

Two New Combinations in *Sechium* (Cucurbitaceae) from Central America, and a New Species from Oaxaca, Mexico

Rafael Lira and Fernando Chiang

Herbario Nacional de México, Apdo. Postal 70-367, 04510 México, D.F., Mexico

ABSTRACT. Based on studies of herbarium collections, fieldwork in Mexico and Central America, and palynological evidence, two species of *Frantzia* (*F. panamensis* and *F. venosa*) are transferred to *Sechium*, and a species in this genus (*S. chinantlense*) from the lowlands of Oaxaca is described as new. A key to the 10 species of *Sechium* is presented.

According to the most recent classification of the Cucurbitaceae (Jeffrey, 1990), the genus *Sechium* P. Browne belongs to tribe Sicyeae, subtribe Sicyinae. Ever since Jeffrey's (1978) work, in which a broader generic circumscription of *Sechium* was presented (encompassing *Ahzeria* Standley & Steyererm., *Frantzia* Pittier, and *Polakowskia* Pittier), there has been a growing interest in the genus. Cruz-León (1985–1986) and Cruz-León & Querol-Lipovich (1985) reported wild populations of *S. edule* (Jacq.) Sw. found in 1982–1983 in Veracruz, Mexico. Newstrom (1985, 1986, 1989, 1990, 1991) presented the results of her research on the origin and evolution of this species, reporting new localities for wild populations of the species in Oaxaca, Mexico, and proposing a different generic circumscription.

Studies of collections (including type material) of all species of *Sechium* and related genera, fieldwork in Mexico and Central America (Lira, 1990, 1991; Lira & Soto, 1991), and palynological studies of species of most of the genera of subtribe Sicyinae (Lira & Alvarado, 1991) have revealed new evidence supporting Jeffrey's (1978) generic circumscription. Taking into account all the above-mentioned works, we propose two new combinations and a new species of *Sechium*.

Sechium panamense (Wunderlin) Lira & Chiang, comb. nov. Basionym: *Frantzia panamensis* Wunderlin, Bull. Torrey Bot. Club 104: 102. 1977. TYPE: Panama. Chiriquí: Boquete District, Bajo Chorro, 6,000 ft., *Davidson 416* (holotype, F, photograph).

Geographical distribution. Apparently endemic to Panama, known only from the type locality, at elevations between 1,800 and 3,000 m.

Additional specimens examined. PANAMA. CHIRIQUÍ: top of peak between Baru and Respinga, ca. 3,000 m, 27 Nov. 1975, *D'Arcy 10135* (MO); Cerro Pata de Macho, ca. 5 mi. NE of Boquete, trail to continental divide leading to Finca Serrano (Francisco Serrano, Pacific slope), 22 Nov. 1979, *Antonio 2687* (MO); Bugaba, Cerro Punta, along ridge to watershed to Bocas del Toro, 8°52'N, 82°33'W, 2,200 m, 26 Jan. 1985, *van der Werff & Herrera 6458* (MO).

Sechium venosum (L. D. Gómez) Lira & Chiang, comb. nov. Basionym: *Frantzia venosa* L. D. Gómez, Phytologia 53: 447. 1983. TYPE: Costa Rica. Limón: along road from Hone Creek to Bribri, *Gómez et al. 20483* (holotype, MO; isotypes, BM, CR, K).

Geographical distribution. Originally reported (Gómez & Gómez, 1983) as endemic to the lowlands of Caribbean Costa Rica, it has now been found at higher elevations (1,300–1,650 m) and also in Panama.

Additional specimens examined. COSTA RICA. LIMÓN: Talamanca, 7 km SW of BriBri, 100 m, 4 May 1983, *Gómez et al. 20361* (MEXU, MO), 20459 (BH, BM, K, MEXU, MO); Limón, 1–3 km N of BriBri, Río Sixaola drainage, 9°38'N, 82°50'W, 250 m, evergreen premontane wet and tropical moist forest formation and cocoa plantation, 9–10 Sep. 1978, *Burger & Antonio 11014* (CR, F); Costado E, Lago Dabagiri, 9 Nov. 1984, *Gómez et al. 23309-B* (MO); Hitori Cerere Reserve and vicinity in Valle La Estrella S of Finca Concepción in woods on slope along Río Cerere, 9°42'N, 83°02'W, 100 m, 31 July 1985, *Hammel & Grayum 14297* (CR); forested hill above BriBri, 100 m, 2 Feb. 1984, *Pennington & Poveda 11465* (CR); base of hills between Punta Cocles and Punta Uva (E of Puerto Viejo de Talamanca), 9°38'N, 82°43'W, 20–60 m, forested ravine, 6 Nov. 1984, *Grayum et al. 4426* (BM, CR, MO); San José Cabecar, 4–23 Mar. 1982, *Ocampo s.n.* (CR); Cantón Talamanca, ca. 3 km sobre el camino maderero que va a Cataratas, 9°38'N, 82°55'W, borde de selva alta perturbada con *Cecropia*, *Heliconia* spp., Urticaceae y Malvaceae, 150 m, 10 Aug. 1990, *Lira & Ocampo 1036* (MEXU); camino al puente del Río Uatsi (ahora destruido), viniendo de Cruce Bribri y Uatsi, 9°37'N, 82°52'W, selva alta perturbada, con cultivos de plátano y cacao, 100 m, 10 Aug. 1990, *Lira & Ocampo 1039* (MEXU) (only fruits were collected). PUNTARENAS: foothills of the Cordillera de Talamanca, between Agua Caliente and the Río Canasta, 8°57'–9°2'N, 82°56'–82°59'W, 1,300–1,650 m, montane forest remnants scattered among pastures, 5 Sep.

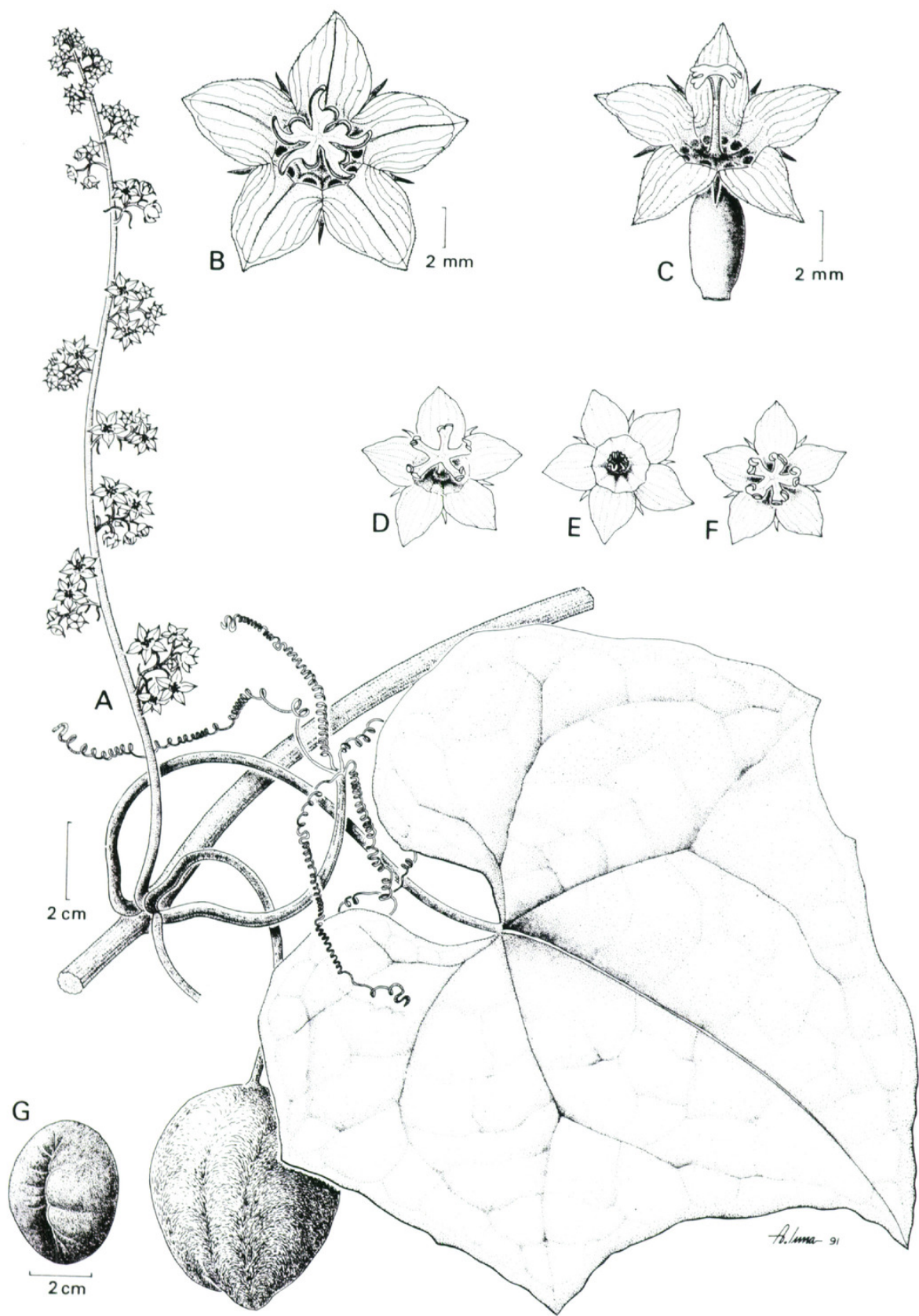


Figure 1. *Sechium chinantlense* Lira & Chiang. —A. Habit. —B. Staminate flower. —C. Pistillate flower. —D. Staminate flower of *S. hintonii*. —E. Staminate flower of *S. pittieri*. —F. Staminate flower of wild *S. edule*. —G. Apical view of the fruit showing the cleft.

1984, *Davidse et al.* 28360 (MO). PANAMA. BOCAS DEL TORO: vicinity of Nievécita, 0–50 m, 8–19 Aug. 1938, *Woodson Jr. et al.* 1841 (MO); Nievécita, 3–20 Aug. 1940, *Woodson Jr. & Schery* 1026 (NY).

***Sechium chinantlense* Lira & Chiang, sp. nov.**

TYPE: Mexico. Oaxaca: Municipio San Lucas Ojitlán, del poblado El Zapotal a Mata de Caña, relictos de selva alta perennifolia, 60 m, 23 Jan. 1989, *Calzada* 14297 (leaves, stam. fl., and mature fr.) (holotype, MEXU). Figure 1.

Sechio eduli (Jacq.) Sw. proximum, a quo differt pedicellis florum masculorum longioribus, filamentis staminibus per $\frac{1}{2}$ – $\frac{3}{4}$ longitudinis connatis, columnam formantibus, hac in 5 ramis divisa, unoquoque ramo in 2 ramis inaequalibus diviso, et fructu constanter glabro, inermi, lateraliter compresso, laete viridi.

Stout, monoecious, perennial vine, or sometimes perennating through the massive roots. Stems sulcate, smooth, almost glabrous, much branched, thickened and woody toward the base. Leaves herbaceous to papery membranous when dried, cordate-ovate to suborbicular, 10–16(–17.5) cm long, 12–22.5(–24) cm broad, slightly 3-angulate-lobed, the lobes obtuse, acute to acuminate, margins remotely denticulate, base cordate, sinus usually semiclosed, both surfaces essentially glabrous, the adaxial one scabrous, slightly puberulent only on the veins, minutely white-pustulate, the abaxial one smooth; petioles sulcate, 12–16(–22) cm long, glabrous. Tendrils 4–6-parted, sulcate, glabrous. Staminate inflorescences axillary, racemose-paniculate, pedunculate, 12–27 cm long, puberulent to glabrous, the flowers in fascicles or in short racemelike branches distributed at intervals along the rachis, the branches not exceeding 18 mm; pedicels slender, 4–12 mm long, puberulent to glabrous; receptacle disk-shaped, ca. 1 mm long, 3–5 mm wide, glabrous; sepals 5, narrowly lanceolate to subulate, 1–3.5 mm long; petals 5, spreading, white to greenish white, triangular-ovate, obtuse to acute, 4–8 mm long, 2.5–4.5 mm broad, with 7–9 parallel nerves, puberulent, glabrescent; stamens 5, 3–4 mm long; filaments fused $\frac{1}{2}$ – $\frac{3}{4}$ their length, forming a thin column, divided into 5 branches somewhat broadened and flat, spreading, these again divided into two unequal-sized and curved branches; antheriferous tissue at the tip of the branches, visible mainly at the margins and underneath; nectaries 10, porelike, surrounding the staminal column at the base of the receptacle, puberulent on the surface, slightly projected underneath the calyx or not at all projected. Pistillate flowers in the same axil as the staminate inflorescences, 1–3 on individual pedicels, sometimes geminate on the same pedicel; pedicel slender, sulcate,

ca. 1 cm long, elongating up to 10 cm in fruit, glabrous; ovary ovoid, constricted at the tip, glabrous, smooth, 1-ovuled; perianth as in the staminate flowers but somewhat reduced; styles fused into a slender column, 3 mm long; stigma 2-lobed, each lobe 3-fid; nectaries as in the staminate flowers, but less evident. Fruits fleshy, obovoid, compressed, 6–9 cm long and nearly as broad in the middle, cleft at the apex, glabrous, unarmed, bright green when mature, pulp pale green to whitish, bitter; seed ovoid, flattened, smooth, 3.5–6 cm long.

Sechium chinantlense is known only from northern Oaxaca, from the region known as “La Chinantla” in the municipios Valle Nacional, Tuxtepec, Chiltepec, Santa María Jacatepec, and San Lucas Ojitlán, where it thrives at altitudes between 20 and 800 m, in evergreen forest or at higher elevations, in the transition between evergreen and montane forest. The populations from south of Valle Nacional start blooming in August and set fruit in October or earlier, whereas the ones from Chiltepec and San Lucas Ojitlán produce flowers until November and fruits from December to January and February. An explanation for these differences could be found in the higher humidity and lower temperatures present in the Valle Nacional area, compared to the warmer and somewhat drier climate of the north.

Paratypes. MEXICO. OAXACA: Mpio. San Lucas Ojitlán, Ejido O. Terán, Presa Cerro de Oro (Santo Domingo), al S de San Lucas Ojitlán, 18°2'N, 96°25'W, relictos de selva mediana con *Bursera* creciendo sobre lomeríos muy pedregosos y rodeados de planicies con suelos muy húmedos, 60 m, 24 Oct. 1990, *Lira & Soto* 1173 (MEXU); Mpio. Santa María Jacatepec, Plan Martín Chino, acahual derivado de selva alta perennifolia, 60 m, suelo negro rocoso con lomeríos, 25 Oct. 1989, *Calzada* 15043 (MEXU); Mpio. Chiltepec, Cerro Faisán, 6 km al W de Chiltepec, 17°58'N, 96°15'W, milpas en lomeríos rocosos rodeados con relictos de selva mediana con *Bursera*, *Gliricidia*, *Ceiba*, *Enterolobium*, Araceae y Sapindaceae, y éstos a su vez rodeados por grandes extensiones de potreros, 60 m, 24 Oct. 1990, *Lira & Soto* 1176 (MEXU); Chiltepec and vicinity, in llanos, 20 m, 12 Dec. 1940, *Martínez-Calderón* 369 (GH, MEXU), 14 Jan. 1941, 458 (GH); Mpio. Valle Nacional, km 61 de la carretera Tuxtepec–Oaxaca, selva mediana, 730 m, 28–31 Oct. 1991, *Castrejón & Concepción* 183, 194, 212 (MEXU); 12 km al S de Valle Nacional, carretera 175 a Oaxaca, 17°41.3'N, 96°20.5'W, ladera húmeda con una caída de agua, selva alta perennifolia perturbada con *Cecropia*, 720 m, 25 Oct. 1990, *Lira & Soto* 1185 (MEXU); 12.5 km al S de Valle Nacional, carretera 175 a Oaxaca, 17°41.2'N, 96°19.5'W, ladera húmeda con una caída de agua, selva alta perennifolia perturbada, 720 m, 25 Oct. 1990, *Lira & Soto* 1186 (MEXU); 13.5 km al S de Valle Nacional, carretera 175 a Oaxaca, 17°41'N, 96°19.5'W, ladera húmeda con una caída de agua, selva alta perennifolia, 730 m, 25 Oct. 1990, *Lira & Soto* 1187 (MEXU); 15 km al S de Valle Nacional, casi 1 km

al N de Puerto Eligio, carretera 175 a Oaxaca, 17°38'N, 96°20'W, ladera húmeda con una caída de agua, selva alta perennifolia perturbada, 660 m, 26 Oct. 1990, *Lira & Soto 1188* (MEXU); steep mountain sides above and generally 9 mi. S of Valle Nacional, along the highway to Oaxaca, 800 m, 10 Oct. 1962, *McVaugh 21801* (MICH); a 11 km al S de Valle Nacional, carretera Tuxtepec–Oaxaca, selva alta perennifolia, 850 m, *Soto et al. 13191* (MEXU).

Specimens of *Sechium chinantlense* have been identified and/or reported as *S. compositum* (J. D. Smith) C. Jeffrey, or as a hybrid between the latter and *S. edule* or a different species (Newstrom, 1985, 1986, 1989, 1990, 1991). The characteristics shown by the stamens and fruits permit the separation of *S. chinantlense* from other species of the genus (see Fig. 1). Furthermore, the absence of *S. compositum* in Oaxaca does not support the contention that the new species is a hybrid between *S.*

compositum and any other species. In this regard, populations of wild *S. edule* can be found growing in the vicinity (although at higher elevations) of populations of *S. chinantlense* in the south of Valle Nacional, Oaxaca. However, an examination of both populations did not yield evidence of hybridization, indicating that, notwithstanding their vicinity and similar phenology, these two species are probably reproductively isolated. On the other hand, in the northern part of the range of *S. chinantlensis*, there are no wild populations of *S. edule*.

With these three additions, *Sechium* is now considered to include 10 species forming the two sections proposed by Jeffrey (1978). Based on our observations, as well as some additional bibliographic information (Wunderlin, 1976, 1977, 1978), we propose the following key to distinguish the sections and the species.

Key to the Sections and Species of *Sechium*

- 1a. Nectaries surrounding base of reproductive structures, pore- or pouchlike, sunken into the base of receptacle and ± protruding beneath section *Sechium*
 - 2a. Filaments completely fused; anthers free, sessile on the tip of the filament column; floral nectaries conspicuously protruding beneath the receptacle.
 - 3a. Lower surface of the leaves pubescent; floral nectaries tomentellous on upper surface *S. talamancense* (Wunderlin) C. Jeffrey
 - 3b. Lower surface of the leaves glabrous; floral nectaries glabrous on upper surface *S. tacaco* (Pittier) C. Jeffrey
 - 2b. Filaments partially fused, about ½–¾ their length and then divided into 3–5 branches; anthers 3–5 (sometimes more) at the tip of the filament branches; floral nectaries not protruding beneath the receptacle, or only slightly so.
 - 4a. Filament branches not or inconspicuously divided; mature fruits variable in size, shape, indument, and armature.
 - 5a. Male inflorescence paniculate; pedicels 7–20 mm long; mature fruits 6–10 cm long, fleshy, with longitudinal ridges and short spines on the ridges, to completely smooth and unarmed (Chiapas and Guatemala) *S. compositum* (J. D. Smith) C. Jeffrey
 - 5b. Male inflorescence racemose, or if more divided, the branches very short and the pedicels less than 6 mm; mature fruits fleshy to woody-fibrous with or without ridges, angles or furrows and spines.
 - 6a. Male inflorescence erect; filaments fused more than ¾ their total length; mature fruits fleshy, variable in size, shape, and armature; wild (bitter fruits; Mexico in the states of Veracruz, Hidalgo, Puebla, and Oaxaca) and cultivated (nonbitter fruits) plants *S. edule* (Jacq.) Sw.
 - 6b. Male inflorescence pendulous; filaments fused ½–¾ their total length; mature fruits 3–4.5 cm long, woody-fibrous, with 5 longitudinal ridges, the ridges with thin spines covered by retrorse barbs; wild plants (Estado de México and Guerrero) *S. hintonii* (P. G. Wilson) C. Jeffrey
 - 4b. Filament branches divided into two unequal-sized and curved branches; mature fruits 6–9 cm long, ovate-cordate, consistently smooth, unarmed, and bright green (Oaxaca) *S. chinantlense* Lira & Chiang
- 1b. Nectaries surrounding base of reproductive structures, covered by a cushionlike compressed structure, not sunken into the base of the receptacle section *Frantzia*
 - 7a. Male inflorescence racemose to paniculate, erect or pendulous (Nicaragua to Panama).
 - 8a. Male inflorescences erect, racemose to racemose-paniculate; flowers conspicuously pedicellate; fruits ovoid to fusiform.
 - 9a. Male inflorescences densely villous; sepals linear lanceolate, 6–8 mm long; fruits fusiform (Costa Rica) *S. villosum* (Wunderlin) C. Jeffrey
 - 9b. Male inflorescences not villous; sepals triangular, up to 1 mm long; fruits ovoid (Nicaragua to Panama) *S. pittieri* (Cogn.) C. Jeffrey
 - 8b. Male inflorescences pendulous, racemose; flowers very shortly pedicellate to almost sessile; fruits ovoid to globose (Costa Rica and Panama) *S. venosum* (L. D. Gómez) Lira & Chiang
 - 7b. Male inflorescences umbelloid (Panama) *S. panamense* (Wunderlin) Lira & Chiang

Acknowledgments. This paper forms part of the project "Taxonomic and Ecogeographic Studies in Latin American Cucurbitaceae," sponsored by the International Board for Plant Genetic Resources, conducted by R. Lira in the Herbario Nacional de México, Instituto de Biología, U.N.A.M. We thank the curators of BH, BM, CHAPA, CR, ENCB, F, GH, K, MICH, MO, MU, NY, UC, US, USF, and XAL for loan of specimens. The illustration was prepared by Albino Luna, Instituto de Biología, U.N.A.M.

Literature Cited

- Cruz-León, A. 1985-1986. ¿Chayote o cruza intergenéricas? Hallazgo y características. *Revista de Geografía Agrícola*, Chapingo Nos. 9-10: 100-106.
- & D. Querol-Lipovich. 1985. Catálogo de Recursos Genéticos de chayote (*Sechium edule* Sw.) en el Centro Regional Universitario Oriente. Universidad Autónoma de Chapingo, Mexico.
- Gómez, L. D. & J. Gómez. 1983. *Plantae Mesoamericanae Novae*. IX. *Phytologia* 53: 447-448.
- Jeffrey, C. 1978. Further notes on Cucurbitaceae. IV. Some New World taxa. *Kew Bull.* 33: 347-380.
- Jeffrey, C. 1990. An outline classification of the Cucurbitaceae. Appendix. Pp. 449-463 in D. M. Bates, R. W. Robinson & C. Jeffrey (editors), *Biology and Utilization of the Cucurbitaceae*. Cornell Univ. Press, Cornstock, New York.
- Lira, R. 1990. Taxonomic and Ecogeographic Studies in Latin American Cucurbitaceae. 1st Progress Report (January-August 1990). Project supported by FAO/International Board for Plant Genetic Resources, Rome.
- . 1991. Taxonomic and Ecogeographic Studies in Latin American Cucurbitaceae. 2nd Progress Report (August 1990-January 1991). Project supported by FAO/International Board for Plant Genetic Resources, Rome.
- & J. L. Alvarado. 1991. A palynological study of *Sechium* (Cucurbitaceae) and its allies. 42nd AIBS Annual Meeting, San Antonio, Texas, U.S.A. (4-8 August 1991). *Amer. J. Bot. (Supplement)* 78(6): 233. [Abstract.]
- & J. C. Soto. 1991. *Sechium hintonii* (P. G. Wilson) C. Jeffrey (Cucurbitaceae): rediscovery and observations. *FAO/IBPGR Pl. Genet. Res. Newsletter* 87: 5-10.
- Newstrom, L. 1985. Collection of Chayote and its wild relatives. *FAO/IBPGR Pl. Genet. Res. Newsletter* 64: 14-20.
- . 1986. Studies in the origin and evolution of *Sechium edule* (Jacq.) Sw. Ph.D. Thesis, University of California, Berkeley.
- . 1989. Reproductive biology and evolution of the cultivated chayote *Sechium edule*: Cucurbitaceae. Pp. 491-509 in G. H. Bock & Y. B. Linhart (editors), *Evolutionary Ecology of Plants*. Westview Press, Boulder, Colorado.
- . 1990. Origin and evolution of Chayote, *Sechium edule*. Pp. 141-149 in D. M. Bates, R. W. Robinson & C. Jeffrey (editors), *Biology and Utilization of the Cucurbitaceae*. Cornell Univ. Press, Cornstock, New York.
- . 1991. Evidence for the origin of chayote *Sechium edule* (Cucurbitaceae). *Econ. Bot.* 45: 410-428.
- Wunderlin, R. P. 1976. Two new species and a new combination in *Frantzia* (Cucurbitaceae). *Brittonia* 28: 239-244.
- . 1977. A new species of *Frantzia* (Cucurbitaceae) from Panama. *Bull. Torrey Bot. Club* 104: 102-104.
- . 1978. Cucurbitaceae. In: R. E. Woodson et al. (editors), *Flora of Panama*. *Ann. Missouri Bot. Gard.* 65: 285-366.



Chiang Cabrera, Fernando. and Lira, R. 1992. "Two new combinations in *Sechium* (Cucurbitaceae) from Central America, and a new species from Oaxaca, Mexico." *Novon a journal of botanical nomenclature from the Missouri Botanical Garden* 2, 227–231. <https://doi.org/10.2307/3391556>.

View This Item Online: <https://www.biodiversitylibrary.org/item/14662>

DOI: <https://doi.org/10.2307/3391556>

Permalink: <https://www.biodiversitylibrary.org/partpdf/2518>

Holding Institution

Missouri Botanical Garden, Peter H. Raven Library

Sponsored by

Missouri Botanical Garden

Copyright & Reuse

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

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

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

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