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## Cnidoscolus elasticus, the Source of Highland Chilte, a Remarkable New Rubber Yielding Tree from the States of Durango and Sinaloa, Mexico

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During the course of the survey undertaken by the Rubber Development Corporation of the United States Government in the spring of 1943, under the field direction of the writer, the source of highland chilte was discovered to be an undescribed species of *Cnidoscolus*.

**Cnidoscolus elasticus** Lundell sp. nov.—Arbor parva, ramulis crassis, rubris. Folia longe petiolata, petiolo usque ad 25 cm. longo, lamina late cordata, usque ad 15 cm. longa, 25 cm. lata, lobis 5, raro 6 vel 7. Inflorescentiae cymosae, longe pedunculatae. Flores 1.7–1.8 cm. longi. Capsula ovoideo-ellipsoidea, ad 3.5 cm. longa. Semina oblongo-ellipsoidea, 1.7–2.3 cm. longa, 1 cm. lata.

A small to medium sized, hardy, xerophilous, deciduous tree, up to 35 cm. in diameter, 10 m. high, dichotomously branched, covered with papery reddish bark which peels off in thin sheets (as in some species of *Bursera*) ; trunk short, stout, usually less than 3 m. high, sometimes slightly swollen below the middle; branchlets thick, stubby, up to 1.3 cm. in diameter at apex, essentially glabrous, reddish, with large pale leaf scars; pith conspicuous and continuous, not in plates, drying white; twigs finely pubescent with short brownish hairs, the stinging hairs few. Petioles rather stout, up to 25 cm. long, at first pubescent with short matted brownish hairs, essentially glabrous with age except for a few scattered subappressed stinging hairs. Gland at apex of

petiole collar-like, laminated. Leaf blade broadly cordate with broad deep rounded basal sinus, usually 5-lobed, rarely 6- or 7-lobed, up to 15 cm. long, 25 cm. wide, the apical lobes extending three-fourths to base, obovate-elliptic, the basal lobes shallower, ovate or oblong, or merely triangular, abruptly acuminate; margin in young leaves denticulate with gland tipped teeth, with age entire; base of blade barbate with stinging hairs, the blade essentially glabrous with age except along the veins, finely pubescent at first, the few stinging hairs appressed; palmately veined, the primary and secondary veins conspicuous on the undersurface. Inflorescence a long-stalked, dichotomously branched cyme arising with the new leaves and shoots at the tips of the old branches, bearing either staminate or both pistillate and staminate flowers, sometimes small and compact, usually open and large, up to 20 cm. long (including peduncle 11 cm. long), 15 cm. wide, finely pubescent with short brownish hairs. Flowers white, fragrant, borne at the end of the dry season before the leaves appear. Staminate flowers: calyx finely pubescent, up to 1.8 cm. long, the tube about 9 mm. long, constricted at base into a short stipe about 1 mm. long, the 5 spreading lobes elliptic, rounded at apex, up to 5.5 mm. wide; stamens 10, in two whorls at the summit of the column; filaments about 1.1 mm. long; anthers about 3.5 mm. long; staminodia 3, about 3 mm. long; basal half of staminal tube glandular-pubescent; basal gland orange, annular, about 1 mm. high. Pistillate flowers: calyx finely pubescent on outer surface, about 1.7 cm. long, the tube 4 mm. in diameter, 8 mm. long, the lobes elliptic-oblong, about 5 mm. wide; ovary finely pubescent, triquetrous, oblong, abruptly narrowed into short style 1 mm. long; styles 3, dichotomously branched only twice; gland at base of ovary annular. Peduncle and branches of inflorescence thickened in fruit, bearing short persistent stinging hairs. Capsule rather fleshy, 3-locular, ovoid-ellipsoid, up to 3.5 cm. long, tapering subabruptly at apex into an obtuse point, covered with short stinging hairs; endocarp chartaceous, sometimes persistent on the seeds, bicornute at apex. Seeds brown to almost black, oblong-

ellipsoid, 1.7 to 2.3 cm. long, 1 cm. wide, somewhat flattened.

MEXICO: Sinaloa, Arroyo de la Fresa, Rancho del Pino, near Chele, alt. 925 m., May 9, 1943, *C. L. Lundell 13021* (type in the herbarium of Southern Methodist University), a small tree, 7.5 cm. in diameter, 7 m. high; same locality and date, *Lundell 13020*, a tree, 30 cm. in diameter, 9 m. high, bark reddish and papery, flowers white, the fleshy gland at base of ovary orange; same locality, Oct. 1943, *C. L. Lundell & Rodolfo Gomez 12613*, a small tree, 15 cm. in diameter, 5 m. high, capsules fleshy, ellipsoid, with abruptly conical beak; road from Rancho del Pino to Copala, May 28, 1943, *C. L. Lundell & Manuel Itie 12175*. Durango, Corral de Piedra, above Tayoltita, Piaxtla River, alt. about 1650 m., April 10, 1943, *Lundell 13001*, a small tree, 30 cm. in diameter, 10 m. high, with thin papery reddish bark, staminate flowers white and fragrant; La Joya, above Corral de Piedra, alt. about 1650 m., April 11, 1943, *Lundell 13008*, a small tree, 30 cm. in diameter, 5 m. high; Ojito, above Corral de Piedra, alt. about 1650 m., April 12, 1943, *Lundell 13009*, a small tree, 10 cm. in diameter, 4 m. high, flowers white; Ejido Campanilla, San Felipe de las Minas, near Huajupa, San Lorenzo River watershed, on mountain slope, alt. about 1700 m., April 27, 1943, *Lundell 13012*, a small tree, 30 cm. in diameter; same locality and date, *Lundell 13013;* Otaes, April 26, 1943, *Lundell 13080*, seeds collected in that vicinity.

Vernacular names: "cucaracho", "chilte rojo", chiquete", "chilte", "chicle", "chilte colorado".

*C. elasticus* evidently has closest affinity to *C. tubulosus* (Muell. Arg.) I. M. Johnst., but differs at once from that species in having mature leaves glabrous except along the primary veins, and larger seeds 1.7 to 2.3 cm. long. Other characteristics which set apart the species are its dichotomous branching, distinctive papery red bark which peels off in sheets, entire leaf margin, large staminate and pistillate flowers (1.7 to 1.8 cm. long), stamens borne in two whorls at the apex of the staminal column, and fleshy beaked capsules up to 3.5 cm. long. A peculiarity of this species,

and also of *C. tepiquensis* (Cost. & Gall.) Lundell,[1] is the prevalence of trees bearing only staminate flowers.

In much of its range, *C. elasticus* is known as the *cucaracho* tree, so called because of the fancied resemblance of its seeds to small spotted cockroaches.

The species is found at altitudes of from 500 to 1750 meters in the Sierra Madre of the states of Durango and Sinaloa, Mexico where it is restricted apparently to the upper watersheds of the San Lorenzo, Elota, Piaxtla, and Baluarte rivers. In this area there are three distinctive vegetation zones: (1), the deciduous scrub forest, a low open growth of arborescent species usually less than 10 meters high, occupying the belt extending from the river and arroyo beds up to an altitude of from 1200 to 1750 meters, depending upon the exposure; (2), the oak-grass savanna, a narrow belt between the deciduous scrub forest and the pineland, occurring at altitudes of from approximately 1200 to 2000 meters; and (3), the pine forest, the covering of the peaks above 2000 meters.

The principal tree associates of the *cucaracho* are species of *Bursera, Erythrina, Bombax, Ceiba, Plumeria, Ipomoea,* and various unidentified Leguminosae. In habit, color, and bark characteristics, the species of *Bursera* so closely resemble the chilte producer as to be easily confused with the latter. In April, when practically every plant is leafless, *C. elasticus* is one of the few trees in flower.

*C. elasticus* usually occurs in small stands in shaded ravines immediately below the oak-grass savanna, and in ravines which extend upward through the oak-grass savanna. It has not been encountered in the pine forest. The rocky ravines which are its home have slopes of from 30 to 90 degrees. Some mountain peaks contain no more than two or three stands of the trees because of its limited habitat;

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[1] *Cnidoscolus tepiquensis* (Cost. & Gall.) Lundell, comb. nov. *Jatropha tepiquensis* Cost. & Gall., Rev. Gen. Bot. 18: 388. 1906.

In the interpretation of the Mexican species of *Cnidoscolus*, frequent use has been made of the mimeographed report, "The Mexican species of Jatropha", prepared by Rogers McVaugh of the United States Bureau of Plant Industry.

often these small stands are a mile or more apart in the most difficult kind of terrain imaginable. Some stands of the species contain as many as a thousand trees, but the average is below fifty; in many localities, only a few, five to twenty trees were found. Our estimate is that there are not more than five hundred thousand trees of *C. elasticus* in Durango and Sinaloa.

Highland chilte, the gum from *C. elasticus,* has a rubber content ranging from 44 to 50 per cent. This rubber, the subject of exhaustive laboratory tests, compares favorably in quality with the best *Hevea* rubber. From the wild stands, our estimate of maximum production is 500 tons of gum annually.

*C. elasticus* exhibits a definite wound stimulus reaction to tapping. In the wild it may be bled at weekly intervals for four months each year, October through January, by shaving the original incisions in each panel with an amazonas knife. Indications are from initial field tests that the average annual yield per tree will approximate two pounds of dry gum with conservative tapping practices. The latex coagulates naturally overnight. If placed in containers to form fifty pound blocks, this method of preparation for market is most satisfactory. The moisture content of such blocks ranges from 25 to 50 per cent. The addition of water to the latex brings about immediate coagulation, but the gum rapidly putrefies when treated in this manner.

### Other Sources of Chilte

Another species yielding a gum similar to highland chilte is *C. tepiquensis,* a tree which is known to range from Concordia in the State of Sinaloa southward in the coastal region through Nayarit into northern Jalisco as far south as Tomatlan. The best stands of this tree are in Municipio Puerto Vallarta, Jalisco near the known southern limit. *C. tepiquensis* is usually called *chilte blanco.* Its gum has an average rubber content of approximately 30 per cent.

*C. elasticus* and *C. tepiquensis,* the only known sources of chilte gum, may be distinguished readily in the field as follows:

Tree with stout boles not over 3 meters high; bark reddish, peeling off in thin papery sheets; branching dichotomous, stag-horn in appearance; lobes of mature leaves with entire margin; flowering in April and May; found in highlands usually at an altitude of from 500 to 1750 meters; restricted to Durango and Sinaloa..... *C. elasticus.*

Tree with boles up to 20 meters high; bark whitish, not peeling off; branching verticillate, the branches usually in whorls of 3 or 4; mature leaves with spatulate lobes cuspidate-dentate above the middle; flowering in June and July; found in wet lowlands at an altitude of from 5 to 500 meters; apparently restricted to southern Sinaloa, Nayarit, and Jalisco..... *C. tepiquensis.*

In view of the economic possibilities of the two species, particularly *C. elasticus,* seeds of both trees were gathered. Plantings to test the adaptability, and plantation possibilities, of *C. elasticus* were made in March, 1944 at the Agricultural Research Station of the Institute of Technology and Plant Industry of Southern Methodist University at Dallas, and in April, 1944 in the Rio Grande Valley of Texas.

A technical report covering in detail the field investigations of the sources of chilte, and the progress of the test plantings of the two species, will be published elsewhere.

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# Concretions in the Woodbine Sands Near Irving, Texas

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## Introduction

It is the purpose of this paper to describe field relations of a group of concretions found in the Woodbine sands of the Cretaceous Gulf Series. The concretions studied are in the eastern part of Tarrant County, north-central Texas. The locality is six and a half miles west of Irving, Texas, along the road that parallels the Rock Island Railway. For a mile along the road the concretions are well exposed in the Woodbine croppings and are sectioned in road cuts.