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Honduran *Smilax* L. (zarzaparrilla) (Liliales, Smilacaceae): an estimate of the amount of plants required for the Boston 1855 exports

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Abstract. The genus *Smilax* L. has a long history of ethnobotanical uses. Zarzaparrilla was exported from Latin America to Europe for over five centuries to treat syphilis. In 2013, *Smilax* rhizomes collected from Cortés, Honduras were dried and weighed: one *Smilax febrifuga* Kunth (*cuculmeca blanca*), one *Smilax officinalis* L. (*zarzaparrilla*), and two individuals of *Smilax domingensis* Willd. (*cuculmeca*). The fresh weights of each rhizome were 2.32 kg, 0.52 kg, 0.71 kg, and 24.40 kg, respectively. These values were used to estimate the number of plants needed to meet the 23,405 kg of zarzaparrilla that arrived in Boston in 1855 from Honduras. The weights obtained suggest that to reach the 23,405 kg exported, 10,088 individuals of *S. febrifuga* would be needed. In the case of S. *officinalis,* 45,010 would be needed and for *S. domingensis*, 32,965 young or 959 mature would be necessary. The demand of *Smilax* (to ineffectively treat syphilis) in combination with deforestation reduced their populations in Honduras. The amount of zarzaparrilla exported from Honduras in 1855 may have been three times the amount that arrived in Boston given that while in Jamaica, ships were unloaded and their zarzaparrilla cargo was subdivided into boats destined for Habana, London, and Boston. A list of *Smilax* species currently known from Honduras, a review of other ethnobotanical uses, and a discussion of common names for *Smilax* in the Antilles and Mesoamerica is presented.

Key words: Commercialization, cuculmeca, extraction, exportation, syphilis.

Smilax L. (zarzaparrilla) (Liliales, Smilacaceae) en Honduras: un estimado de la cantidad de plantas requeridas para la exportación a Boston en 1855

Resumen. El género *Smilax* L. tiene una larga historia de usos etnobotánicos. La zarzaparrilla fue exportada de Latinoamérica a Europa y utilizada como tratamiento para la sífilis por más de cinco siglos. En 2013, en Cortés, Honduras, rizomas de *Smilax* fueron colectados, secados y pesados, obteniendo: un individuo de *Smilax febrifuga* Kunth (cuculmeca blanca), uno de *Smilax officinalis* L. (zarzaparrilla), y dos de *Smilax domingensis* Willd. (cuculmeca). El peso fresco de cada rizoma fue de 2.32 kg, 0.52 kg, 0.71 kg y 24.40 kg, respectivamente. Estos valores se usaron para estimar el número de plantas necesarias para alcanzar los 23,405 kg de zarzaparrilla exportadas desde Honduras a Boston en 1855. Los pesos antes mencionados indican que al menos 10,088 individuos de *S. febrifuga* fueron necesarios para alcanzar los 23,405 kg exportados. En el caso de *S. officinalis*, 45,010 plantas hubieran sido necesarias y para *S. domingensis*, al menos 32,965 plantas jóvenes o 959 plantas maduras tuvieron que haber sido exportadas. La demanda de *Smilax* (para inefectivamente tratar la sífilis) junto con la deforestación, redujo la población de este género en Honduras. La cantidad de zarzaparrilla exportada desde Honduras a Boston en 1855 pudo haber sido tres veces mayor, ya que los barcos descargaban en Jamaica, donde el cargamento se dividía en botes con destino a la Habana, Londres y Boston. Se enlistan las especies de *Smilax* que se conocen en Honduras, se hace una revisión de otros usos etnobotánicos y se discuten los nombres comunes de *Smilax* en las Antillas y Mesoamérica.

Palabras clave: Comercialización, cuculmeca, extracción, exportación, sífilis.

Introduction

In every part of its global natural distribution, *Smilax* L. has been used to treat different ailments. An European medicinal use for *Smilax*, especially *S. china* L., was as an ointment to treat skin sores. This well-

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known use is an important reason why Latin American *Smilax* species became extensively used to treat syphilis. Another use for *Smilax* in Europe was to make a non-alcoholic drink known as root beer.

Smilax was exported from Latin America to Europe in varying amounts for 500 years. The mid-nineteenth century was the peak time for *Smilax* exports to Europe from Latin America to treat syphilis. In addition to the large exports reported by Pereira (1855) and Wells (1857), Robles and Villalobos (1998) reported that *Smilax* was the main export from Iquitos, Peru in 1853. They (Robles and Villalobos 1998) also indicated that plants taken to Europe were transplanted, grown as crops, and harvested for medicine. After the transplanted plants were in production, the imports from Latin America slowly declined.

The objective of this study was to estimate the number of plants needed to match the quantities historically exported from Honduras to Boston in 1855. Wells (1857) presented the weight of the exported bundles, but there is no data on the weight of the individual rhizomes or roots. To provide these data four individuals from three species were dug up. Their weights were used to estimate the number of plants required to match the amounts reported by Wells (1857).

Methods

On July 5, 2013, the authors searched for native *Smilax* species in the Department of Cortés, Honduras. The collection area was about 5 km west of Lake Yojoa, at 14.5 °N and 87.4 °W, and 620–700 m elevation. One collection was made near a well-traveled trail near PANACAM lodge (*Parque Nacional Cerro Azul Meámbar*). The other three collections were made at two sites about 20–40 m lower in elevation, near Plan de Yure. Plan de Yure is located 2–3 km west of PANACAM lodge. All collection sites had subtropical humid or subtropical very humid forests. Average annual precipitation at the collection locations was 1,600–2,000 mm with annual temperatures ranging from 21–26 °C. The highest amounts of precipitation and the lowest ambient temperatures occur from November to January. The lowest amounts of precipitation and highest ambient temperatures occur from February to March.

Five people searched both sides of the trails and roads looking for the plants. One *Smilax officinalis* L. root was collected near a well-traveled trail near PANACAM lodge. Large *Smilax domingensis* Willd. rhizomes were collected close to the road and near Plan de Yure. The rhizomes from two other species were collected about 500 m west of the second location. All four plants were excavated with a pick, and herbarium specimens were collected. Vertical and horizontal rhizomes were collected to the point where the rhizome diameter was less than 2–3 cm.

After the rhizomes were cleaned of all soil fresh weights were taken using a digital balance (Table 1). Dry weights were determined after the rhizomes were placed in an open air, light bulb drier for 28 days and then placed in the sun for another 8 days.

Table 1. Fresh and dry weights for four *Smilax* rhizomes excavated in Honduras.

	Fresh weight (kg)	**Dry weight (kg)**	**Number of clonal sprouts**	**Individuals needed to match 23,405 kg (1855 exports)**
Smilax domingensis (One young plant)	0.71	0.36	None seen	32,965
Smilax domingensis (One mature plant)	24.40	14.60	None seen	959
Smilax febrifuga	2.32	0.91	5	10,088
Smilax officinalis (One young plant)	0.52	0.24	None seen	45,010

The collected plants have the following information: 1) *Smilax domingensis* (*cuculmeca, diente de chucho, palo de la vida, bejuco de la vida*) Hazlett #14,341, HEH, EAP: two individuals (Fig. 1); 2) *Smilax febrifuga* Kunth (*cuculmeca blanca*) Hazlett #14,339, HEH, EAP: one individual (Fig. 2), and 3) *Smilax officinalis* (*zarzaparrilla*) Hazlett #14,340, HEH, EAP: one individual.

Results

The root weight data in this study allow for a rough calculation on the number of plants needed to match the old records. The large rhizomes of *S. domingensis* and of *S. febrifuga* collected were tuberous. Tuberous rhizomes would have been transported as slices or chips. The exported zarzaparrilla bundles reportedly had long rhizomes with small diameters; tubers from these two species were probably not among the exports. Fibrous rhizomes and stems of *S. officinalis* were probably among those exported.

The larger of the two *S. domingensis* had a large tuberous root that weighed 24.4 kg. It extended to about 1.3 m in one direction and 0.3–0.5 m in another (Figure 1A). The cross sections of its rhizomes varied in diameter from 4–15 cm (Figure 1B). Wells (1857) indicated that some of the rhizomes exported from Honduras in 1855 were red. The reddish-brown color of these rhizomes suggests that a plant of these characteristics might have been one of the exported. When the 24.4 kg fresh weight of this large root was used to calculate the number of plants needed to match the 23,405 kg (51,600 lb) of zarzaparrilla reported by Wells (1857), 959 individuals of this plant would be needed (Table 1). The smaller of the two *S. domingensis* collected did not have a well-developed tuber. A small plant like this would require 25,720 individuals to reach Well´s 23,405 kg (Table 1).

Smilax febrifuga smaller diameter rhizomes, especially those at the base of the stem, were light pink in color and weighed 2.32 kg fresh; 10,088 of these plants would be needed for Well´s 23,405 kg (Figure 2, Table 1). Finally, *S. officinalis* had rhizomes that weighed 0.52 kg fresh, meaning 45,010 plants of this characteristics would be needed (Table 1).

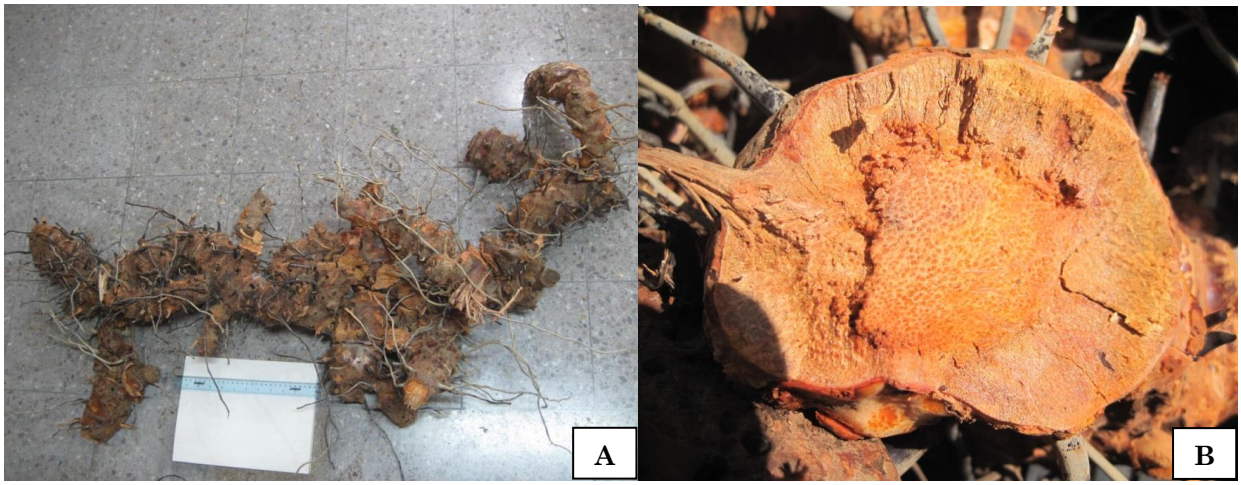

Figure 1. *Smilax domingensis*: A) an entire 14.4 kg rhizome excavated in Honduras; B) cross-section (6–8 cm) of this reddish brown rhizome (photos: Luis Bejarano).

The rhizomes of the small *S. officinalis* plant extended laterally to about 20 cm from the base of the root. The rhizomes weighed only 0.5 kg. Rhizomes from 2–5 plants were required to make one of the 2.5–4.0 bundles reported by Wells (1857). This number is similar to the 2–3 plants per bundle reported by Gibbons (1871).

Greater rhizome weights than those reported here can occur on a single *Smilax* plant. For example, Austin (2004) reported the excavation of *S. auriculata* Walter rhizomes in Florida, United States. After he collected a bushel of rhizomes, this plant continued to sprout up as if none had been collected. Experienced collectors in Honduras were probably able to field identify plants with more rhizomes at the time. We did not weigh the aboveground stem, but if those were included, fewer plants would be required to make a bundle. Despite the small sample, thousands of *Smilax* plants must have been collected to meet the reported export amounts from Honduras.

In combination with deforestation, the centuries of *Smilax* exportation to, ineffectively, treat syphilis greatly reduced their population in Honduras and Mesoamerica in general. Other plants, for example, *Chichona officinalis* L. (*i.e.* quinine bark to treat malaria) were also exported to Europe to treat diseases but never at the *Smilax* quantities.

Figure 2. *Smilax febrifuga* rhizomes (2.3 kg) excavated in Honduras: note the characteristic scales for this species.

Common names

The most cited common name for *Smilax* is zarzaparrilla or *sarsaparrilla*. This word is from *zarza* (prickle or bramble) and *parrilla* or *varilla* (small bar or rod). Together they suggest a vine with prickles. At least four Honduran *Smilax* species have been called zarzaparrilla or sarsaparrilla: *S. domingensis*, *S. officinalis*, *S. aristolochiifolia* (House et al. 1995, Nelson-Sutherland 1986 & 2008), and *S. moranensis* M. Martens & Galeotti (Monroy-Ortiz and Castillo-España 2007). Zarzaparrilla is also the common name for *S. officinalis* in Costa Rica (Robles and Villalobos 1998). In Sololá, Guatemala the common name *bejuco de la vida* is reported for at least three *Smilax* species: *S. officinalis*, *S spinose* Mill., and *S. subpubescens* A. DC. (MacVean 2006).

Martínez (1944) reported three Náhuatl names for *Smilax* species. One of these is *mecapatli* (*mecapalli* = cord & *patli* = medicine) that suggests a cord-like plant that is used for medicine. Another Náhuatl name is *quauhmecpal* (*quauitl* = tree; *neca* = not useful). The *neca* suffix may be *meca*, suggesting a cord. However, if *neca* (not useful) is correct, this may refer to the spines on *Smilax* that make it 'not useful' as tying material. A Mayan name for *Smilax spinosa* is *xkokeha*.

Another New World name for some *Smilax* species is *cuculmeca*, name that is shared with species from *Dioscorea* R. Br (Dioscoreales, Dioscoreaceae). The word *cuculmeca* or *cuculmeco* is apparently derived from the Náhuatl *cuculi* (disease: pain or disease) and *miqui* (death). In Honduras, at least three *Smilax* species are called *cuculmeca*: *S. domingensis*, *S. febrifuga*, and *S. spinosa* (House et al. 1995, Nelson-Sutherland 2008). Monroy-Ortiz and Castillo-España (2007) listed both zarzaparrilla and *cuculmeca* as common names for *S. spinosa* in Mexico. Both Mexico and Costa Rica use *cuculmeca* as a name for *S. cordifolia* Humb. & Bonpl. ex Willd. and *S. officinalis*. In Costa Rica and Panama *cuculmeca* is used for *S. chiriquensis*, but in Mexico *cuculmeca* is *S. pringlei* Greenm. (Monroy-Ortiz and Castillo-España 2007).

Cuculmeca is an unreliable name to identify the plants since species of both *Smilax* and *Dioscorea* share the name. Honduran *Dioscorea* plants named *cuculmeca* include *D. cyanisticta* Donn. Sm., *D. polygonoides* Humb. & Bonpl. ex Willd., and *D. urophylla* Hemsl. (House et al. 1995, Nelson-Sutherland 2008). *Dioscorea macrostachya* Benth. is also known as *cuculmeca* (Williams 1981). The Flora Mesoamericana (Huft, 1994) has *colcomeca*, as a common name for *D. bartlettii* C.V. Morton. The *Biblioteca Digital de la Medicina Tradicional Mexicana* (2009) calls *S. spinosa* zarzaparrilla, but includes *cocolmecatl* and *cocolineca* as regional variants.

American *Smilax* species were recognized as similar to European species. European common names, especially 'China root' for *S. china*, were also used for American species (Austin 2004). A few of these reused, modified, or derived names are China-brier (*S. auriculata* Walter), *bejuco chino,* chainey-brier (*S. tamnoides* L.), *raíz de China* (Cuba), chaney-winder, chaney-wine, chaney vine, chany or chaney root (Nicaragua: Creole), *chiny* (Miskito), and *alguma raiz ou pau de China* (Portuguese: some root or stick from China). In Panama, China Root is used for *S. cordifolia* Humb. & Bonpl. ex Willd. For Florida, United States, Austin (2004) summarized the different indigenous names and uses for *Smilax*.

Taxonomy

The dioecious habit and within-species heteroblasty (variability in the leaf shape and size) has created considerable problems concerning the species taxonomy. Duke et al. (2009) referred to this confusion as a taxonomic quagmire. The absence of diagnostic aboveground features in the genus has led to a classification based on root anatomy. Mabberley (2008) reported over 350 described species worldwide. Mabberley (2017) lists 260 species, 90 less than his 2008 paper. The recent Vascular Plants of the New World database (Ulloa Ulloa et al. 2017) listed 122 *Smilax* species in the Americas contrasted with the 29 species listed by Mabberley (2017).

In Honduras, Nelson-Sutherland (2008) listed 12 *Smilax* species while Ferrufino-Acosta (2010) recognized 10. The ten species recognized by Ferrufino-Acosta (2010) are 1) *S. domingensis*, 2) *S. febrifuga*, 3) *S. mollis* Humb. & Bonpl. ex Willd., 4) *S. moranensis* M. Martens & Galeotti, 5) *S. officinalis*, 6) *Smilax regelii* Killip. & C.V. Morton, 7) *S. spinosa* Houst. ex Mill., 8) *S. subpubescens* A. DC., 9) *S. velutina* Killip & C. V. Morton, and 10) *S. aristolochifolia*. *Smilax aristolochiifolia* is now considered a synonym of *S. officinalis* (Givnish 2017), reducing the known *Smilax* species for Honduras to nine.

***Smilax* ethnobotany**

The most mentioned medicinal benefit for *Smilax* include its use as an antiseptic, anti-inflammatory, and to treat arthritis. Galeano and Galeano (2007) listed several uses for *Smilax officinalis* in Honduras. External uses were to treat skin fungi, skin ulcers, inflammations, rashes, and itches; internal uses were as a sudorific, carminative, diuretic, as well as a treatment for colds, anemia, to "purify the blood", and to improve digestion. After the arrival of the Spaniards, the use of *Smilax* to treat syphilis became the most prevalent.

Smilax spinosa (as *S. mexicana)* is used as a crown of thorns on figures of the Christ in Mayan churches in Mexico (Leach and Jerome 1950). Nelson-Sutherland (2008) reported similar uses in Honduras for *S. febrifuga* (*corona de Cristo*) and *S. officinalis* (*coronilla*). House et al. (1995) and Ferrufino-Acosta (1999) indicate the use of *S. domingensis* in Honduras to treat anemia ("strengthen blood"), increase the "flow of normal vaginal fluids", to regulate menstrual cycles, to increase female fertility, to treat venereal diseases,

and to clean the womb after childbirth. Ferrufino-Acosta (1999) also reports the use of *S. subpubescens* as a mooring for house construction and as material of basket making.

The bubbly or soapy saponin content in the European *S. aspera* is important in the production of a non-alcoholic beverage first known as small beer (Bethard 2004). The recipe for small beer was to boil bitter *S. aspera* rhizomes, minimally ferment this liquid, and add a mixture of herbs and sugars. The saponin-rich plant gave this light brown beverage a slightly bitter flavor and a foamy head. These traits simulated that of beer make from hops and led to the "root beer" common name. This root beer brewing concept was exported to other countries. In Australia, a local species (*S. glycyphylla* Hassk.) was used to make a sweet tea that was popular until the 1930s (Mabberley 2017).

When syphilis first appeared in Europe, a mercury-based ointment called *unguentum saracenium* was used to treat its scabies (Crosby 1972). Unfortunately, the patients became ill or died from mercury poisoning. Other European remedies for syphilis in the 1500s included the use guaiacum (*Guaiacum sanctum* L.) and zarzaparrilla (often *S. china*). While Europeans continued to suffer with syphilis, the discovery of *Smilax* species in the New World presented the possibility of new and better treatments. Zarzaparrilla began to be exported from Latin America to Europe in the early seventeenth century from Mexico followed by "Honduras" (probably both British and Spanish) and continue to be exported until the mid-nineteenth century (Gibbons 1871). By the beginning of the seventeenth century, the more spectacular outbreak of syphilis had begun to diminish but not thanks to the use of *Smilax*.

***Smilax* 1855 exports from Honduras**

An eighteenth century account of zarzaparrilla by (Wells 1857) described Honduran zarzaparrilla as a "vine of thorns" that grows wild throughout Honduras; with greater concentrations —thus more available for collection– in the Olancho department. Wells (1857) further described Honduran zarzaparrilla rhizomes as grayish-brown in color with a few scarlet or red root (perhaps another species). He also indicated that indigenous peoples would excavate and sell zarzaparrilla to intermediaries for export. The intermediaries would sort rhizomes into two qualities (criteria unknown) and would tie rhizomes and aboveground stems/vines into bundles that measured about 30 cm long and weighed 1.36–5.44 kg. These bundles were consolidated into larger bales that weighed 3–5 *arrobas* (one *arroba* is 25 lb [11.3 kg]). Gibbons (1871) reported that a pound (0.45 kg) of Honduran zarzaparrilla was sold for 7–15 denarius (same as a pence, equal to 1/12 shillings). Ten pence in 1855 was equivalent in 1999 to $27 US dollars. Gibbons (1871) also indicated that one pound of dry *Smilax* would yield one-half ounce of medicinal extract. There is a preserved bundle of Honduran zarzaparrilla in the Museum of the Pharmaceutical Society, London. This bundle is 76.2 cm long, has a diameter of 25–30 cm, and weights 7.7 kg. Bundles were tied into larger bales for transport to the Honduran port cities of Omoa and Trujillo.

Pereira (1854) reported that *Smilax* imported into Jamaica from 1840–1845 was Honduran zarzaparrilla (perhaps *S. officinalis*). Pereira (1854) indicates that zarzaparrilla bundles in Jamaica averaged 43 cm length and 0.68 kg and weighed 36.2–54.4 kg each. Wells (1857) information of Honduran exports to the United States came from Mickerson and Company in Boston, MA. Wells (1857) found that 516 bales of zarzaparrilla were imported on eight shipments from Omoa and Trujillo to Boston in 1855. At 100 lb per bale (45.3 kg) (conservative estimate), this is about 51,600 lb (23,405 kg) of *Smilax*. The actual amount of zarzaparrilla exported from Honduras in 1855 may have been three times the amount that arrived in Boston given that while in Jamaica, ships were unloaded and their zarzaparrilla cargo was subdivided into boats destined for Habana, London, and Boston (Wells 1857).

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