

ETHNOBOTANY OF *CLITORIA* (LEGUMINOSAE)¹

PAUL R. FANTZ

Fantz, Paul R. (Department of Horticultural Science, North Carolina State University, Raleigh, NC 27695-7609). ETHNOBOTANY OF *CLITORIA* (LEGUMINOSAE). *Economic Botany* 45(4):511-520. 1991. Reported economic uses of *Clitoria* (Leguminosae) are summarized based upon literature reports and label data obtained from examination of over 8000 herbarium vouchers. Reports are categorized by economic use. Most reports are for an African species, *C. ternatea*, presently distributed throughout the tropics. Economic data for 23 species are reported, many for the first time.

Etnobotánia de *Clitoria* (Leguminosae). Los usos económicos de *Clitoria* (Leguminosae) son reportados en este trabajo basados en los informes de la literatura científica y los datos obtenidos de las etiquetas de más de 8000 registros de herbario. Los informes son categorizados por uso económico. La mayoría de los informes corresponden a la especie africana, *C. ternatea*, distribuida en todos los trópicos. Muchos de los datos económicos de las 23 especies son reportados por primera vez.

Key Words: *Clitoria*; *Clitoria ternatea*; ethnobotany.

Clitoria L. (Leguminosae) comprises sixty species distributed mostly within the tropical belt with a few species found in temperate areas. *Clitoria* is characterized as a woody genus with showy, resupinate, papilionaceous flowers, an infundibular calyx with persistent bracteoles, persistent stipules and stipels, and stalked ovaries with a geniculate, bearded style (Fantz 1990). No universal vernacular name for the genus is known, although the English "butterfly pea" is used often.

Clitoria potentially could be a more economically important genus, but many species are known only locally. Historically, *Clitoria ternatea* L. has been prized for its economic value and most literature reports concern this species. In this report I present data on the economic uses of *Clitoria* species obtained from the labels of over 8000 herbarium vouchers supplemented with a summary of economic uses reported in literature.

REPRODUCTIVE MEDICINE

The topic of *Clitoria* species as aphrodisiacs has been controversial and past discussion on this issue distasteful. Sharp criticism has been made of the fanciful analogies between the morphology of the flower and the female sexual apparatus (Descourtilz 1826; Eaton 1817; Eaton and Wright 1840; Smith 1807), sometimes with newly proposed generic names (*Vexillaria*, Eaton 1817; *Nauchea*, Descourtilz 1826). Nevertheless, peoples in widely dispersed geographical areas reportedly use different species of *Clitoria* medicinally as a treatment to enhance fertility, to control menstrual discharge, to treat gonorrhea, and as a sexual stimulant. These peoples may follow an ancient principle called the Doctrine of Signatures, a belief that plant structures that resemble portions of the human body have been so structured by a creator as to indicate their ability to provide remedies or ailments for those body portions.

Clitoria ternatea was named originally by Breyne (1678) as *Flos clitoridis ternatensibus* and regarded as appropriately named (Rumpf 1747). The Portuguese vernacular name "Fula criqua" applied to this plant was derived from the form of the flowers (Rumpf 1747). Translated, it means

¹ Received 8 August 1990; accepted 25 July 1991. Paper No. 12449 of the Journal Series of the North Carolina Agricultural Research Service, Raleigh, NC 27695-7609.

“to speed or hurry-up creation.” The Spanish word “conchita” found in vernacular names “bejuco de conchitas” or “conchita azul” and “conchita blanca” (*C. ternatea*), “conchita cobelta” (*C. arborescens* R. Brown in Ait.), and “conchita blanca” (*C. falcata* Lam.; syn. *C. rubiginosa* Juss. ex Pers., *C. glycinoides* DC.) has a sexual connotation in reference to its use medicinally in childbirth and as an emmenagogue, or as a sexual stimulant, according to several Spanish botanists (pers. comm.). Spanish dictionaries (Dubois-Charlier 1986; Garcia-Pelayo and Graes 1979; Gooch and Paredes 1978) note variations of the root word as union, conception, female shell or organs, or as “VULG. cunt.” However, many vernacular names utilized for species of *Clitoria* lack any sexual connotations in translation.

The root of *C. ternatea* has been used as an emmenagogue in the area of Southeast Asia formerly known as Indo-China (Crevost and Petelot 1929) and in the Philippines (Quisumbing 1951). Hocking (1955) reports leaves and roots used as an antiperiodic in southern Asia. Infusions of the roots or flowers in a syrup or in wine are used in El Salvador to induce menstrual flow (Morton 1983). The “root is chewed and blown up the nostrils of a cow before she is sent to the bull to ensure fertility” in the Sudan (Pritchard 4, K). The juice of the leaves mixed with water forms a jelly used as a cooling medicine for treatment of gonorrhoea (Chopra et al. 1958). Dastur (1962) reported an infusion of root bark used in treating gonorrhoea.

“Catuaba,” *C. guianensis* (Aubl.) Benth., is put in cachaca (rum or brandy from sugarcane juice) “to make a man out of you” in Minas Gerais, Brazil. The collectors noted the effect as “Potencia!” (Williams et al. 5416, GH, UC). *Clitoria lasciva* Bojer ex Benth. was reported as an “aphrodisiac” (Voyage Boivin s.n., G). A tribal herb doctor in Ecuador (Río Napo) administers *C. pozuzoensis* Macbride to induce fertility in barren couples and as a sexual stimulant (Fantz 2027, FLAS).

OTHER MEDICINAL USES

Nearly all medicinal properties of *Clitoria* are recorded for *C. ternatea* (summarized in Table 1) by researchers of medicinal plants in Asia. Remedies and treatments reported are grouped below by plant organ used. All apply to *C. ternatea* unless stated otherwise.

ROOTS

The root or root bark is reported often to be an effective laxative (Table 1). The degree of cleansing action reported varies from an aperient to a powerful cathartic, but it may not be a safe medicine. The “root is used as a purgative medicine or remedy” in Martinique (Hahn 234, BM, G, M, NY, P, W).

As a laxative the treatment is reported to be an alcoholic extract of the roots (Dey 1896). It acts as a brisk purgative in doses of five to ten grains, but produces gripping and tenesmus, and the patient will feel feverish and uneasy (Chopra et al. 1949; O’Shaughnessy 1842). The root has been described as a purgative and narcotic toxin (Quisumbing 1951; Rajan 1926). Symptoms of narcotic poisoning include unconsciousness attended by extreme irritability and a peculiar loss of memory (Rajan 1926).

The root is used as a diuretic; a treatment for ascites, an accumulation of excess fluids in the abdominal cavity; and in treating enlargement of the abdominal viscera (Table 1). Jayaweera (1981) reported treatment “used in large doses as a hydragogue cathartic and useful in anasarca [edema with accumulation of serum in the connective tissue] and ascites.” Dastur (1962) reported the treatment as “an alcoholic extract of the root in doses of five to ten grains” (=0.65 g). An infusion of the root bark has been used as a diuretic treatment (Chopra et al. 1958; Kirtikar and Basu 1918; Sheriff 1891) and as a demulcent in treating cases of irritation of the bladder and of the urethra (Dastur 1962; Jayaweera 1981; Kirtikar and Basu 1918; Quisumbing 1951; Sanjyal and Ghose 1934; Sheriff 1891). Jayaweera (1981) reported treatment in small doses as “a cholagogue purgative and used with advantage in acute and chronic congestion of the liver and biliousness.”

The root or root juice has been reported to promote nausea and vomiting (Table 1). Using the root in soup as an emetic is considered a useful treatment in lung ailments and for removing the phlegm of chronic bronchitis (Table 1). Two tolas (=0.4 oz) of the root juice are used in cold milk in the Concan region of India for the latter purpose (Dymock 1885; Kirtikar and Basu 1918). Six drachms (=0.8 oz) of the root juice are used in India and Pakistan with cold milk “in chronic bronchitis to help expectoration” (Dastur 1962). Chopra et al. (1949) noted

that opinions differ with regard to the emetic properties of the root. Roots are chewed to relieve lung and throat complaints in the Sudan (Prichard 4, K).

Root juice of a white-flowered form of *C. ternatea* is blown into the nostrils as a treatment for headaches (hemicrania) in India and Sri Lanka (Dastur 1962; Dymock 1885; Jayaweera 1981; Kirtikar and Basu 1918).

The root is reported to be used as an antidote against snakebites (cobras and daboias) and scorpion-stings (genera *Buthus* and *Palamnoeus*) in Indian indigenous medicine (Chopra et al. 1949, 1958). However, doses administered in strict conformity with directions given in standard Indian medicinal books to dogs and rabbits injected with snake or scorpion venom had no preventive, antidotal, or therapeutic effect (Chopra et al. 1958).

STEMS AND BARK

Clitoria glaberrima Pitt. is an "active plant," one whose extracts exhibited inhibitory effects in experimental tumor systems (J. A. Duke 1981, pers. comm.).

LEAVES

An infusion of the leaves is applied as a treatment on skin eruptions (Chopra et al. 1949). Juice of the leaves mixed with common salt is applied around the ear as a treatment to alleviate earaches in India, especially when accompanied by swollen glands (Kirtikar and Basu 1918; Mukraji 1889; Quisumbing 1951). Dastur (1962) reported the mixture used as a warm dressing over the swollen glands. Abbiw (1990) reported only leaf juice is used for treating earaches in Ghana. Mixed with water, the leaf juice forms a jelly used externally on eczema, impetigo and prurigo (Chopra et al. 1958). Mixed with green ginger, it is administered in treatment of cases of colliquative sweating in hectic fever (Dastur 1962; Kirtikar and Basu 1918; Quisumbing 1951).

The leaves are placed on swollen joints in the Philippines (Jayaweera 1981; Mukraji 1889; Quisumbing 1951; Tavera 1892) and in Java (Jayaweera 1981). Burkill (1935) quoting Tavera misreported that it was the seeds that were used as poultices on swollen joints. Leaves of the white-flowered form of *C. ternatea* are used as poultices in Java (Burkill 1935; Heyne 1927; Quisumbing 1951).

Hocking (1955) reported leaves as well as roots

to be used as an emetic in southeastern Asia. This is the only known report of leaves used for this treatment. Dastur (1962) reported an infusion of the leaves as "a useful wash for ulcers" in India and Pakistan.

Tiwari and Gupta (1959) reported a new compound ($C_{26}H_{50}O_2$, "aparajitin") from an alcoholic extract of dried leaves of *C. ternatea* determined to be an o-lactone of 2-methyl-4-hydroxy-n-pentacosanoic acid. Aiyar et al. (1973) reported beta-sitosterol and aparajitin from leaves of *C. ternatea*. Sinha (1960b) described an unknown o-lactone compound obtained from an alcoholic extract of dried leaves of *C. mariana* L. The empirical formula reported was $C_{26}H_{50}O_2$ and the description of its properties was nearly identical to that of aparajitin.

SEEDS

Seeds are given as a treatment for their aperient or mild purgative action (Table 1). Seeds in a powdered form constitute a more useful and a safer medicine than doses of the roots (Chopra et al. 1949). Although they contain a toxic alkaloid (Burkill 1935; Chopra et al. 1958; Quisumbing 1951), Mesa (1945) reported that powdered seeds are administered as a laxative to children and are used as a diuretic. In India and Pakistan, a powder of the roasted seeds was given in doses of one drachm (=0.06 oz) to children having colic or constipation (Dastur 1962). Powdered seeds mixed with ginger have been recommended as a diuretic treatment for enlargement of abdominal viscera (Jayaweera 1981), and this powder has been administered in doses of 30–60 grains (=1.9–3.9 g) for treatment of ascites and enlargement of the abdominal viscera (Dastur 1962).

The seeds contain a fixed oil, a bitter resinous principle, and tannin (Allen and Allen 1981; Ambasta 1986; Dymock et al. 1890; Nadkarni 1927). The testa is brittle and the cotyledons are filled with starch (Nadkarni 1927). Sinha (1960a) identified the yellow fixed oil as gamma-sitosterol. Kulshrestha et al. (1968) detected the cersulfate positive compounds adenosine, kaempferol-3-rhamnoglucoside, p-hydroxy-cinnamic acid and ethyl-alpha-D-galactopyranoside by thin layer chromatography of the seeds. Gupta and Lal (1968) isolated hexacosanol, hetasitosterol and an anthoxanthin glucoside (acid hydrolysis yielded quercetin and glucose) from seeds. Aiyar et al. (1973) reported kaempferol-3-rhamnoglucoside

TABLE 1. MEDICINAL USES OF *CLITORIA TERNATEA* L.

| Medicinal use | Plant part | Literature sources |
|---|---------------|---|
| Animal infections | | |
| Scorpion stings | Roots | Chopra et al. 1949, 1958. |
| Snake bites | Roots | Chopra et al. 1949, 1958. |
| Tapeworms (Antihelminthic) (Vermifuge) | Seeds | Crevost and Petelot 1929; Dastur 1962; Dey 1896; Drury 1873; Jayaweera 1981; Quisumbing 1951; Waring 1868. |
| Body aches | | |
| Earache | Leaf juice | Abbiw 1990; Dastur 1962; Kirtikar and Basu 1918; Mukraji 1889; Quisumbing 1951. |
| Headache (Hemicrania) | Leaf juice | Dastur 1962; Dymock 1885; Jayaweera 1981; Kirtikar and Basu 1918. |
| Fluid accumulation | | |
| Abdominal viscera | Roots | Dastur 1962. |
| | Seeds | Jayaweera 1981. |
| Anasarca | Roots | Jayaweera 1981. |
| Ascites | Roots | Jayaweera 1981; Kirtikar and Basu 1981. |
| Biliousness | Roots | Jayaweera 1981. |
| Demulcent | Root bark | Dastur 1962; Jayaweera 1981; Kirtikar and Basu 1918; Quisumbing 1951; Sanyal and Ghose 1934; Sheriff 1891. |
| Diuretic | Roots | Ambasta 1986; Chopra et al. 1958; Dastur 1962; Dutt 1928; Hocking 1955; Jayaweera 1981; Quisumbing 1951; Rajan 1926; Sanyal and Ghose 1934; Sheriff 1891. |
| | Seeds | Duke 1986. |
| Gastrointestinal | | |
| Antidysentery | Flowers | Morton 1983. |
| | Unknown | Chopra et al. 1958. |
| Aperient | Roots | Burkill 1935; Duke 1986; Jayaweera 1981; Quisumbing 1951; Rajan 1926; Sanyal and Ghose 1934. |
| Cathartic | Roots | Ambasta 1986; Burkill 1935; Chopra et al. 1949, 1958; Dastur 1962; Dey 1896; Gardner and Bennett 1956; Jayaweera 1981. |
| | Unknown | Pammel 1911. |
| Laxative | Roots | Dalgado 1896; Dutt 1928; Hocking 1955; Jayaweera 1981; Kirtikar and Basu 1918. |
| | Root bark | Chopra et al. 1958; Kirtikar and Basu 1918; Sheriff 1891. |
| | Seeds | Abbiw 1990; Chopra et al. 1949; Crevost and Petelot 1929; Dastur 1962; Dey 1896; Drury 1873; Duke 1986; Jayaweera 1981; Kirtikar and Basu 1918; Mesa 1945; Morton 1983; Quisumbing 1951; Waring 1868. |
| Purgative | Roots | Chopra et al. 1949; Duke 1986; Mesa 1945; O'Shaughnessy 1842. |
| Ulcers | Leaf infusion | Dastur 1962. |
| Inflammations | | |
| Cystitis | Seeds | Duke 1986. |
| Eczema | Leaf juice | Chopra et al. 1958. |
| Eye | Flower juice | Burkill 1935. |
| Impetigo | Leaf juice | Chopra et al. 1958. |
| Prurigo | Leaf juice | Chopra et al. 1958. |

TABLE 1. CONTINUED.

| Medicinal use | Plant part | Literature sources |
|---------------------------|---|--|
| Skin eruptions | Leaf infusion | Chopra et al. 1949; Kirtikar and Basu 1918; Mukraji 1889; Quisumbing 1951. |
| Poisons | | |
| Antidotic | Seeds | Duke 1986. |
| Pulmonary system | | |
| Antitubercular | Unknown | Chopra et al. 1958. |
| Bronchitis—phlegm removal | Roots | Ainslie 1826; Dastur 1962; Drury 1873; Dymock 1885; Kirtikar and Basu 1918; Quisumbing 1951. |
| Hectic fevers | Leaves | Dastur 1962; Kirtikar and Basu 1918; Quisumbing 1951. |
| Refrigerant | Seeds | Duke 1986. |
| Swollen body areas | | |
| Glands | Leaf juice | Kirtikar and Basu 1918; Mukraji 1889; Quisumbing 1951. |
| Joints | Leaf poultice | Burkill 1935; Heyne 1927; Jayaweera 1981; Mukraji 1889; Quisumbing 1951; Tavera 1892. |
| Urogenital system | | |
| Antiperiodic | Roots Leaves | Hocking 1955. Hocking 1955. |
| Conception | Unknown | Breyne 1678; Rumpf 1747. |
| Emmenagogue | Flower infusion Roots Root infusion | Morton 1983. Crevost and Petelot 1929; Quisumbing 1951. Morton 1983. |
| Gonorrhoea | Leaf juice Root bark | Chopra et al. 1958. Dastur 1962. |
| Vomitive | | |
| Emetic | Leaves Roots | Hocking 1955. Gardner and Bennett 1956; Lindley 1838. |
| Vomitive | Roots | Abbiw 1990; Crevost and Petelot 1929; Dalgado 1896; Dastur 1962; Hocking 1955; Mesa 1945; Quisumbing 1951. |

and p-hydroxycinnamic acid is obtained from the seeds.

Seeds are regarded as an effective anthelmintic treatment in destroying or expelling tapeworms (Table 1). Duke (1986) reported that the seeds are used in treatment of cystitis and are antidotic, diuretic, and a refrigerant.

FLOWERS

A flower decoction was used in Cuba as a treatment to halt dysentery (Morton 1983). Floral juice of a white-flowered form of *C. ternatea* was used in Malaysia to treat inflamed eyes (Burkill 1935).

PLANT ORGAN UNKNOWN

Chopra et al. (1958) reported that *C. ternatea* is alleged to have anti-dysenteric and anti-tu-

bercular properties. Pammel (1911) reported "*C. ternatea* of the Pacific Islands is a powerful cathartic." No plant organ was noted in these references.

POISONS AND PESTICIDES

Several species of *Clitoria* are known to have toxic properties. Toxic constituents in *C. ternatea* are a hazard to humans and animals (Chopra et al. 1949; Liener 1983).

Seeds of *C. arborescens* contain alkaloids with weak curariform action and are used as a fish poison (Gardner and Bennett 1956). Seeds of a related species, *C. arborea* Hoffm. ex Benth., are alkaloid-positive (Schultes et al. 24120, US). Pammel (1911) cites *C. amazonum* Hoffm. ex Benth. and *C. arborescens* used as fish poisons,

but does not note the plant part. The most toxic plant in the region of Rio Içana (Amazonas, Brazil), planted and cultivated by Indians in fair quantities, is the darume vine, *C. froesii* Fantz (Frões 12441/185, A, NY). Leaves of *C. laurifolia* gave a negative test for alkaloids (Arbain et al. 1989).

The genus is not noted for its pesticidal properties, although some species contain the insecticide, rotenone. Stems and fleshy roots of *C. falcata* in Surinam have a strong odor of rotenone (Archer 2848, U, US). A cultivated population of *C. laurifolia* Poir. in São Paulo, Brazil, was noted as the only cultivated legume not attacked by fungi or insects (Norris 278, NY). Tuber juice of *C. macrophylla* Wall. ex Benth. is sprayed on vegetables to kill green flies in Thailand and the root juice is used to kill worms in the backs of buffaloes (Collins 1441, K, US). Roots of *C. javitensis* (H.B.K.) Benth. have a cucumber odor repelling insects (Hermann 11208, NY, US), yet flowers are noted to harbor stinging ants (Steyermark 74763, F, NY, VEN) and attract ants, bees and thrips (Duke 15039(2), NY).

DYES AND FIBERS

Clitoria ternatea is the only species of the genus previously reported to be used as a dye plant. Ambasta (1986) reported flowers yielding a blue dye, whereas Kunkel (1984) reported the "flowers used as colourants." Blue flowers are boiled with rice to give it a bluish tinge on the Moluccan island of Amboina (Rumpf 1747; Uphof 1968) and in Malaysia (Burkill 1935) and Ghana (Abbiw 1990). Blue flowers are used to dye mats in Malaysia (Allen and Allen 1981) and to give a temporary color to white cloth in the Riouw Archipelago (Burkill 1935). The flowers are used as a reagent for detecting acid and alkaline solutions (Allen and Allen 1981; Burkill 1935). Abbiw (1990) reported both seeds and the corollas are used in Ghana as a litmus substitute. Juice of the leaves is used occasionally in the Dutch East Indies to color food green (Burkill 1935). Leaves of *C. arborea* are used in Peru for dyeing textiles (Woytkowski 6253, MO).

Species growing as lianas are used locally by the natives to make ropes. *Clitoria sagotii* Fantz was noted as a "bushrope" in Guyana (Jenman 4930, K). Stems of *C. lasciva* are the source of a fiber used by natives of Madagascar for making rope (Uphof 1968).

AGRONOMIC PROPERTIES

Leaves of *C. ternatea* are eaten by livestock in India (Ambasta 1986) and by sheep and goats in Ghana (Abbiw 1990); the foliage and pods are grazed by livestock (Allen and Allen 1981). The species is used as a forage crop in Venezuela (Zambrano 105, FLAS, LA). Green pods of *C. ternatea* are eaten as vegetables in Asia (Allen and Allen 1981; Uphof 1968) and Kunkel (1984) reported the "pods [to be] eaten like beans."

C. ternatea along with legumes of other genera has been studied in pasture surveys and experimental plots to determine its feasibility as a forage crop. Selected studies (Bunting and Bunting 1956; Burkill 1935; Hassell 1945; Kok et al. 1943; Katiyar et al. 1970; Oakes 1970) have concluded that it is a good forage crop, easily established in pastures, with the potential to produce more harvests than current crops. In one experiment, *C. ternatea* was fairly successful as a green manure on land that was to be fallow for a short time; however, it climbed too much (Burkill 1935). "It was not regarded highly as a green manure and foliage crop" in Sri Lanka (Allen and Allen 1981). *C. laurifolia* was judged fair as a green manure in warm countries (Uphof 1968), but better plants existed (Burkill 1935). *C. laurifolia* is well adapted as a hedge plant to control terraces and prevent soil erosion on steep slopes in tea plantations in Sri Lanka (Allen and Allen 1981; Burkill 1935; Holland and Joachim 1933) and as a cover crop on teak plantations (Allen and Allen 1981). The foliage is unpalatable for stock, but pigs eat the fleshy roots (Allen and Allen 1981). *C. falcata* (as *C. rubiginosa*) "is regarded highly as a forage vine in the Philippines" (Allen and Allen 1981).

Root nodulation studies with various strains of rhizobia identified eight nodulated species of *Clitoria* (Allen and Allen 1981). These include *C. australis* Benth., *C. biflora* Dalz., *C. fairchildiana* Howard (*C. racemosa* Benth.), *C. falcata* Lam. (*C. rubiginosa* Juss. ex Pers.), *C. guianensis* (Aubl.) Benth., *C. laurifolia* Poir., *C. mariana* L., and *C. ternatea*.

The wood is moderately hard, heavy, coarse-textured, straight-grained, splits easily, is stringy, and lacks durability and luster in *C. arborea* (as *C. hoffmanseggi* Benth.), *C. brachycalyx* Harms, and *C. dendrina* Pitt. (as *C. fendleri* Rusby). Thus, the wood of these species is not marketed commercially (Allen and Allen 1981; Record and Hess 1943).

TABLE 2. SPECIES OF *CLITORIA* IN CULTIVATION.

| Species | Habit | Flowers | Location and representative herbarium vouchers |
|-------------------------|----------|-----------------------------------|--|
| <i>C. arborescens</i> | Liana | 4-6 cm violaceous | St. Vincent: <i>Caley s.n.</i> , CGE, NY, W. Trinidad: <i>Tuinen 4245</i> , U; <i>Vere s.n.</i> , BM. |
| <i>C. brachystegia</i> | Tree | 4-6 cm violaceous | USA; Florida: <i>McFarlin 6453</i> , MICH. |
| <i>C. dendrina</i> | Tree | 3-4 cm dark purple | W. Indies: <i>Rohr 62</i> , BM. |
| <i>C. fairchildiana</i> | Tree | 4-6 cm violaceous | Brazil: <i>Black 52-14147</i> , P; <i>Constantino 11857</i> , RB, S, U; <i>Egler & Irwin 46712</i> , NY; <i>Glaziou, 9738</i> , K; <i>Moreira 85</i> , US; <i>Silva 74</i> , FLAS, RB. Dominican Rep.: <i>Jimenez 5834</i> , NY, US. India: <i>Bhau-mik 11021</i> , CAL, FLAS; <i>Predeep 13254</i> , CAL. Philippines: <i>Pancho 6572</i> , US. USA; Florida: <i>Campbell s.n.</i> , FLAS; <i>Fantz 4316</i> , CAL; <i>Gillis 7030 & 8311</i> , US; <i>Howard 17052</i> , HAL; <i>Wass-mer s.n.</i> , FTG. |
| <i>C. falcata</i> | Vine | 4-6 cm white | Brazil: <i>Barreto 102</i> , F; <i>Gardner s.n.</i> , BM; <i>Kuhlman 3936</i> , US. Mexico: <i>Feddema 8782</i> , MICH. Tobago: <i>Fairchild 2926</i> , US. |
| <i>C. froesii</i> | Liana | 3-4 cm color? | Brazil: <i>Froes 12441/185</i> , A, NY. |
| <i>C. glaberrima</i> | Tree | 2.5-4 cm white | Guatemala: <i>Bernoulli & Cairo 1177</i> , K. Panama: <i>Pittier 6799</i> , GH, K, M, P, US. |
| <i>C. heterophylla</i> | Vine | 2.5-3 cm blue | Brazil: <i>Bowie & Cunningham s.n.</i> , BM. East Indies: <i>Hallier s.n.</i> , G. India: hort. bot. <i>Calcuttensis s.n.</i> , CAL, DD; <i>Wallich 767</i> , BM. Sri Lanka: <i>Anony-mous s.n.</i> , MPU. USA; Florida: <i>Walsingham 65298</i> , US. |
| <i>C. javanica</i> | Vine | 3-3.5 cm white | Java: <i>Horsfield s.n.</i> , BM, K, U. |
| <i>C. javitensis</i> | Liana | 6-8 cm pink/rose | England: <i>Fosberg s.n.</i> , S. Martinique: <i>Duss 1074</i> , NY; <i>Stehle 3533</i> , NY. |
| <i>C. lasciva</i> | Liana | 5.5-6.5 cm blue | Mauritius: <i>Boulton s.n.</i> , CGE; <i>Lemann s.n.</i> , CGE; <i>Telfair s.n.</i> , K. |
| <i>C. laurifolia</i> | Subshrub | 4.5-5 cm white | Brazil: <i>Ducke s.n.</i> , FLAS, S, U; <i>Norris 278</i> , NY; <i>Vasconcellos s.n.</i> , RB. China: <i>Chung 7053</i> , A. India: <i>CBD s.n.</i> , E. Martinique: <i>Debeaux 42</i> , US. Nigeria: <i>Fairchild 1165</i> , US. USA; Florida: <i>Ritchey s.n.</i> , FLAS. N. Carolina: <i>Clair s.n.</i> , NCU. Zaire: <i>Corbitier 1037</i> , K. |
| <i>C. mariana</i> | Herb | 4-6 cm lilaceous | USA; Kentucky: <i>Short s.n.</i> , PH. Missouri: <i>Kellogg s.n.</i> , MO. |
| <i>C. ternatea</i> | Vine | 4-6 cm blue, white or double blue | Aruba: <i>Stoffers 1900</i> , U. Brazil: <i>Barreto 5707</i> , F; <i>Donville s.n.</i> , G; <i>Pickel 112</i> , BM, F. China: <i>Chung 7053</i> , A. Cuba: <i>Hermann 910</i> , BM, F, NY. Ecuador: <i>Mille s.n.</i> , F. Fr. Guiana: <i>Sagot s.n.</i> , BM, S. Germany: <i>Anonymous s.n.</i> , M, NY. Guatemala: <i>Standley 24325</i> , GH. India: <i>Kunan s.n.</i> , NY; <i>Roo 66106</i> , BM. Jamaica: <i>Crosby et al. 346</i> , F, GH, MICH, MO, NY, UC. Mexico: <i>Lun-dell 1022</i> , F, GH, MICH, MO, NY. Moluccas: <i>Anonymous s.n.</i> , W. New Caledonia: <i>Grunov s.n.</i> , W. Paraguay: <i>Teague 117</i> , BM. USA; Florida: <i>Beckner 2184</i> , FLAS; <i>Fantz 2031</i> , CAL and <i>3294</i> , DUKE; <i>McFarlin 5705</i> , MICH and <i>8996</i> , FLAS; <i>Moldenke 805</i> , MO, NY, PENN, S, W. Il-linois: <i>Hill s.n.</i> , MO; <i>Steyermark s.n.</i> , F. Ken-tucky: <i>Short s.n.</i> , PH. Missouri: <i>B. G. s.n.</i> , MO. Texas: <i>Cory 17159</i> , A; <i>Pruett 10</i> , F, W; <i>Wall 383</i> , S. |

ORNAMENTAL PROPERTIES

Only a few species of *Clitoria* are known in cultivation outside of their natural range, yet others have potential for becoming economically important as ornamentals because of their large (4–8 cm long), showy flowers. White or pigmented (pink, blue to purplish) banners often have yellow centers with dark red to violet veins extending to the margins.

Among ornamental *Clitoria*, climbing species are best known. Most tropical floras cite *C. ternatea* as cultivated and an escapee. Other species cited as cultivated ornamentals include *C. mariana*, *C. fairchildiana* Howard (as *C. racemosa* Benth.) as a fast growing, blue-flowered tree, and *C. falcata* (as *C. rubiginosa*) as a fragrant, mauve-flowered vine (Allen and Allen 1981) and *C. javitensis* (as *C. arborescens*, a misidentification) as a pink-flowered liana (Standley 1933). Table 2 lists species cultivated and representative herbarium vouchers.

TREES

These species are poorly represented in cultivation. The more common species is *C. fairchildiana* (*C. racemosa*), endemic to the deltas of northeastern Brazil, commonly cultivated elsewhere in Brazil and sporadically worldwide. Other species rare in cultivation include *C. brachystegia* Benth., an Ecuadorian endemic, *C. dendrina* Pitt., of Venezuela and Colombia, and *C. glaberrima* Pitt., native from Venezuela to Panama with sparsely isolated collections north to Mexico that may have been introduced.

LIANAS

Most woody vines historically were misidentified and labeled as *C. arborescens* Ait. For example, the illustration of *C. arborescens* (Curtis 1832) consists of inflorescences and flowers drawn in 1822 combined with leaves from another species drawn in 1832. There are a number of liana species that would make attractive ornamentals, some having flowers to 9.5 cm long; multiflowered inflorescences to 100 cm; cauliflory; or rufo-pubescent stems or fruits. Standley (1933) reports *C. javitensis* (under the misidentification as *C. arborescens*) "is one of the most beautiful of all Central American plants because of the exquisite coloring of its large blossoms." The species found occasionally in cultivation include *C. arborescens*, French Guiana to Colombia, *C.*

froesii, endemic to Amazonas, Brazil, *C. javitensis*, western Amazonian Basin to Costa Rica, and *C. lasciva*, a Madagascarene endemic.

HERBACEOUS VINES

These species produce aerial, twining stems from a subterranean xylopodium. The oldest reported (Breyne 1678) and most widely cultivated ornamental is the east African species, *C. ternatea*, usually for its azure flowers. It is cultivated in Ghana as a "decorative" (Abbiw 1990), under glass in Europe (Curtis 1812), and throughout the tropics where it often escapes and naturalizes. Double flowers have been known for three centuries (Commelin 1701) as well as a white-flowered form (Tournefort 1706). These taxa are classified by Fantz (1990) as var. *pleniflora* Fantz and var. *ternatea* f. *albiflora* (Voigt) Fantz, respectively. Another early cultivated species (Curtis 1820) is *C. heterophylla* Boj., endemic to Madagascar and Mauritius, with two distinct, morphological, leaflet shapes. Other less commonly cultivated vines include *C. falcata*, neotropics and introduced into Africa and naturalized, and *C. javanica* Miq., endemic to Thailand.

SUBSHRUBS TO SUFFRUTESCENT HERBS

These species range from small shrubs to those producing erect to trailing aerial stems seasonally from a subterranean xylopodium. The most commonly cultivated subshrub (Burkill 1935; Holland and Joachim 1933) has been *C. laurifolia* (syn. *C. cajanifolia* (Presl.) Benth.). It is a coastal species native to the neotropics and introduced into central Africa (naturalized in Zaire) and Southeast Asia–Indonesia. A suffrutescent herb known in cultivation (Petiver 1704) for three centuries is *C. mariana*, native of the United States, sporadically cultivated within its area of distribution.

SUMMARY

This article provides the most comprehensive list of economic uses and documentation for 23 species of *Clitoria*. I hope that it will (1) stimulate ethnobotanists to explore this genus further, (2) initiate chemical studies of species to develop beneficial drugs, and (3) increase awareness of the ornamental value of the genus for use in a broader geographic arena.

ACKNOWLEDGMENTS

Appreciation and thanks are extended to Walter H. Lewis who encouraged me to document economic uses of *Clitoria*, to George Wilson

and Gloria Abad who assisted with the Spanish abstract, and to the curators of the herbaria of A, ARIZ, ASC, ASU, BA, BM, BR, CAL, CGE, CM, DUKE, F, FLAS, FTG, G, GH, HAL, K, LA, M, MG, MICH, MIN, MO, MPU, MY, NCSC, NY, P, PENN, PH, RB, S, SI, U, UC, UMO, UNC, US, USCH, VEN, W and WIS for the loan of herbarium material.

LITERATURE CITED

- Abbiw, D. K.** 1990. Useful plants of Ghana. Intermediate Technology Publ., London.
- Ainslie, W.** 1826. *Materia indica*. Allen & Co., London.
- Aiyar, V. N., V. Narayanan, T. R. Seshadri, and S. Vydeeswaran.** 1973. Chemical components of some Indian medicinal plants. *Indian Journ. of Chem.* 11:89-90.
- Allen, O. N., and E. K. Allen.** 1981. Pages 171-172 in *The Leguminosae, a source book of characteristics, uses and nodulation*. Univ. Wisconsin Press, Madison, WI.
- Ambasta, S. P., ed.** 1986. Page 133 in *The useful plants of India*. Publications and Information Directorate, New Delhi.
- Arbain, D., J. R. Cannon, Afriastini, K. Kartawinata, R. Djamal, A. Bustari, A. Dharma, Rosmawaty, H. Rivai, Zaherman, D. Basir, M. Sjaifar, Sjaiful, R. Nawfa, and S. Kosela.** 1989. Survey of some West Sumatran plants for alkaloids. *Econ. Bot.* 43:73-78.
- Breynne, J.** 1678. Pages 76-78, t. 31-32 in *Exoticum aliaromque minus cognitarum plantarum centuria prima*. Danzig.
- Bunting, A. H., and L. Bunting.** 1956. Some observations on natural and established pastures and pasture plants in the Sudan rainlands. *Empire J. Exper. Agric.* 24(95):185-191.
- Burkill, I. H.** 1935. Pages 588-589 in *A dictionary of the economic products of the Malay Peninsula*. Vol. 1. Crown Agents, London.
- Chopra, R. N., R. L. Badwar, and S. Ghosh.** 1949. Pages 41-45, 339-340, 465-467 in *Poisonous plants of India*. Vol. 1. Govt. of India Press, Calcutta.
- , **I. C. Chopra, K. L. Honda, and L. D. Kapur.** 1958. Pages 501, 544, 600-601, 604, 606-607, 609-610 in *Indigenous drugs of India*. 2nd ed. U. N. Dhur & Sons, Calcutta.
- Commelin, K. [Commelijn, C.]** 1701. Page 47, t. 24 in *Horti medici Amestelaeadam rariorum plantarum descriptio et icones*. Vol. 1. P. & J. Braeu, Amsterdam.
- Crevost, C. H., and A. Petelot.** 1929. Catalogue de produits de L'Indo-Chine (plantas medicinales). *Bull. Econ. de L'Indo-Chine* 32:325.
- Curtis, W.** 1812. *Bot. Mag.* 36:t. 1542. L. Reeve, London.
- . 1820. *Bot. Mag.* 47:t. 2111. L. Reeve, London.
- . 1832. *Bot. Mag.* 59:t. 3165. L. Reeve, London.
- Dalgado, D. G.** 1896. Page 39 in *Vires plantarum Malabaricum*.
- Dastur, J. F.** 1962. Pages 59-60 in *Medicinal plants of India and Pakistan*. 2nd ed. Taraporevala Sons & Co., Bombay.
- Descourtilz, M. E.** 1826. Sur les Nauchées, genre nouveau dans la famille des légumineuses. *Mem. Soc. Linn. Paris, Prec. Hist.* 4:6-14.
- Dey, K. L.** 1896. Page 90 in *The indigenous drugs of India*. Thacker, Spink, Calcutta.
- Drury, C. N.** 1873. Page 145 in *The useful plants of India*. Richardson, London.
- Dubois-Charlier, F.** 1986. *The American Heritage Larousse Spanish dictionary*. Houghton Mifflin, Boston.
- Duke, J. A.** 1986. Page 58 in *Isthmian ethnobotanical dictionary*. 3rd ed. Scientific Publishers, Jodhpur.
- Dutt, N. B.** 1928. *Commercial drugs of India*. Bwahar, Calcutta.
- Dymock, W.** 1885. Page 235 in *The vegetable materia medica of western India*. Richardson, London.
- , **C. H. Warden, and D. Hooper.** 1890. *Pharmacographia India*. Shri, Calcutta.
- Eaton, A.** 1817. *Manual of botany for the northern states*. 1st ed. Webster & Skinners, Albany, NY.
- , **and J. Wright.** 1840. *North American botany*. 8th ed. Webster & Skinners, Albany, NY.
- Fantz, P. R.** 1990. *Clitoria (Leguminosae) Antillarum*. *Moscocosa* 6:152-166.
- Garcia-Pelayo, R., and A. Graes.** 1979. *Larousse dictionario básico de la lengua española*. Larousse, Marcella, Mexico.
- Gardner, C., and H. W. Bennett.** 1956. *The toxic plants of western Australia*. Western Australian Newspapers, Perth.
- Gooch, A., and A. G. de Paredes.** 1978. *Cassell's Spanish dictionary*. Macmillan, New York.
- Gupta, R. K., and L. B. Lal.** 1968. Chemical components of the seeds of *Clitoria ternatea* Linn. *Indian J. Pharm.* 30(7):167-168.
- Hassell, O. L.** 1945. Native pasture legumes on the Central Coast. *Queensland Agric. J.* 60:5-13.
- Heyne, K.** 1927. Page 82 in *De nuttige planten Nederlandsch Indie*. Ruygrok, Batavia.
- Hocking, G. M.** 1955. Page 54 in *A dictionary of terms in pharmacognosy and other divisions of economic botany*. Charles C Thomas, Springfield, IL.
- Holland, T., and A. Joachim.** 1933. A soil erosion experiment. *Trop. Agric. Ceylon.* 80(4):199-207.
- Jayaweera, D. M.** 1981. Medicinal plants (indigenous and exotic) used in Ceylon. 3:191. The National Science Council of Sri Lanka, Colombo.
- Katiyar, R. C., S. K. Ranjhan, and K. S. Shukla.** 1970. Yield and nutrient value of *Clitoria ternatea*—a wild perennial legume for sheep. *Indian J. Dairy Sci.* 23:79-81.
- Kirtikar, K. R., and B. D. Basu.** 1918. Pages 448-

- 449 in Indian medicinal plants. Sudhindra Nath Basu, Calcutta.
- Kok, E. A., L. B. Machado, and L. V. Meirelles.** 1943. Valor nutritivo de plantas forrageiros. Bol. Indust. Anim. 6:67-83.
- Kulshrestha, D. Kumar, and M. P. Khare.** 1968. Chemical investigation on the seeds of *C. ternatea* L. Chem. Ber. 101:2096-2105.
- Kunkel, G.** 1984. Page 98 in Plants for human consumption: an annotated checklist of the edible phanerogams and ferns. Koeltz Scientific Books, Koenigstein, Fed. Rep. Germany.
- Liener, I. E.** 1983. Toxic constituents in legumes. Chap. 5. Chemistry and biochemistry of legumes. Edward Arnold, London.
- Lindley, J.** 1838. Pages 242-243 in Flora medica. Longman, Orme, Brown, Green and Longmans, London.
- Mesa, J. T. R.** 1945. Pages 235-236 in Plantas medicinales aromáticas o venenosas de Cuba. Republica de Cuba Ministerio de Agricultura, Havana.
- Morton, J. F.** 1983. Pages 303-304 in Atlas of medicinal plants of middle America, Bahamas to Yucatan. Charles C Thomas, Springfield, IL.
- Mukraji.** 1889. *Clitoria*. Page 288 in G. Watt, ed., A dictionary of the economic products of India. Supt. Govt. Printing, Calcutta.
- Nadkarni, K. M.** 1927. Indian materia medica. Shri-butkar, Bombay.
- Oakes, A. J.** 1970. Legumes in the U.S. Virgin Islands. Turrialba 20:153-165.
- O'Shaughnessy, W. B.** 1842. The Bengal dispensatory and companion to the pharmacopoeia. W. H. Allen, London.
- Pammel, L. H.** 1911. Pages 529, 534, 830 in A manual of poisonous plants chiefly of Eastern North America, with brief notes on economic and medicinal plants, and numerous illustrations. Vol. 2. The Torch Press, Cedar Rapids, IA.
- Petiver, J.** 1704. Catalogus plantarum in hortis ficcis Petiverianis quoe vel ineditae aut hactenus obscure descriptae funct. London:Appendix 3:243.
- Quisumbing, E.** 1951. Medicinal plants of the Philippines. Dept. Agric. & Nat. Resources, Philippines, Tech. Bull. 16:387-389.
- Rajan, R. S.** 1926. An interesting case of narcotic poisoning and recovery. Indian Med. Gaz. 61:128-129.
- Record, S. J., and R. W. Hess.** 1943. Timbers of the New World. Yale Univ. Press, New Haven, CT.
- Rumpf [Rumphius], G. E.** 1747. Herbarium Amboinense 5:56, t. 31. M. Uytwerf, Amsterdam.
- Sanyal, D., and R. Ghose.** 1934. Page 374 in Vegetable drugs of India. Dehra Dun, Calcutta.
- Sheriff, M.** 1891. Materia medica of Madras. Madras Govt. Press, Madras, India.
- Sinha, A.** 1960a. Gamma-sitosterol from the seeds of *Clitoria ternatea* Linn. Current Sci. (India) 29(5): 180-181.
- . 1960b. Isolation of a Î-lactone compound from the leaves of *Clitoria mariana* Linn. Nature 187(4732):149-150.
- Smith, J. E.** 1907. In Rees, A. The cyclopaedia. 8(16): *Clitoria*. Longman, Hurst, Rees, Orme & Brown, London.
- Standley, P. C.** 1933. The flora of Barro Colorado Island, Panama. The Arnold Arboretum of Harvard Univ., Jamaica Plain, MA.
- Tavera, T. H. P.** 1892. Page 92 in Plantas medicinales de Filipinas. Madrid.
- Tiwari, R. D., and R. K. Gupta.** 1959. Chemical examination of the leaves of *Clitoria ternatea* Linn. Journ. Indian Chem. Soc. 36(4):243-246.
- Tournefort, M.** 1706. Suite de l'establissement de quelques nouveaux genres des plants. Mem. Math. Phys. Acad. Roy. Sci. Amst. 5:104-105.
- Uphof, J. C.** 1968. Page 138 in Dictionary of economic plants. 2nd ed. Stechert-Hafner Service Agency, New York.
- Waring, C.** 1868. Page 80 in Pharmacopoeia of India. London.