definition.

seltine, the most
a; his treatment
e.g., Chittenden)
old) concept of
proboscidea Schmidel,
nera (one native
ed States. One
theastern United
temperate areas
nited States to
en introduced as

he Martyniaceae
niaceae (Jussieu,
ham & Hooker,
ker, Heine, and
nd Gesneriaceae
by Cortesi. The
separate family,
hich they differ

; their glandular
collected as a waif
(Van Eseltine). I
our area, although
om *Proboscidea* as

: abaxially; fertile
..... *Proboscidea*.
..... *Ibicella*.



spheroidal, reticulate, apparently nonaperturate. Gynoecium syncarpous, carpels 2; stigma 2-lipped, the lips thin, broad and flat, sensitive to touch; style elongate, included in or slightly exerted from the throat; ovary unilocular, with 2 parietal intruded placentae, each placenta expanded into a broad lamella, T-shaped in cross-section; ovules many [few], unitegmic, tenuinucellar, anatropous; embryo sac development normal (Polygonum type); endosperm *ab initio* cellular, with haustoria. Fruit a 2-valved drupe, imperfectly 5- [4-] locular, terminated by an upcurved beak developed from proximal portion of the style and longer [or shorter] than the fruit body; exocarp thick, fleshy, deciduous in 2 valves; endocarp woody, sculptured [or echinate], crested along the adaxial [and sometimes abaxial] suture, dehiscing along both sutures [sometimes only distally, then more or less indehiscent proximally], the beak splitting into two elongate [or short], sharp-pointed "horns"; seeds numerous [few], relatively large, rugose-tuberculate; endosperm thin, membranaceous; embryo straight, oily, with fleshy, epigeal cotyledons. TYPE GENUS: *Martynia* L.

The Martyniaceae comprise about 20 species. Van Eseltine, the most recent monographer of the family, recognized five genera; his treatment has since been followed by most workers, although a few (e.g., Chittenden) include, in an enlarged (and more than a century old) concept of *Martynia*, the genera *Ibicella* (Stapf) Van Eseltine, *Proboscidea* Schmidel, and *Martynia* L. sensu stricto (= *M. annua* L.). Two genera (one native and one introduced) occur in the conterminous United States. One species of *Proboscidea* represents the family in the southeastern United States.² The family is indigenous to tropical and warm temperate areas of the New World from southern (southwestern?) United States to Uruguay and northern Argentina; a few species have been introduced as weeds into the Old World.

As with many "Personatae," the taxonomic status of the Martyniaceae is debatable. The family has been included in Bignoniaceae (Jussieu, Kunth), Gesneriaceae (Baillon), and Pedaliaceae (Bentham & Hooker, Decaisne, Hutchinson [1926], and, more recently, Backer, Heine, and Humbert). A close relationship between Martyniaceae and Gesneriaceae has been re-emphasized, mainly on anatomical grounds, by Cortesi. The Martyniaceae now are most commonly considered to be a separate family, the New World counterpart of the Pedaliaceae, from which they differ in their unilocular ovary and parietal placentae.

A characteristic vegetative feature of Martyniaceae is their glandular

²*Ibicella*, a South American genus of three species, has been collected as a waif in the southeastern United States, e.g., on "ballast" in Alabama (Van Eseltine). I find, however, no evidence that the genus has become established in our area, although it is naturalized in parts of California. It can be distinguished from *Proboscidea* as follows:

Calyx synsepalous and spathaceous, 5-lobed, split to the base abaxially; fertile stamens 4; endocarp body sculptured. *Proboscidea*.
Calyx of 5 free sepals; fertile stamens 2; endocarp body echinate. *Ibicella*.

hairs, which consist of a one- to several-celled head. The copious, sticky secretion plants a distinctive aminoid odor and clear insects are trapped by the secretion on the noted by various authors and can be seen in herbarium specimens. The function of the unknown. Insectivory immediately comes been strongly affirmed for *Martynia* [i.e., who reported a proteolytic enzyme in the locally that the plant "è una pianta insettivora" Lioni got negative results in a search for Manganaro suggested that the secretion of aparato capturado de la humedad atmosférica seguramente xerófila."

The fruits of Martyniaceae are certainly characteristic. As these fruits mature, the exocarp fleshy. An upwardly-curved beak of our genus and in *Ibicella*, shorter than it develops from the proximal portion of the of some Martyniaceae that evidently suggests. At fruit maturity, in an unsurpassed example, the exocarp sloughs off in two valves, splitting along the sutures. Concurrently, the endocarp, crested and sculptured, echinate, or ribbed, begins to split along the sutures. The beak splits into two sharp-elongate horns.

The fruits are adapted for dispersal by means of the hooked horns: the literature mentions cattle, bison, and panthers (!) as vectors. Aided by the stylar horns, the fruits climb the fur. In our genus, seeds presumably do not rot about. In *Martynia*, the seeds seem to rot about the rotting of the endocarp.

Nomenclature for the fruit type of the Martyniaceae has been called, *inter alia*, a "woody exocarp and woody endocarp," a "woody fruit with deciduous pericarp" (!), a "ligneous capsule," a "subdrupaceous capsule," a "drupaceous capsule." unwilling to commit themselves use similar paper on fruit classification that mentioned *Martynia* among "Steinfrüchte Früchte." I call the fruit of *Martynia* does not fit into the classical definition of fleshy or pulpy, indehiscent exocarp (the authors), a hard or bony, indehiscent seed. Fruits of *Prunus* best exemplify the term "drupe" is used for many fru

Gynoecium syncarpous, flattened and flat, sensitive to frost; inserted from the throat; placentae: each placenta exserted; ovules many; embryo sac development cellular, with haustoria; style: terminated by an oblong, fleshy, deciduous in fruit; crested along the length along both sutures (inset proximally), the pointed "horns"; seeds: late; endosperm thin; cotyledons: epigeal.

Van Eseltine, the most recent genera; his treatment of a few (e.g., Chittenden's very old) concept of *Proboscidea* Schmidel, two genera (one native to the United States. One from the southeastern United States, warm temperate areas of the United States to have been introduced as

of the Martyniaceae and Ignoniaceae (Jussieu, Bentham & Hooker, Backer, Heine, and Martyniaceae and Gesneriaceae) by Cortesi. The two are a separate family, in which they differ

is their glandular

been collected as a waif in our area, although it is from *Proboscidea* as

base abaxially; fertile
 *Proboscidea*.
 *Ibicella*.

hairs, which consist of a one- to several-celled uniseriate stalk and a several-celled head. The copious, sticky secretion of the hairs gives the plants a distinctive aminoid odor and clammy feel. That many small insects are trapped by the secretion on the leaves and stems has been noted by various authors and can be seen on both living plants and herbarium specimens. The function of the hairs and their secretion is unknown. Insectivory immediately comes to mind, and this indeed has been strongly affirmed for *Martynia* [i.e., *Ibicella*] *lutea* by Mamel, who reported a proteolytic enzyme in the secretion and stated unequivocally that the plant "è una pianta insettivora." Earlier, Fermi & Buscaglioni got negative results in a search for such an enzyme in *Martynia*. Manganaro suggested that the secretion of *Ibicella lutea* "se trate de un aparato capturado de la humedad atmosférico, dado que la planta . . . es seguramente xerófila."

The fruits of Martyniaceae are certainly the family's outstanding characteristic. As these fruits mature, the endocarp becomes woody, the exocarp fleshy. An upwardly-curved beak (longer than the fruit body in our genus and in *Ibicella*, shorter than it in *Craniolaria* and *Martynia*) develops from the proximal portion of the style, and it is the long beak of some Martyniaceae that evidently suggested the name "unicorn plant." At fruit maturity, in an unsurpassed example of vegetable ecdysis, the exocarp sloughs off in two valves, splitting along the abaxial and adaxial sutures. Concurrently, the endocarp, crested along one or both sutures and sculptured, echinate, or ribbed, begins to dehisce distally along the sutures. The beak splits into two sharp-pointed, hooked, and (in ours) elongate horns.

The fruits are adapted for dispersal through attachment to mammals by means of the hooked horns: the literature records sheep, mules, horses, cattle, bison, and panthers (!) as vectors but surely there are others. Aided by the stylar horns, the fruits cling to fetlock, tail, mane, or body fur. In our genus, seeds presumably drop out as the fruits are carried about. In *Martynia*, the seeds seem to be freed only by crushing or rotting of the endocarp.

Nomenclature for the fruit type of the Martyniaceae is problematical. The fruit has been called, *inter alia*, a "capsule with fleshy deciduous exocarp and woody endocarp," a "woody many-seeded capsule," a "capsule with deciduous pericarp" (!), a "ligneous drupe," a "drupaceous capsule," a "subdrupaceous capsule," a "drupaceous follicle," and a "pod." Authors unwilling to commit themselves use simply "fruit." I have seen only one paper on fruit classification that mentions Martyniaceae: Gusuleac included *Martynia* among "Steinfrüchten" in his category "Eusynkarpe Früchte." I call the fruit of Martyniaceae a drupe even if the choice does not fit into the classical definition of a drupe, which emphasizes a fleshy or pulpy, indehiscent exocarp (the exocarp plus mesocarp of some authors), a hard or bony, indehiscent endocarp, and a single carpel and seed. Fruits of *Prunus* best exemplify this concept. In practice, however, the term "drupe" is used for many fruits not fitting this definition.

Characteristics making martyniaceae fruits aberrant as drupes can be seen in other drupaceous fruits, although, so far as I am aware, not all in the same one. The fleshy exocarp of the Martyniaceae separates in two valves to reveal the endocarp or "stone" (Nafday calls it a "pyrene"), and a similarly dehiscent exocarp is found in the almond (*Prunus amygdalus*) and in *Bursera Simaruba* (three valves). The endocarp of Martyniaceae dehisces along two sutures (at this point in its development the endocarp is a remarkable mimic of a "typical" capsule); dehiscent endocarps seem to be rare among drupes but can be seen occasionally in *Prunus*. The drupes of Martyniaceae are bicarpellate, and those of *Rhamnus*, *Melia*, *Ilex*, *Empetrum*, *Elaeis*, and certain other genera also consist of more than one carpel. The "stones" of Martyniaceae contain many or as few as four seeds, or even sometimes two in *Martynia* (Nafday); "stones" with more than one seed occur also in other drupes, e.g., *Borassus* (three), *Orbigyna* (three to eight), *Melia* (six), and even *Prunus* (sometimes two). There appears, then, to be no way to avoid calling the fruits of Martyniaceae drupes, although they are unlike that fruit type as generally typified by *Prunus*. Such a situation emphasizes the need, as far as classification and nomenclature of fruits are concerned, of a thorough review and revision.

Genetic and somatic chromosome numbers (mostly undocumented) reported for Martyniaceae indicate diploid numbers of $2n = 30$ (Martini, Perry) or $2n = 32$ (Covas & Schnack) for *Ibicella* (*Proboscidea*) *lutea*; $2n = 32$ for *Martynia annua* (Srinivasan); and $2n = 30$ for *Proboscidea fragrans* (Perry, Sugiura) and *P. louisianica* (Gaiser, Martini, Perry, Snow).

Several Martyniaceae are grown in gardens for their showy flowers and curious fruits. A few are widely distributed weeds that, in some regions, are considered noxious. Some species are used in folk medicine, and some produce edible roots, young fruits, and seeds.

REFERENCES:

- ABBIATTI, D. Las Martiniáceas Argentinas. *Notas Mus. La Plata* 4 (Bot. no. 29): 443-473. 2 pls. 1939. [*Ibicella Parodii*, sp. nov., 458.]
- ALSTON, A. H. G. Part VI. Supplement. H. Trimen, A hand-book to the flora of Ceylon. vi + 350 pp. London. 1931. [*Martynia annua* (as *M. diandra*), 221; rather common in waste places in the dry region.]
- ALTSCHUL, S. VON R. Drugs and foods from little-known plants. 366 pp. Cambridge, Mass. 1973. [Brief notes on uses of *Ibicella* & *Proboscidea*, 275.]
- ANONYMOUS. The wealth of India. Raw materials. Vol. 6: L-M. 484 + xiv pp. New Delhi. 1962. [*Martynia annua*, 307.]
- . Proclaimed noxious weeds. *Jour. Dept. Agr. Victoria* 66: 331-334. 1968. [*Ibicella lutea*, *Martynia annua*, & *Proboscidea louisianica*, 331.]
- BACKER, C. A. Pedaliaceae. In: C. G. G. J. VAN STEENIS, gen. ed., *Fl. Malesiana* I. 4: 216-221. 1951. [Includes Martyniaceae, i.e., *Martynia annua*.]
- BAILEY, F. M. The weeds and suspected poisonous plants of Queensland. 245 pp. Brisbane. 1906. [*Martynia Proboscidea* (= *Proboscidea louisianica*) & *M. diandra* (= *M. annua*) introduced, becoming pests in some localities.]

- BAILEY, L. H. The standard cyclopedia of horticulture. 1928-30. [*Craniolaria*, 1: 877; *Martynia* 2: 2005.]
- BAILLON, H. Organogénie florale des Martyniacées. 1863. [*M. fragrans* (= *Proboscidea*) *louisianica*, & *M. lutea* (= *Ibicella lutea*).] Notes sur les Pédalinées. *Bull. Mus. Hist. Nat. Paris* 1887. [Includes Martyniaceae.]
- . Gesnériacées. *Hist. Pl.* 10: 59-112. of Gesneriaceae, 69-71, 106, 107.]
- BALICKA-IWANOWSKA, G. Contribution à l'étude de certains Gamopétales. *Flora* 86: 47-71. 60, 61, pl. 7/8, figs. 41-43.]
- BENNETT, A. G. Pedaliaceae. In: C. F. P. V. BENTHAM, G., & J. D. HOOKER. Pedaliaceae. [Tribus I. Martyniaceae, 1055, 1056; *Proboscidea* & *Craniolaria*.]
- BLAKELY, W. F. Weeds of New South Wales. 575-579. 1923. [Includes *Ibicella louisianica*.]
- BORBÁS, V. [Note on *Martynia* seedlings (Martynia) Természettud. Közl. 1881: 478. 1]
- BUREAU, E. Monographie des Bignoniacées. 31 pls. Paris. 1864. [General comment on Martyniaceae, *passim*.]
- CANDOLLE, A. P. DE. Sesameae. *Prodr.* 9: 1-10. [*Ibicella* & *Proboscidea*] & *Craniolaria*.
- CHITTENDEN, F. J., ed. The Royal Horticultural Society's Catalogue of Plants. ed. 2. 4 vols. Oxford. 1974. [*Proboscidea*], 3: 1256.]
- CHOPRA, R. N., I. C. CHOPRA, K. L. H. Indigenous drugs of India. ed. 2. 816 pp. alleged to have anti-tubercular properties. listed among plant remedies used in India.
- CORTESTI, R. Observations morphologiques sur la flore du Paraguay. *Bull. Soc. Bot. Genève* 1887: 1-10. [*integrofolia*; notes on systematic position.]
- COVAS, G., & B. SCHNACK. Estudios científicos sobre las plantas de Argentina. *Agron.* 14: 224-231. 1947. [Includes *Martynia annua*.]
- DAS, V. S. R., K. N. RAO, & J. V. S. RAO. Pedaliaceae. *Curr. Sci. Bangalore* 1947: 1-10. [*Martynia annua*.]
- DAVIS, G. L. Systematic embryology of the Bignoniaceae. *Ann. N. Y. Acad. Sci.* 1966. [Martyniaceae, 171, 172.]
- DECAISNE, J. Revue du groupe des Pédalinées. *Ann. Bot. Paris* 1865. [*Martynia*, 322, 323; *Craniolaria*, 328.]
- ECKEY, E. W. Vegetable fats and oils. *Ann. N. Y. Acad. Sci.* 1966. [*Martynia louisiana* (= *diandra*) (= *Martynia annua*).]

be treated as drupes can be seen occasionally in certain other genera also of Martyniaceae contain sometimes two in *Martynia* or also in other drupes, *Melia* (six), and even to be no way to avoid although they are unlike that a situation emphasizes of fruits are concerned.

mostly undocumented) of $2n = 30$ (*Martynia lutea* (*Proboscidea lutea*), $2n = 30$ for *Proboscidea* (*Martynia*, Perry, Snow). Their showy flowers and that, in some regions folk medicine, and some

us. La Plata 4(Bot. no. ov. 458.)

A hand-book to the flora of *M. annua* (as *M. diandra*).

on plants. 366 pp. Cambridge & *Proboscidea*, 275.] vol. 6: L-M. 484 + xiv

Victoria 66: 331-334. *Proboscidea louisianica*, 331.]

; gen. ed., Fl. Malesiana, i.e., *Martynia annua*.]

nts of Queensland. 245. *Proboscidea louisianica* nests in some localities.]

- BAILEY, L. H. The standard cyclopedia of horticulture. ed. 2. 3 vols. New York. 1928-30. [*Craniolaria*, 1: 877; *Martynia* (including *Ibicella* & *Proboscidea*), 2: 2005.]
- BAILLON, H. Organogénie florale des *Martynia*. *Adansonia* 3: 341-348. pl. 11. 1863. [*M. fragrans* (= *Proboscidea fragrans*), *M. Proboscidea* (= *P. louisianica*), & *M. lutea* (= *Ibicella lutea*).]
- . Notes sur les Pédalinées. Bull. Mens. Soc. Linn. Paris 84: 665-671. 1887. [Includes Martyniaceae.]
- . Gesnériacées. Hist. Pl. 10: 59-112. 1888. [Martyniaceae as a "série" of Gesneriaceae, 69-71, 106, 107.]
- BALICKA-IWANOWSKA, G. Contribution à l'étude du sac embryonnaire chez certain Gamopétales. *Flora* 86: 47-71. pls. 1-10. 1899. [*Martynia bicolor*, 60, 61. pl. 7/8, figs. 41-43.]
- BENNETT, A. G. Pedalineae. In: C. F. P. VON MARTIUS, Fl. Brasil. 7: 399-406. 1871. [Actually only Martyniaceae.]
- BENTHAM, G., & J. D. HOOKER. Pedalineae. Gen. Pl. 2: 1054-1060. 1876. [Tribus I. Martyniae, 1055, 1056; *Martynia* (including *Ibicella* & *Proboscidea*) & *Craniolaria*.]
- BLAKELY, W. F. Weeds of New South Wales. Agr. Gaz. New South Wales 34: 575-579. 1923. [Includes *Ibicella lutea*, *Proboscidea fragrans*, & *P. louisianica*.]
- BORBÁS, V. [Note on *Martynia* seedlings with three cotyledons.] (In Hungarian.) Természettud. Közl. 1881: 478. 1881.
- BUREAU, E. Monographie des Bignoniacées. [Text.] 215 pp.; Atlas. 35 pp. 31 pls. Paris. 1864. [General comments on morphology & relationships of Martyniaceae, *passim*.]
- CANDOLLE, A. P. DE. Sesameae. Prodr. 9: 249-257. 1845. [*Martynia* (including *Ibicella* & *Proboscidea*) & *Craniolaria*, 253-255.]
- CHITTENDEN, F. J., ed. The Royal Horticultural Society dictionary of gardening. ed. 2. 4 vols. Oxford. 1974. [*Martynia* (including *Ibicella* & *Proboscidea*), 3: 1256.]
- CHOPRA, R. N., I. C. CHOPRA, K. L. HANDA, & L. D. KAPUR. Chopra's indigenous drugs of India. ed. 2. 816 pp. Calcutta. 1958. [*Martynia annua* alleged to have anti-tubercular properties, 601; *M. diandra* (= *M. annua*) listed among plant remedies used in treating scorpion-sting, 610.]
- CORTESI, R. Observations morphologiques et anatomiques sur une Martyniacée du Paraguay. Bull. Soc. Bot. Genève II. 38: 63-75. 1946. [*Craniolaria integrifolia*; notes on systematic position of Martyniaceae.]
- COVAS, G., & B. SCHNACK. Estudios cariológicos en Antófitas. II parte. Rev. Argent. Agron. 14: 224-231. 1947. [*Ibicella lutea* ($2n = 32$), 230, fig. 32.]
- DAS, V. S. R., K. N. RAO, & J. V. S. RAO. Phenolic acids in some members of Pedaliaceae. Curr. Sci. Bangalore 35: 160. 1966. [Includes *Martynia annua*.]
- DAVIS, G. L. Systematic embryology of the angiosperms. viii + 528 pp. New York. 1966. [Martyniaceae, 171, 172.]
- DECAISNE, J. Revue du groupe des Pédalinées. Ann. Sci. Nat. Bot. V. 3: 321-336. 1865. [*Martynia*, 322, 323; *Proboscidea*, 324-327; *Craniolaria*, 327, 328.]
- ECKEY, E. W. Vegetable fats and oils. 836 pp. New York. 1954. [Martyniaceae, 749; *Martynia louisiana* (= *Proboscidea louisianica*) & *Martynia diandra* (= *Martynia annua*).]

- ENDLICHER, S. Genera plantarum. 2 vols. lx + 1483 pp. Vindobonae. 1836-1840. [Martyniaceae included in Pedaliaceae, 723-725.]
- ERDTMAN, G. Pollen morphology and plant taxonomy. Angiosperms. 539 pp. Waltham, Mass. 1952. [Martyniaceae, 265, 266; pollen of *Craniolaria*, *Ibicella*, & *Martynia*, fig. 153.]
- ERNST, A. Plants used medicinally at Caracas, Venezuela, South America, and their vernacular names. Jour. Bot. London 3: 143-150, 277-284, 306-322. 1865. [*Craniolaria* ("Crassiolaria") *annua*, 284.]
- FARNSWORTH, N. R., R. N. BLOMSTER, M. Y. QUTMBY, & J. W. SCHERMERHORN. The Lynn index. A bibliography of phytochemistry. Monograph VI. Order Tubiflorae. 274 pp. Pittsburgh. 1969. [Martyniaceae, 160, 161.]
- FERMI, C., & BUSCAGLIONI. Die proteolytischen Enzyme im Pflanzenreiche. Centralbl. Bakt. Parasit. Pflanzenkr. II. 5: 24-27, 63-66, 91-95, 125-134, 145-158. 1899. [Negative results in tests for proteolytic enzymes in *Martynia Proboscidea* (= *P. louisianica*), 129-131.]
- FIRMINGER, T. A. Firminger's manual of gardening for India. ed. 8. 666 pp. Calcutta. 1947. [Martyniaceae, 408, 409.]
- FISCHER, H. Beiträge zur vergleichenden Morphologie der Pollenkörner. Inaugural-Dissertation, Breslau. 63 pp. 1890. [Martyniaceae, 22.]
- FROGGATT, J. L. [Note on *Martynia (Ibicella) lutea*.] Proc. Linn. Soc. New South Wales 45: 180. 1920. ["Men employed in cutting the plants become extremely dizzy in the head after working on it for any length of time."]
- GIBBS, R. D. Chemotaxonomy of flowering plants. Vol. 3. Orders. pp. 1275-1980. Montreal & London. 1974. ["Chemistry of the Martyniaceae," 1778; tables 84-86.]
- GIBSON, D. N. Martyniaceae. Unicorn plant family. In: Flora of Guatemala. Fieldiana Bot. 24 (pt. X, 3/4): 233-238. figs. 40, 41. 1974. [*Martynia*, *Proboscidea*.]
- GLOXIN, B. P. Observationes botanicae. 24 pp. 3 pls. Argentorati. 1785. [General taxonomic account of *Martynia*, *Proboscidea*, & *Craniolaria*, 1-15; *Martynia*, pl. 1.]
- GORTER, K. 1909. Ueber die Verbreitung der Chlorogensäure in der Natur. Arch. Pharm. 247: 184-196. [Leaves of *Martynia diandra* (= *M. annua*) contain Chlorogensäure, 195.]
- GRÜNEWALD, R. Vergleichende Anatomie der Martyniaceae und Pedaliaceae. 43 pp. Schotten, Hessen. 1897.
- GUSULEAC, M. Zur Präzisierung der Nomenklatur der Früchte und der Prinzipien eines natürlichen Fruchtsystems. Bul. Fac. Sti. Cernauti 12: 337-355. 1939. [*Martynia* a "Steinfrucht," 347.]
- HAAGE, F. A. Ueber *Martynia Craniolaria* Swartz. Allg. Gart. Zeit. 5: 11, 12. 1837. [Horticultural notes; *Craniolaria annua*.]
- HARRIS, J. A. Syncarpy in *Martynia lutea*. Torreya 6: 25-28. 1906. [Four-horned fruits from joining of two flowers; *Ibicella lutea*.]
- HARTL, D. Das Placentoid der Pollensäcke, ein Merkmal der Tubifloren. Ber. Deutsch. Bot. Ges. 76 (Generalversammlungs-heft): (70)-(72). 1963. [Placentoids present in Martyniaceae.]
- HECKEL, E. Du mouvement dans les stigmates bilabiés des Scrophularinées, des Bignoniacées et des Sésamées. Compt. Rend. Acad. Sci. Paris 79: 702-704. 1874. [Includes Martyniaceae.]

- HENAUER, R. Chemotaxonomie der Pflanzen. Band 5. Dicotyledonaceae-Quinaceae. 506 pp. Basel & Stuttgart. 1969. 43-50; also a few notes under Pedaliaceae, 299-303.]
- HERNE, H. Pedaliaceae. In: J. HUTCHINSON & J. M. DALZIEL. Afr. ed. 2: 388-391. 1963. [*Martynia annua*, 388, 389.]
- HOLY, R. H. Nomenclatural history and typification of *Martynia lutea* (Martyniaceae). Taxon 18: 527-534. 1969.
- HERZOG, F. C. Plantas e substâncias vegetais tóxicas e medicinais. São Paulo. 1939. [*Craniolaria*, 272.]
- BORNESTER, W. Die Entstehung des Embryo der Pflanzen. 14 Hft. Leipzig. 1849. [Notes on *Martynia diandra*, 41.]
- HOWELL, J. T. Plants worthy of note—III. Leaf. West. Bot. Soc. [Notes on *Ibicella lutea*, *Martynia fragrans* (*Proboscidea louisiana* (*P. louisianica*)).]
- HERBERT, H. Pedaliacées. Fl. Madagascar et des Comores 5-44. 1971. [*Martynia annua*, 43, 44.]
- HIRST, E. The poison plants of New South Wales. 498 pp. Sydney. 1911. [*Martynia lutea*, 383; = *Ibicella lutea*.]
- HUTCHINSON, J. The families of flowering plants. Vol. 1. 1. xiv + 328 pp. London. 1926; ed. 2. xv + 510 pp. London. 1959. [Ed. 1, Martyniaceae included in Pedaliaceae, 305, 306; as separate family, 392.]
- Evolution and phylogeny of flowering plants. Dicotyledons. xvi + 717 pp. London & New York. 1969. 462.]
- The families of flowering plants. ed. 3. xx + 988 pp. London. 1973. [Martyniaceae, 146, 483.]
- JESSIEU, A. L. DE. Genera plantarum secundum ordines naturalium. 498 pp. Paris. 1789. [*Martynia* & *Craniolaria* in Bignoniaceae, 140.]
- KAJALE, L. B., & B. A. RAZI. Contribution to the flora of India. I. Jour. Univ. Poona Sci. Tech. 6: 1-10. 1957. [= *M. annua*.]
- KOELREUTER, J. G. Dritte Fortsetzung der vorläufigen Synopsis des Geschlecht der Pflanzen betreffenden Versuch. 156 pp. Leipzig. 1766. [Early mention of sensibility, 134, 135.]
- KUNTH, C. S. Synopsis plantarum, quas in itinere aequinoctiali orbis novi, collegerunt Al. de Humboldt et Arn. 1822-1825. [Martyniaceae, i.e., *Martynia* & *Craniolaria*, 2: 251-253.]
- LAWRENCE, G. H. M. *Proboscidea* and other unicorn plants. Bailey 5: 127-132. 1957.
- LEAL, A. R. Presencia de *Proboscidea lutea* en México. Agr. 128: 257-263. 1939. [*Ibicella lutea*.]
- LINDLEY, J. *Martynia lutea*. Edward's Bot. Reg. plate + 3 pp. of text; = *Ibicella lutea*.]
- LUTZ, C. Untersuchungen über reizbare Narben. 1911. [*Martynia lutea* (*Ibicella lutea*), *M. Proboscidea*, & *M. tricolor* (*Proboscidea* sp.), passim.]

- 3 pp. Vindobonae, 1836-37-25.]
- Angiosperms. 539 pp. 56; pollen of *Craniolaria*.
- South America, and 43-150, 277-284, 306-322.
- & J. W. SCHERMERHORN. Chemistry. Monograph VI. [Martyniaceae, 160, 161.] Enzyme im Pflanzenreiche. 7. 63-66, 91-95, 125-134, r proteolytic enzymes in 131.]
- for India. ed. 8. 666 pp.
- gie der Pollenkörner. In: Martyniaceae. 22.]
- a.] Proc. Linn. Soc. New cutting the plants become for any length of time." Col. 3. Orders. pp. 1275-76; "y of the Martyniaceae,"
- In: Flora of Guatemala. 40. 41. 1974. [*Martynia*,
- Argentorati. 1785. [*Genlea*, & *Craniolaria*, 1-15;
- ogensäure in der Natur. *ia diandra* (= *M. annua*)
- niaceae und Pedaliaceae.
- er Früchte und der Prinzi- Sti. Cernauti 12: 337-355.
- Allg. Gart. Zeit. 5: 11, 12.
- 1 6: 25-28. 1906. [Four- *ella lutea*.]
- kmal der Tubifloren. Ber- heft): (70)-(72). 1963.
- abiés des Scrophularinées, end. Acad. Sci. Paris 79:
- HEGNAUER, R. Chemotaxonomie der Pflanzen. Band 5. Dicotyledoneae: Magnoliaceae-Quinaceae. 506 pp. Basel & Stuttgart. 1969. [Martyniaceae, 48-50; also a few notes under Pedaliaceae, 299-303.]
- HEINE, H. Pedaliaceae. In: J. HUTCHINSON & J. M. DALZIEL, Fl. W. Trop. Afr. ed. 2. 2: 388-391. 1963. [*Martynia annua*, 388, 389.]
- HEVLY, R. H. Nomenclatural history and typification of *Martynia* and *Proboscidea* (Martyniaceae). Taxon 18: 527-534. 1969.
- HOEHNE, F. C. Plantas e substâncias vegetais tóxicas e medicinais. 355 pp. São Paulo. 1939. [*Craniolaria*, 272.]
- HOFMEISTER, W. Die Entstehung des Embryo der Phanerogamen. 90 pp. 14 pls. Leipzig. 1849. [Notes on *Martynia diandra*, 41; - *M. annua*.]
- HOWELL, J. T. Plants worthy of note — III. Leaflet. West. Bot. 1: 39, 40. 1933. [Notes on *Ibicella lutea*, *Martynia fragrans* (*Proboscidea fragrans*), & *M. Jussieui* (*P. louisianica*).]
- HUMBERT, H. Pedaliacées. Fl. Madagascar et des Comores, 179^e Famille: 5-44. 1971. [*Martynia annua*, 43, 44.]
- HURST, E. The poison plants of New South Wales. 498 pp. Sydney. 1942. [*Martynia lutea*, 383; = *Ibicella lutea*.]
- HUTCHINSON, J. The families of flowering plants. Vol. 1. Dicotyledons. [ed. 1.] xiv + 328 pp. London. 1926; ed. 2. xv + 510 pp. Oxford. 1959. [Ed. 1, Martyniaceae included in Pedaliaceae, 305, 306; ed. 2, Martyniaceae as separate family, 392.]
- . Evolution and phylogeny of flowering plants. Dicotyledons; facts and theory. xxvi + 717 pp. London & New York. 1969. [Martyniaceae, 461, 462.]
- . The families of flowering plants. ed. 3. xx + 968 pp. Oxford. 1973. [Martyniaceae, 146, 483.]
- JUSSIEU, A. L. DE. Genera plantarum secundum ordines naturales disposita. . . . 498 pp. Paris. 1789. [*Martynia* & *Craniolaria* included in "Ordo XII. Bignoniae," 140.]
- KAJALE, L. B., & B. A. RAZI. Contribution to the embryology of *Martynia diandra* Glox. I. Jour. Univ. Poona Sci. Tech. 6: 28-33. 1954. [1955?] [= *M. annua*.]
- KOELREUTER, J. G. Dritte Fortsetzung der vorläufigen Nachricht von einigen das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen. 156 pp. Leipzig. 1766. [Early mention of sensitive stigmas of Martyniaceae, 134, 135.]
- KUNTH, C. S. Synopsis plantarum, quas in itinere ad plagam aequinoctialem orbis novi, collegerunt Al. de Humboldt et Am. Bonpland. 4 vols. Paris. 1822-1825. [Martyniaceae, i.e., *Martynia* & *Craniolaria*, included in Bignoniaceae; 2: 251-253.]
- LAWRENCE, G. H. M. *Proboscidea* and other unicorn plants (Martyniaceae). Baileya 5: 127-132. 1957.
- LEAL, A. R. Presencia de *Proboscidea lutea* en Mendoza. Anales Soc. Cient. Agr. 128: 257-263. 1939. [*Ibicella lutea*.]
- LINDLEY, J. *Martynia lutea*. Edward's Bot. Reg. 11: t. 934. 1825. [Color plate + 3 pp. of text; = *Ibicella lutea*.]
- LUTZ, C. Untersuchungen über reizbare Narben. Zeitschr. Bot. 3: 289-348. 1911. [*Martynia lutea* (*Ibicella lutea*), *M. Proboscidea* (*Proboscidea louisianica*), & *M. tricolor* (*Proboscidea sp.*), *passim*.]

- MACMILLAN, H. F. Tropical planting and gardening with special reference to Ceylon. ed. 5. 560 pp. London. 1943. [Brief mention of *Martynia diandra* as of value in snake-bite remedies, 367; = *M. annua*.]
- MAHESHWARI, J. K. The flora of Delhi. 447 pp. New Delhi. 1963. ["A semi-lunar, extra-floral nectary occurs at the base of the pedicel" of *Martynia annua*, 263.]
- MAMELI, E. Ricerche anatomiche, fisiologiche e biologiche sulla *Martynia lutea* Lindl. Atti Ist. Bot. Univ. Pavia II. 16: 137-188. pls. 11-14. 1916. [*Ibicella lutea*.]
- MANGANARO, A. Breves apuntes sobre la *Proboscidea lutea* (Lindl.) Stapf. Su irritabilidad estigmática. Anales Soc. Cient. Argentina 79: 89-92. 1915. [*Ibicella lutea*.]
- MARTIN, A. C. The comparative internal morphology of seeds. Am. Midl. Nat. 36: 513-660. 1946. [Martyniaceae, 646.]
- MARTINI, E. Ricerche embriologiche sulla Martyniaceae. Nuovo Giorn. Bot. Ital. 46: 197-226. pls. 4-6. 1939. [*Proboscidea Jussieui* (*P. louisianica*), $n = 15$; *Proboscidea lutea* (*Ibicella lutea*), $n = 15$.]
- MELCHIOR, H. Martyniaceae. In: H. MELCHIOR, Engler's Syllabus der Pflanzenfamilien. ed. 12. 2: 461, 462. 1964.
- METCALFE, C. R., & L. CHALK. Anatomy of the dicotyledons. Vol. 2. Oxford. 1950. [Pedaliaceae, including Martyniaceae, 1013, 1014.]
- MORTON, J. F. Current folk remedies of northern Venezuela. Quart. Jour. Crude Drug Res. 13: 97-121. 1975. [*Craniolaria*, 105.]
- MUNZ, P. A., & D. D. KECK. A California flora. 1681 pp. Berkeley & Los Angeles. 1959. [Martyniaceae, 679, 680; *Ibicella*, *Proboscidea*.]
- NARAYAN, U. R. Studies in the Tubiflorae of Nagpur. V. Martyniaceae. Bull. Bot. Soc. Coll. Sci. Nagpur 4(2): 58-71. text figs. 1, 2; pls. 1, 2. 1963. [*Martynia annua*.]
- NASIR, Y. Martyniaceae. In: E. NASIR & S. I. ALI, eds. Flora of West Pakistan No. 13. 3 pp. 1 pl. 1972. [*Martynia annua*.]
- OLIVER, F. W. Ueber Fortleitung des Reizes bei reizbaren Narben. Ber. Deutsch. Bot. Ges. 5: 162-169. 1887. [Behavior of sensitive stigmas of *Martynia lutea* (*Ibicella lutea*) & *Martynia Proboscidea* (*Proboscidea louisianica*).]
- PAILLIEUX, A., & D. BOIS. Le potager d'un curieux. Histoire, culture et usages de 100 plantes comestibles peu connues ou inconnues. 295 pp. Paris. 1885. [*Martynia lutea* (*Ibicella lutea*), 59, 60; account repeated in ed. 2, 106-108. 1892.]
- PERRY, B. A. Genetic and cytological studies on the Euphorbiaceae, Martyniaceae and the Malvaceae. Ph.D. dissertation, Univ. of Virginia. 1942. [Part II. Cytogenetic studies on the Martyniaceae. 22 pp. 1 pl.; *Proboscidea fragrans* ($2n = 30$), *P. louisianica* ($2n = 30$), *Ibicella lutea* ($2n = 30$).]
- PHILLIPS, E. P. The genera of South African flowering plants. ed. 2. 923 pp. Pretoria. 1951. [Martyniaceae, 692, 693; *Proboscidea lutea* (*Ibicella lutea*) naturalized in South Africa.]
- PITTIER, H. Manual de las plantas usuales de Venezuela. 458 pp. Caracas. 1926. [*Craniolaria annua*, 220.]
- RICHHARIA, R. H. *Martynia* pollen germination on the *Sesamum* stigma. Curr. Sci. Bangalore 6: 222, 223. 1937. [*Martynia annua*.]

- RIDLEY, H. N. The dispersal of plants throughout the world. 2 vols. London. 1930. [*Martynia*, 596.]
- RODRIGUEZ, J. V. *Martynia annua* L. Bol. Mus. Nac. Montevideo 1948. [Brief notes on family included.]
- SCHACHT, H. Entwicklungs-geschichte des Pflanzensystems der Klasse van het Koninkrijk-Nederlandsche Schapen, Letterkunde en Schoone Kunsten Tweede Deel. 234 pp. 26 pls. Amsterdam. 1818. [*Ibicella lutea*], 118-120, pl. 17. figs. 9-18.]
- SCHNITZLEIN, A. Iconographia familiarum naturalium. Bonn. 1843-1870. [Pedaliaceae, including *Martynia diandra* (*Martynia annua*), fig. 1; *Martynia Proboscidea* (*Proboscidea louisianica*), fig. 2.]
- SHAH, S. V., J. W. AIRAN, & A. V. REGE. Fatty acids in *Martynia diandra* (N. O. Pedaliaceae). Curr. Sci. 1977. [*Martynia annua*.]
- SOLENER, H. Systematische Anatomie der Pflanzen. Stuttgart. 1899. [Pedaliaceae, including *Martynia diandra* and *Sesamum indicum* D.C. Proc. Indian Mus. Nat. Hist. Soc. 1900. [*Martynia annua* ($2n = 32$), 162.]
- STAPP, O. Martyniaceae. Nat. Pflanzenfam. IV. 23: 665-677. 1889. [*Martynia Proboscidea* (*M. lutea* (*Ibicella lutea*), 670.]
- SUÁREZ, D. H. Martyniaceae. In: A. L. CARRERA, eds. Flora de la Argentina. 5 (Ericaceae a Calicereae): 302-304.
- TIWARY, N. K. Morphological and physiological studies on *Martynia diandra*. (Abstr.) Proc. 34th Indian Bot. Cong. 1963. [*Martynia annua*.]
- VAN ESELTINE, G. P. A preliminary study of the Martyniaceae. N. Y. State Agr. Exper. Sta. 7: 1929.
- WEHMER, C. Die Pflanzenstoffe. 2 vols. 2: 1140.]
- WHITE, C. T. Weeds of Queensland. No. 1. Queensland Agr. Jour. 23: 96, 97. 1925.
- Noxious weeds. Ibid. 56: 332-334. [*Ibicella lutea*] and *M. louisiana* (Prodr.).
- WHITTET, J. N. Weeds [of New South Wales]. [Martyniaceae (*Ibicella lutea*, *Martynia diandra*), 321, 322; *P. louisianica*, frontisp.].
1. *Proboscidea* Schmidel, Icones Plantarum 1763.
- Erect to decumbent, glandular-pubescent [or tuberous-rooted perennials]. Leaves alternate, entire to sinuate [or palmately lobed, sometimes inequilateral at base. Racemes axillary, sometimes terminal, many-flowered, the axis lengthening

- androgynous with special reference to the first mention of *Martynia diandra* (*M. annua*). New Delhi, 1963. ["A semi-base of the pedicel" of *Martynia*.] *Phytologia* 16: 117-158. *pls.* 11-14, 1916.
- Martynia lutea* (Lindl.) Stapf. *St. Bot. Argentina* 79: 89-92, 1913.
- Morphology of seeds. *Am. Midl. Nat.*
- Martyniaceae. *Nuovo Giorn. Bot. Giardini Jussieu (P. louisianica)*, 1915: 15.
- Bot. Engler's Syllabus der Pflanzenfamilien. *Engler's Syllabus der Pflanzenfamilien*, Vol. 2. Oxford, 1915: 1013, 1014.
- northern Venezuela. *Quart. Jour. Bot.* 105: 105.
- lutea*. 1681 pp. Berkeley & Los Angeles, 1963. [*Ibicella*, *Proboscidea*.]
- Nagpur. V. Martyniaceae. *Bull. Bot. Surv. India* 5: 1-2. 1963.
- S. I. ALI, eds. *Flora of West Bengal*. Calcutta, 1963. [*Martynia annua*.]
- Stigmas bei reizbaren Narben. *Ber. Bot. Gesellsch. Berlin* 46: 1-15. 1929. [Behavior of sensitive stigmas of *Martynia Proboscidea* (*Proboscidea*).]
- Stigmas. *Histoire, culture et usages des plantes médicinales*. 295 pp. Paris, 1885. [Account repeated in ed. 2, 106-107.]
- in the Euphorbiaceae. *Martyniaceae*. *Univ. of Virginia*, 1942. [*Martyniaceae*. 22 pp. 1 *pl.*; *Proboscidea* ($2n = 30$), *Ibicella lutea*.]
- Flowering plants. ed. 2. 923 pp. 1933. [*Proboscidea lutea* (*Ibicella*).]
- Venezuela. 458 pp. Caracas, 1963. [Mention on the *Sesamum* stigma. *Martynia annua*.]
- RIDLEY, H. N. The dispersal of plants throughout the world. xx + 744 pp. 22 *pls.* Ashford, England, 1930. [*Martynia*, 596; *Proboscidea*, 536, 595, 596.]
- RODRIGUEZ, J. V. *Martynia annua* L. *Bol. Mus. Nac. Costa Rica* 2(1): 11-13, 1948. [Brief notes on family included.]
- SCHACHT, H. Entwickelungs-geschichte des Pflanzen-embryon. *Verhandelingen der Eerste Klasse van het Koninklijk-Nederlandsche Instituut van Wetenschappen, Letterkunde en Schoone Kunsten te Amsterdam. Derde Reeks. Tweede Deel*. 234 pp. 26 *pls.* Amsterdam, 1850. [*Martynia lutea* (= *Ibicella lutea*), 118-120. *pl.* 17. *figs.* 9-18.]
- SCHNITZLEIN, A. *Iconographia familiarum naturalium regni vegetabilis*. 4 vols., incl. 277 *pls.* Bonn, 1843-1870. [Pedalineae, 2: Ordo 153, *pl.* 153: *Martynia diandra* (*Martynia annua*), *fig.* 1; *Craniolaria annua*, *figs.* 2-14; *Martynia Proboscidea* (*Proboscidea louisianica*), *figs.* 15-21.]
- SHAH, S. V., J. W. AIRAN, & A. V. REGE. Fatty oil from the fruit of *Martynia diandra* (N. O. Pedaliaceae). *Curr. Sci. Bangalore* 11: 291, 1942. [*Martynia annua*.]
- SOLEREDER, H. *Systematische Anatomie der Dicotyledonen*. xii + 984 pp. Stuttgart, 1899. [Pedalineae, including Martyniaceae, 691, 692.]
- SRINIVASAN, A. R. Contribution to the morphology of *Petalium nurex* Linn. and *Sesamum indicum* D.C. *Proc. Indian Acad. Sci. B* 16: 155-164, 1942. [*Martynia annua* ($2n = 32$), 162.]
- STAPP, O. Martyniaceae. *Nat. Pflanzenfam.* IV. 3b: 265-269, 1895.
- STURTEVANT, E. L. History of garden vegetables [part of article]. *Am. Nat.* 23: 665-677, 1889. [*Martynia Proboscidea* (*Proboscidea louisianica*) & *M. lutea* (*Ibicella lutea*), 670.]
- SUÁREZ, D. H. Martyniaceae. *In: A. L. CABRERA*, Fl. Provincia Buenos Aires 5 (Ericáceas a Caliceráceas): 302-304, 1965. [*Ibicella lutea*.]
- TIWARY, N. K. Morphological and physiological observations on *Martynia diandra*. (Abstr.) *Proc. 34th Indian Sci. Congr.* 1947(3): 157, 1948. [*Martynia annua*.]
- VAN ESSELTINE, G. P. A preliminary study of the unicorn plants (Martyniaceae). *N. Y. State Agr. Exper. Sta. Tech. Bull.* 149: 1-41. *figs.* 1-15, 1929.
- WEHMER, C. *Die Pflanzenstoffe*. 2 vols. Jena, 1929, 1931. [*Martyniaceae*, 2: 1140.]
- WHITE, C. T. Weeds of Queensland. No. 37. Devil's claw (*Martynia lutea*). *Queensland Agr. Jour.* 23: 96, 97, 1925. [*Ibicella lutea*.]
- . Noxious weeds. *Ibid.* 56: 332-336, 1941. [Includes *Martynia lutea* (*Ibicella lutea*) and *M. louisiana* (*Proboscidea louisianica*).]
- WHITTET, J. N. Weeds [of New South Wales]. 404 pp. Sydney, 1958. [*Martyniaceae* (*Ibicella lutea*, *Martynia annua*, & *Proboscidea louisianica*), 321, 322; *P. louisianica*, *frontisp.*]

1. *Proboscidea* Schmidel, *Icones Plantarum* (Keller ed.) 49. *tab.* 12, 13, 1763.

Erect to decumbent, glandular-pubescent, strong-scented annual herbs [or tuberous-rooted perennials]. Leaves simple, long petioled, opposite to alternate, entire to sinuate [or palmately or pinnately lobed], cordate and sometimes inequilateral at base. Racemes usually exceeding leaves, few- to many-flowered, the axis lengthening in fruit, as do the pedicels. Calyx

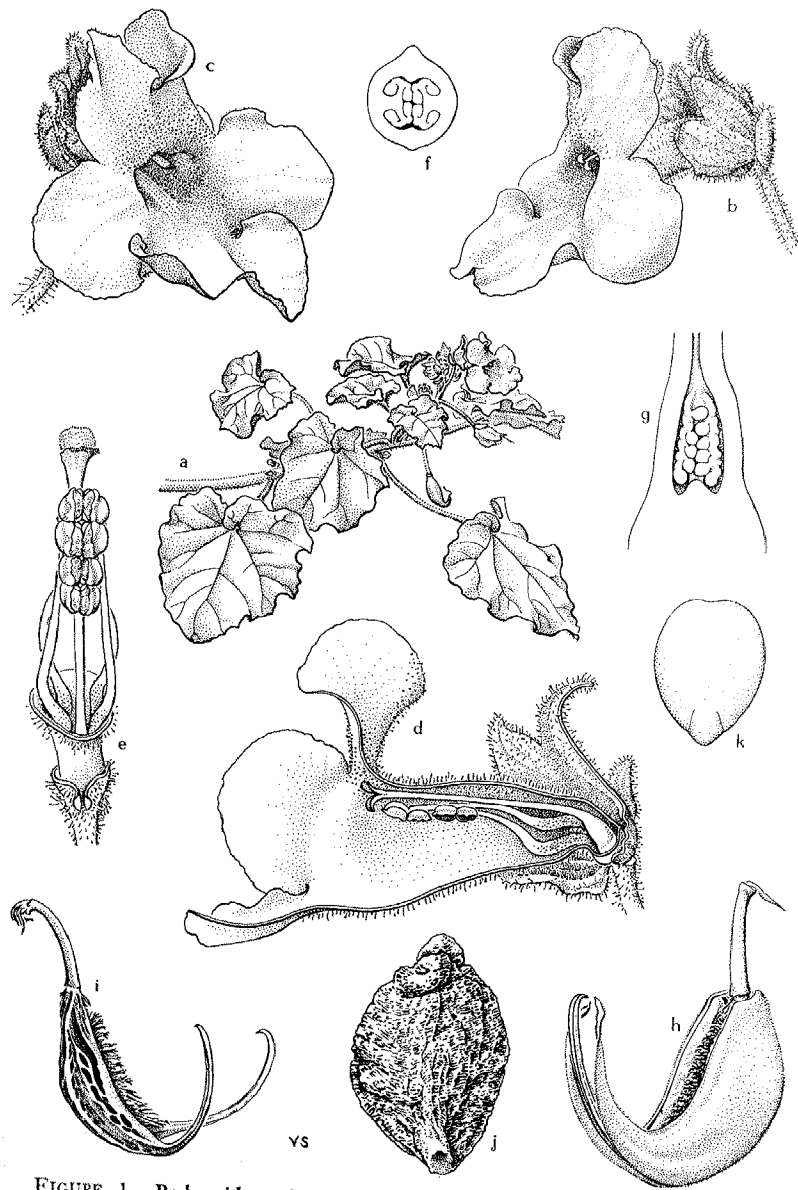


FIGURE 1. *Proboscidea*, *P. louisianica*: a, branch with flower and young fruit, $\times \frac{1}{4}$; b, lateral view of flower to show calyx, bractlets, and expanded stigma, $\times 1$; c, flower with stigmatic lobes nearly closed together after stimulation, $\times 1$; d, flower in partial longitudinal section to show position of style and stamens, $\times 1\frac{1}{2}$; e, flower with calyx and most of corolla removed to show stamens and style from below, $\times 2$; f, cross section of ovary oriented as in flower to show parietal placentation, $\times 8$; g, ovary in vertical section, cut between the two placentae, showing one placenta and its ovules, $\times 8$; h, mature

bibracteolate at base, style 5-lobed, split to base on cylindrical at base, this throat campanulate [or lobed, the lobes rounded staminode, included in longer; anthers of each proximal tips of anthers tips of anthers of the style as long as] stamens; style sensitive, obovate [obovate from the throat. Drupe upcurved beak $1\frac{1}{2}$ -3 [woody, sculptured, crested along both sutures, the "horns"; seeds several to endosperm thin, delicate (Miller) Thellung. (*M. proboskis*, in allusion to

A genus of 14 species native from the southern United States. Our species, *P. louisianica*, is widespread in the southern and southeastern United States. In fallow fields, waste places, and garden weed, it has spread to Australia) it is considered

The flowers are protandrous and visited by bees. The insect enters through the filament bases and opens the corolla. They may also take pollen from the anthers along the median line of the corolla after even the slightest touch of the stigma; pollen on the corolla then closes against the stigma, preventing its dislodgment. The insect rubs against the corolla. As the insect exits, the corolla reduces the transfer of pollen because the receptive surface is

In a series of touches

fruit, the fleshy exocarp $\times \frac{1}{2}$; i, endocarp after embryo, oriented as in section

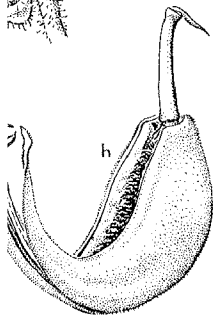
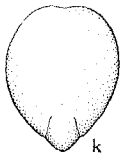
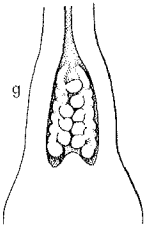
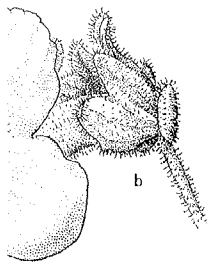
bibracteolate at base, synsepalous, spathaceous, more or less unequally 5-lobed, split to base on abaxial side, eventually deciduous. Corolla tube cylindrical at base, this cylindrical portion about equalling calyx, the throat campanulate [or infundibular], the limb somewhat 2-lipped, 5-lobed, the lobes rounded. Androecium of 4 fertile stamens and one short staminode, included in throat, the abaxial pair of fertile stamens the longer; anthers of each pair becoming connate side by side, and the proximal tips of anthers of the longer stamens becoming connate to distal tips of anthers of the shorter. Gynoecium somewhat exceeding [or about as long as] stamens; style about three times as long as ovary; stigma lips sensitive, obovate [obovate-oblongate], included in or slightly exerted from the throat. Drupe with thick, dehiscent exocarp, terminated by an upcurved beak $1\frac{1}{2}$ -3 [$1\frac{1}{4}$ - $3\frac{1}{2}$] times as long as the body; endocarp woody, sculptured, crested adaxially [sometimes also abaxially], dehiscent along both sutures, the beak splitting into two elongate, sharp-pointed "horns"; seeds several to many, black [rarely white], rugose-tuberculate; endosperm thin, delicate, papery, whitish. TYPE SPECIES: *P. louisianica* (Miller) Thellung. (*Martynia louisianica* Miller). (Name from Greek, *proboskis*, in allusion to the long-beaked fruit.) — UNICORN PLANT.

A genus of 14 species (9 recognized by Van Eseltine, 5 described since) native from the southern (southwestern?) United States south to Peru. Our species, *P. louisianica* (*Martynia Proboscidea* Gloxin), $2n = 30$, is widespread in the southern United States, but whether it is indigenous to the southeastern United States is uncertain. Occurring in meadows, fallow fields, waste places, and garbage dumps, along roadsides, and as a garden weed, it has spread to the Old World where in some areas (e.g., Australia) it is considered noxious.

The flowers are protandrous and, according to published accounts, pollinated by bees. The insects seek nectar produced by glandular hairs on the filament bases and on the area of the corolla tube between these bases; they may also take pollen. The pollination mechanism of *P. louisianica* is noteworthy (Thieret). The sensitive stigma is distal to the connate anthers along the median line of the upper surface of the corolla tube; its two lips, with their receptive inner surfaces, close together rapidly after even the slightest touch. An insect ascending the tube first contacts the stigma; pollen on its back is "scooped" off by the lower lip, which then closes against the upper lip, trapping the pollen between them and preventing its dislodging as the insect leaves the flower. Next, the insect rubs against the connate introrse anthers and is re-dusted with pollen. As the insect exits, the closed stigma lips may prevent or significantly reduce transfer of pollen of a flower to the stigma of that flower, simply because the receptive surfaces of the stigma are not exposed.

In a series of touches, the time required for closing of the stigma lips

fruit, the fleshy exocarp dehiscent and beginning to fall away from endocarp, $\times \frac{1}{2}$; i, endocarp after drying, $\times \frac{1}{2}$; j, seed with tough seed coat, $\times 4$; k, embryo, oriented as in seed, $\times 4$.



th flower and young actlets, and expanded together after stimulation; position of style and ovary oriented as in critical section, cut beules, $\times 8$; h, mature

increases hardly at all, but the time for their spreading apart again increases considerably (from 5 minutes after the first touch to 25 minutes after the eighth) — the phenomenon of “stigmatic fatigue.”

After sloughing off of the exocarp, the beak of the fruit of *P. louisianica* splits into two sharp-pointed, hooked, elongate horns that, with further drying, become oriented in a way reminiscent of the tusks of a mammoth, with their tips pointing toward each other or even overlapping. After dropping from the plant, the endocarps usually lie with their horns pointing upward, the position in which they are most likely to hook onto animals and thus be dispersed. The common names “mule-grab” and “cow-catcher” for *P. louisianica* attest to the effectiveness of this adaptation for dispersal.

In sheep-raising areas (e.g., Arizona, Australia), the endocarps, with their long, hooked horns, get tangled in the wool of sheep (as do those of *Ibicella lutea*) and interfere with shearing. The horns have been known to work into eye sockets of grazing animals, and stock are recorded as having starved to death when a *Proboscidea* or *Ibicella* endocarp has clamped their jaws together (Gardner). Froggatt reported that “men employed in cutting [*Martynia (Ibicella) lutea* for weed control] become extremely dizzy in the head after working on it for any length of time.” It would be interesting to know the physiological basis of this and whether the same reaction would occur with *P. louisianica*.

Young fruits of *P. louisianica* (and probably other species of *Proboscidea*) can be made into pickles (Harrington) and have even been grown commercially for this purpose (Van Eseltine). They pose no gastronomic threat, however, to *Cucumis sativus*. The dried dehiscent endocarps are made into “floral” decorations. Cultivation of *P. louisianica* for its oil-rich seeds (60% fat in the embryo) has been suggested (Bailey & Long, 1915a, 1915b). Strips split from mature *Proboscidea* endocarps are woven, as dark designs, into baskets by certain southwestern Amerindians; Hevly (1970a) mentions “semicultivated strains” of *P. parviflora* being so used. *Proboscidea louisianica* is an attractive, easily grown garden ornamental. Its fetid aroma and its tendency to become somewhat weedy are its main drawbacks. Its seeds germinate slowly and irregularly, but if Heit's method of removing the outer, dark coat and the delicate, whitish endosperm layer before the seeds are planted is followed, germination will usually occur within 10 days.

REFERENCES:

- Under family references see especially ALTSCHUL, ANONYMOUS (1968), F. M. BAILEY, L. H. BAILEY (1944), BAILLON (1863), BENTHAM & HOOKER, BLAKELEY, DAVIS, DECAISNE, GRÜNEWALD, HEGNAUER, HEVLY (1960a), HOWELL, LAWRENCE, LUTZ, MARTINI, MUNZ & KECK, OLIVER, RIDLEY, STAFF, STURTEVANT, VAN ESELTINE, WHITE (1941), and WHITTET.
- ANDERSON, E. A unicorn on the window-sill. Missouri Bot. Gard. Bull. 53(4): 5-7. 1965. [*P. louisianica*.]

- ANDERSON, F. The development of the flower *louisiana*. Bull. Torrey Bot. Club 49: 1 [*louisianica*.]
- ANDERSON, L. C. Effects of gibberellic acid growth of *Proboscidea louisianica*. Phyto Sci. 1922: 267, 268. 1923.
- AURICH, O., S. DANERT, K. PUFÄHL, A. ROMI & G. SEMBDNER. Phytochemische Unter heimischen Flora and des Gaterslebener turpflanze 14: 447-494. 1966. [*Proboscidea louisianica*.]
- BAILEY, E. H. S., & W. S. LONG. On the corn *louisiana*. Jour. Indus. Engineer. Chem. 25: 1000-1001. 1933. [*louisianica*.]
- & —. On the utilization of the (unicorn, or devil's claws). Oil Paint 1931. [*louisianica*.]
- BAILEY, L. H. The principles of vegetable 1931. [*Martynia*, i.e., *P. louisianica*.]
- BANCROFT, H. A puzzling discovery of a cat 32: 59-64. 1932. [Found near Oxford *P. louisianica*.]
- BEAL, W. J. Carnivorous plants. Proc. 1876a. [Estimate of 7200 small fl. *Martynia* (i.e., *Proboscidea*), “a true —. Inequilateral leaves. *Ibid.* 254, phyllotaxy and branching pattern of —. The venation of a few odd le attention to “pedate” venation of.]
- BERTHOUD, E. L. A peculiar case of pl 326. 1892. [American bison as dis including *Martynia Proboscidea* (= BROWN, W. H. The phenomenon of fat Jour. Sci. Bot. 8: 197-201. 1913.]
- BURR, F., Jr. The field and garden v 1863. [*Martynia*, i.e., *Proboscidea*.]
- CORRELL, D. S. Some additions and Rhodora 68: 420-428. 1966. [*P. louisianica*.]
- Some additions to the flora 1968a. [*P. crassibracteata*, sp. nov —. Some additions and correctio 4: 74-78. 1968b. [*P. spicata* Cor]
- GAISER, L. O., M. SUTHERLAND, & R. *louisiana*. Am. Jour. Bot. 30: 1-2. 1943. [*louisianica*.] spores; 2n = 30; *P. louisianica*.]
- GARDNER, C. A. A new noxious weed *louisiana*. Mill. Jour. Dept. A 1915. [*louisianica*.]
- GORSHKOVA, S. G. Martyniaceae. (BOBROV, eds. Flora URSS 23: 1-2. 1965. by V. L. KOMAROV.)

...spreading apart again & after the first touch to 25 minutes "stimulate fatigue."

...of the fruit of *P. louisiana*: pedicel horns that, with further growth of the tusks of a mammal, they are even overlapping. Also usually lie with their horns pointing are most likely to hook on: common names "mule-grab" are the effectiveness of this adap-

Australia), the endocarps will be wood of sheep (as do those of ...). The horns have been known to ... and stock are recorded as ... *Ibucella* endocarp has ... Engzatt reported that "meat eaten for weed control" become ... on it for any length of time." ... logical basis of this and whether ...

... probably other species of *Pro* ... (Barrington) and have even been ... (an Eseltine). They pose no ... *pativus*. The dried dehiscent ... s. Cultivation of *P. louisiana* ... has been suggested (Bailey ... mature *Proboscidea* endocarps ... certain southwestern Ameri ... icated strains" of *P. parviflora* ... an attractive, easily grown ... tendency to become somewhat ... minate slowly and irregularly ... dark coat and the delicate ... planted is followed, germina-

UL, ANONYMOUS (1968), F. M. BENTHAM & HOOKER, BLAKE, HEVLY (1960a), HOWELL, JYER, RIDLEY, STAFF, STURTE- TET.

ssouri Bot. Gard. Bull. 53(4):

ANDERSON, F. The development of the flower and embryogeny of *Martynia louisiana*. Bull. Torrey Bot. Club 49: 141-157. pls. 7, 8. 1922. [*P. louisiana*.]

ANDERSON, L. C. Effects of gibberellic acid on germination and continued growth of *Proboscidea louisianica*. Phytomorphology 18: 166-173. 1968.

ANDREWS, F. M. Chloroplasts of *Martynia fragans* [sic]. Proc. Indiana Acad. Sci. 1922: 267, 268. 1923.

AURICH, O., S. DANERT, K. PUF AHL, A. ROMEIKE, H. RÖNSCH, K. SCHREIBER, & G. SEMBDNER. Phytochemische Untersuchungen an Pflanzen der einheimischen Flora and des Gaterslebener Sortiments. II. Mitteilung. Kulturpflanze 14: 447-494. 1966. [*Proboscidea* sp., 461, 462.]

BAILEY, E. H. S., & W. S. LONG. On the composition of the seeds of *Martynia louisiana*. Jour. Indus. Engineer. Chem. 7: 867, 868. 1915a. [*P. louisiana*.]

— & —. On the utilization of the seeds of *Martynia* [sic] *louisiana* (unicorn, or devil's claws). Oil Paint Drug Report. 88(1): 17. 1915b. [*P. louisiana*.]

BAILEY, L. H. The principles of vegetable-gardening, 490 pp. New York. 1931. ["*Martynia*," i.e., *P. louisiana*, 327-330.]

BANCROFT, H. A puzzling discovery of a capsule of *Martynia louisiana*. Torreyia 32: 59-64. 1932. [Found near Oxford, England, during digging of a drain; *P. louisiana*.]

BEAL, W. J. Carnivorous plants. Proc. Am. Assoc. Adv. Sci. 24: 251-253. 1876a. [Estimate of 7200 small flies caught on a single individual of *Martynia* (i.e., *Proboscidea*), "a true insectivorous plant."]

— Inequilateral leaves. *Ibid.* 254, 255. 1876b. [Brief description of phyllotaxy and branching pattern of *Martynia* (i.e., *Proboscidea*).]

— The venation of a few odd leaves. *Ibid.* 255, 256. 1876c. [Calls attention to "pedate" venation of *Martynia* (i.e., *Proboscidea*).]

BERTHOUD, E. L. A peculiar case of plant dissemination. Bot. Gaz. 17: 321-326. 1892. [American bison as disseminators of various species of plants, including *Martynia Proboscidea* (= *P. louisiana*).]

BROWN, W. H. The phenomenon of fatigue in the stigma of *Martynia*. Philip. Jour. Sci. Bot. 8: 197-201. 1913. [*M. louisiana* (*P. louisiana*).]

BURR, F., Jr. The field and garden vegetables of America. 674 pp. Boston. 1863. ["*Martynia*," i.e., *Proboscidea*, 612, 613.]

CORRELL, D. S. Some additions and corrections to the flora of Texas — III. Rhodora 68: 420-428. 1966. [*P. sabulosa* Correll, sp. nov., 426.]

— Some additions to the flora of Texas — IV. Madroño 19: 187-192. 1968a. [*P. crassibracteata*, sp. nov., 190.]

— Some additions and corrections to the flora of Texas — VI. Wrightia 4: 74-78. 1968b. [*P. spicata* Correll, sp. nov., 77.]

GAISER, L. O., M. SUTHERLAND, & R. MOORE. Cytological studies in *Martynia louisiana*. Am. Jour. Bot. 30: 543-551. 1943. [Development of microspores; $2n = 30$; *P. louisiana*.]

GARDNER, C. A. A new noxious weed. The devil's claw. *Martynia* (*Proboscidea*) *louisiana*, Mill. Jour. Dept. Agr. West. Australia II. 9: 129-131. 1932. [*P. louisiana*.]

GORSHKOVA, S. G. Martyniaceae. (In Russian.) In: B. K. SHISHKIN & E. G. BOBROV, eds. Flora URSS 23: 18, 19. 1958. [*P. louisiana*; series initiated by V. L. KOMAROV.]

- HARGER, E. B. Sensitive stigmas of *Martynia* [*Proboscidea*]. Bot. Gaz. 8: 208. 1883. [*P. louisianica*.]
- HARRINGTON, H. D. Edible native plants of the Rocky Mountains. 392 pp. Albuquerque, N. M. 1967. [*P. louisianica*, 318-320; includes recipe for "devilsclaw pickles."]
- HEIT, C. E. Germination studies and testing method for (*Martynia Proboscidea*) martynia seed. Newslett. Assoc. Off. Seed Analysts 45(4): 55-60. 1971. [*P. louisianica*.]
- HEVLY, R. H. A new species of *Proboscidea* (Martyniaceae) from Mexico. Brittonia 21: 311-313. 1969 [1970]. [*P. diversifolia*.]
- . Martyniaceae. Pp. 1445-1449 in D. S. CORRELL & M. C. JOHNSTON. Manual of the vascular plants of Texas. xv + 1881 pp. frontisp. 1 map. Renner, Texas. 1970a. [*Proboscidea* only.]
- . A new species of *Proboscidea* (Martyniaceae) from Baja California, Mexico. Madroño 20: 392-395. 1970b [1971]. [*P. gracillima*.]
- HITCHCOCK, A. S., & J. B. S. NORTON. First report on Kansas weeds — the seedlings. Kansas State Agr. Coll. Exper. Sta. Bull. 50: 19-54. pls. 1-9. 1895. [*Martynia Proboscidea* (*P. louisianica*), 37 (description of seedling); pl. 6, fig. 90.]
- & ———. Third report on Kansas weeds — descriptive list, with distribution. *Ibid.* 57: 1-64. pls. 1-17. 1896. [*Martynia Proboscidea* (*P. louisianica*), 25 (poor description of plant); pl. 12, fig. 136.]
- & G. L. CLOTHIER. Fourth report on Kansas weeds — fruits and seeds. *Ibid.* 66: 19-54. pls. 1-17. 1897. [*Martynia Proboscidea* (= *P. louisianica*), 32 (description of fruit & seed); pl. 11, fig. 136.]
- HOWELL, J. T. *Martynia louisianica* Miller — a correction. Leaflet West. Bot. 1: 80. 1933. [Nomenclatural note; *P. louisianica*.]
- HURD, P. D., JR., & LINLEY, E. G. Pollination of the unicorn plant (Martyniaceae) by an oligolectic, corolla-cutting bee (Hymenoptera: Apoidea). Jour. Kansas Entomol. Soc. 36: 248-252. 1963. [*P. arenaria*.]
- KEARNEY, T. H., R. H. PEEBLES, and collaborators. Arizona flora. viii + 1085 pp. Berkeley & Los Angeles. 1960. [Martyniaceae, 795, 796; *Proboscidea* only.]
- LUBBOCK, J. A contribution to our knowledge of seedlings. Vol. 2. ii + 646 pp. London. 1892. [Description of seeds and seedlings of *Martynia fragrans* (*P. fragrans*) & *M. Proboscidea* (*P. louisianica*), 345-348.]
- MALATO-BELIZ, J. Notas de florística VIII. Anuár. Soc. Brot. 30: 9-16. 4 pls. 1964. [*P. louisianica* ("louisiana") new to Portugal, 12; pl. 1 (poor drawings — the fruit seems to be that of *Ibicella* rather than *Proboscidea*, the flowering branch is unrecognizable as Martyniaceae), pl. 2 (photograph too poor to interpret).]
- MARTIN, P. S., & C. M. DREW. Additional scanning electron photomicrographs of southwestern pollen grains. Jour. Arizona Acad. Sci. 6: 140-161. 1970. [*P. arenaria*, 145, figs. 56A, 56B; pollen bears close resemblance to that of *Chilopsis linearis*.]
- MARTINET, J. Organes de sécrétion des végétaux. Ann. Sci. Nat. V. 14: 91-232. pls. 8-21. 1872. [*Martynia Proboscidea* (= *P. louisianica*), 155, 156, pl. 13, figs. 158-161.]
- MAYBERRY, M. W. *Martynia louisiana* Mill.: an anatomical study. Trans. Kansas Acad. Sci. 50(2): 164-171. 1947. [*P. louisianica*.]

- PLUMER, E. *Martynia proboscidea* [sic]. Am. Nat. 9: 112. "Stems" from fruits of *Proboscidea* (*louisianica*) being Amerindian baskets in the Southwest.]
- REBERTUS, H. W. Wildflowers of the United States. Vol. 2. States. Part 2. New York. 1966. [*P. louisianica*, 123-124.]
- REYES GONZALEZ, M. Estudio de una nueva especie de *louisianica* Harrisson aislada del nectar de las flores de *louisianica*. Anales Inst. Biol. 18: 25-41. 1947. [= *P. fragrans* martyniae-fragrans?]
- SALAZAR, A. C. The viscid substance covering the leaves and *louisianica*. Proc. Okla. Acad. Sci. 4: 18. 1924 [1925]. [*P. louisianica*.]
- SMITH, R. Chromosome numbers of California plants, with reference to cytological interest. Madroño 15: 81-89. 1959. [*louisianica*], $2n = 30, 83$.]
- SMITH, V. Some notes on *Martynia*. Ohio Nat. 6: 444-445. Sexual abnormalities in *Martynia Proboscidea* (= *P. louisianica*).]
- SMITH, T. Studies on the chromosome numbers in higher plants reference to cytokinesis. I. Cytologia 7: 344-350. *louisianica* (*P. fragrans*), $n = 15$, fig. 21.]
- STREIBER, J. W. Floral biology of *Proboscidea louisianica*. Rhodora 78: 169-179. 1976.
- SWAN, J. E. On certain contrivances for cross-fertilization in *louisianica*. B: 1-6. 1879. [*Martynia Proboscidea* (*P. louisianica*).]
- TURIN, T. G. Martyniaceae. In: T. G. TURIN, V. M. TURIN. Fl. Europaea 3: 284. 1972. [*P. louisianica* native to southeastern Russia.]
- WEATHERBY, C. A. An addition to the wool-waste flora of the United States. Rhodora 34: 214, 215. 1932. [*P. fragrans*.]
- WINTON, A. L., & K. B. WINTON. The structure of *louisianica*. Vol. 2. Vegetables, legumes, fruits. 904 pp. *louisianica*, 426-428.]
- YANOVSKY, E. Food plants of the North American continent. Misc. Publ. 237. 84 pp. 1936. [*Proboscidea*, food.]

1977]

[VOL. 58

- M Bot. Gaz. 8: 208.
- contains 392 pp.
includes recipe for
- Martynia Proboscidea* 45(4): 55-60.
-) from Mexico.
- [C. JOHNSTON.
frontisp. 1 map.
- Baja California.
lima.]
- as weeds — the
9-54. *pls. 1-9.*
on of seedling);
- list, with dis-
Proboscidea (*P.*
]
- fruits and seeds.
(= *P. louisiana*).
- West. Bot. 1:
- nt (*Martynia*-
poidea). Jour.
- a. viii + 1085
5; *Proboscidea*
- . ii + 646 pp.
tyनिया fragrans
- : 9-16. 4 *pls.*
1 (poor draw-
oboscidea, the
' (photograph
- tomicrographs
10-161. 1970.
nce to that of
- . 14: 91-232.
155, 156, *pl.*
- tudy. Trans.
- PALMER, E. *Martenia proboscides* [sic]. Am. Nat. 9: 112. 1875. [Note on "strips" from fruits of *Proboscidea (louisianica?)* being used to decorate Amerindian baskets in the Southwest.]
- RICKETT, H. W. Wildflowers of the United States. Vol. 2. The Southeastern States. Part 2. New York. 1966. [*P. louisianica*, 522-524. *pl. 193.*]
- RUIZ ORONÓZ, M. Estudio de una nueva especie de levadura del genero *Rhodotorula* Harrison aislada del nectar de las flores de *Martynia fragrans*. Anales Inst. Biol. 18: 25-41. 1947. [= *P. fragrans*; the yeast, *R. martyniae-fragrantis*.]
- SHEAD, A. C. The viscid substance covering the leaves and stems of *Martynia*. Proc. Okla. Acad. Sci. 4: 18. 1924 [1925]. [*P. louisianica*.]
- SNOW, R. Chromosome numbers of California plants, with notes on some cases of cytological interest. Madroño 15: 81-89. 1959. [*P. Jussieu* (= *P. louisianica*), $2n = 30$, 83.]
- STERKI, V. Some notes on *Martynia*. Ohio Nat. 6: 444-447. 1906. [Mostly floral abnormalities in *Martynia Proboscidea* (= *P. louisianica*).]
- SUGIURA, T. Studies on the chromosome numbers in higher plants, with special reference to cytokinesis, I. Cytologia 7: 544-595. 1936. [*Martynia fragrans* (*P. fragrans*), $n = 15$, *fig. 21.*]
- THIERET, J. W. Floral biology of *Proboscidea louisianica* (Martyniaceae). Rhodora 78: 169-179. 1976.
- TODD, J. E. On certain contrivances for cross-fertilization in flowers. Am. Nat. 13: 1-6. 1879. [*Martynia Proboscidea* (*P. louisianica*), 2, *figs. 2, 3.*]
- TUTIN, T. G. Martyniaceae. In: T. G. TUTIN, V. H. HEYWOOD, *et al.*, eds., Fl. Europaea 3: 284. 1972. [*P. louisianica* naturalized in Portugal and southeastern Russia.]
- WEATHERBY, C. A. An addition to the wool-waste flora of eastern Massachusetts. Rhodora 34: 214, 215. 1932. [*P. fragrans*.]
- WINTON, A. L., & K. B. WINTON. The structure and composition of foods. Vol. 2. Vegetables, legumes, fruits. 904 pp. New York. 1935. [*P. louisianica*, 426-428.]
- YANOVSKY, E. Food plants of the North American Indians. U. S. Dept. Agr. Misc. Publ. 237. 84 pp. 1936. [*Proboscidea*, 57; young fruits used for food.]

DEPARTMENT OF BIOLOGICAL SCIENCES
NORTHERN KENTUCKY UNIVERSITY
HIGHLAND HEIGHTS, KENTUCKY 41076