The Economic Botany of *Manilkara zapota* (L.) Van Royen

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America is well versed in the use of a byproduct of the plant *Manilkara zapota* (L.) Van Royen, yet few people are aware of this product's history. Chewing gum has its origins in the economic botany of the Chicle tree (*M. zapota*). Throughout Mexico and Central America, the Sapotaceae plant family is recognized for its latex. *Manilkara zapota* (synonym: *Achras zapota* L.) is an evergreen canopy tree of medium size (15-30 meters in height) native to Central America, which is currently cultivated throughout the tropics of the world (Castner, Timme, & Duke, 1998). The Sapotaceae (Soapberry family) belongs to the Ebenales order along with the Ebenaceae, Styracaceae, Lissocarpacee, and Symplocaceae according to the Cronquist system of plant classification (Jones & Luchsinger, 1986).

Historically, *M. zapta* was an important source of timber and latex in the new world tropics (Janzen, 1983). The latex is a milk-white exudate produced in laticifer canals under the phloem bark surface (Simpson & Ogorzaly, 1995). The latex is known as chicle, which had its highest demand during the rubber boom of tropical America in the 1800's. When the United States and Great Brittain established Rubber tree (*Hevea* spp.) plantations in southeast Asia in 1876, the rubber boom occurred in tropical America. Economies were left helpless and Indian rubber collectors were massacred (Hill, 1996; Stanfield, 1998). The Chicle tree (synonyms: Sapodilla, Naseberry, Nispero) was the lone latex plant to economically survive.

The Mayan Indians of Mexico and Central America traditionally have chewed the raw chicle latex. Furthermore, Aztec prostitutes loudly snapped their chewing gum to advertise their trade during the height of pre-Columbian Aztec civilization (Plotkin, 1993). This custom was common to many Mexicans, including an eccentric political leader from Veracruz. He is Antonio Lopez de Santa Anna, eleven time president of Mexico (born 1794, died 1876). His military prowess is capped by success at the battle of the Alamo (1836), where Santa Anna's troops killed Davy Crockett and Jim Bowie (Simpson & Ogorzaly, 1995). His eccentric political ways got him exiled to the West Indies. The U. S. Secretary of State, William Seward, payed Santa Anna a visit in the West Indies. Assuming he gained Seward's trust, Santa Anna sailed to New York in 1866. Santa Anna's shipmates stole his money, leaving him stranded in America where Santa Anna was turned away by Secretary of State Seward.

The exiled Mexican president was a wise businessman and politician who brought some chicle with him to New York. He hoped to find an inventor who could make rubber from the chicle latex, so Santa Anna could finance his return to political power in Mexico. Thomas Adams agreed to experiment with the latex, so Santa Anna returned to Mexico in March 1867 to arrange the shipment of two tons of chicle to New York. In short, Adams failed to invent a usable elastic product out of chicle. He was left with hundreds of pounds of chicle sitting around.

At the time, chewing gum was made of sweetened paraffin wax, which was not very chewy. Adams decided to mix the Mayan use of chicle with the chewing gum (wax) concept of the day to produce a new industry. He heated the latex until it softened, added sugar, and molded this into balls to be sold at drug stores. This chewing gum was an instant success, in part due to the popularity of chewing tobacco (*Nicotiana tabacum*) in the late 1800's. The chewing gum industry of today originated with Adam's invention. In fact, he added flavorings to the gum and patented the first machine for manufacturing chewing gum. Today corn syrup, countless flavorings, and hard sugar coatings are added to chewing gum. A direct link to economic botany in today's chewing gum industry is the brand, Chiclets, whose name recognizes the Chicle tree as its historic source.

The Indians who tap the *M. zapota* tree for chicle are known as chicleros (Simpson & Ogorzaly, 1995; Castner, Timme, & Duke, 1998; Hill, 1937; Stanford, 1934). This title typically denotes a devoted Indian who carefully and precisely cuts zigzag gashes in the bark of the Chicle tree with a machete. The Maya Indian chicleros can occasionally still be found tapping for chicle up to fifty feet high in the *M. zapota* trees. The latex follows the gashes down to the base of the tree where it is collected in containers. The latex is consists of 20-25 percent chicle (Hill, 1937). The best time to tap the Chicle trees is during the mornings of the wet season (June to February) when the latex flow is greatest (Stanford, 1934). One flow lasts several hours and may yield up to 60 quarts of impure latex (Hill, 1937). A single tree must heal itself, so 2-6 years should occur between harvests. The raw latex is boiled to coagulate it into crude white chicle that is molded into blocks of 20 pounds. This boiling process takes skill to properly gauge when the chicle is at 33 percent moisture content and needs to be poured off (Hill, 1937). The components of crude chicle are resin, gutta, arabin, calcium, sugar, and various soluble salts. The blocks of chicle are shipped to the U. S. to be used as the base in chewing gum. The gum machinery that Adams patented is used to purify, clean, dry powder, reheat, and compound the chicle with flavoring materials. One tree yields 2.5 pounds of crude chicle (Stanford, 1934). Every 13 pounds of processed chicle makes approximately 5000 pieces of chewing gum (Hill, 1937). In the 1930's each piece of gum contained 15 percent chicle, and sugar, chicle substitutes, and flavoring substances.

Today, with the push for sustainable production of tropical forests, chicle is still harvested on a small scale as a non-timber forest product (NTFP). Green Industries promote the sale of rain forest products to economically well off consumers, but it is believed that public policy makers have failed to recognize the profitability of NTFP's like chicle (Balick & Cox, 1996). According to Mark Plotkin (1993), "Fortunately, enough demand for chicle persists that a portion of the rain forests of Mexico, Guatemala, and Belize are still protected and managed for this product [chicle]."

Even more common today is the harvest of the edible fruits of the *M. zapota* tree. It is considered one of the best fruits in tropical America (Hill, 1937). The rough brown fruits are 3-4 inches with yellowish-brown flesh that is translucent, very sweet, and wholesome. *Manilkara zapota* has a round berry type fruit available year round (Castner, Timme, & Duke, 1998). Many people grow the Chicle tree for its fruit in Florida, and the old world tropics.

Lastly, there are 50 species in the *Manilkara* genus, so if you have interests in latex, rubber, or resin-producing plants, *Manilkara* or the sister genus *Mimusops* of the old world tropics are good starting points (Record & Hess, 1943). Many of these species are considered prized hardwood timbers with mahogany-like wood. Chicle gum is now being harvested from trees of a different plant family, the Apocynaceae. Some of these chicle alternatives are *Couma rigida* M. Arg. (15 percent rubber), *Macouben guianensis* Aubl. (5 percent rubber), *Zschokkea pauciflora* (Kuhlm.) Monac. (7 percent rubber), *Z. lactescens* Kuhlm. (natural vanilla scented chicle rubber), and *Brosimum gaudichaudii* Trec. from the Moraceae (natural Chiclet-like gum in the fruit, utilized raw as a chewing gum) [Mors & Rizzini, 1966].

Literature Cited

Balick, M. J., and P. A. Cox. 1996. Plants, people, and culture: the science of ethnobotany. Scientific American Library, New York.

Castner, J. L., S. L. Timme, and J. A. Duke. 1998. A field guide to medicinal and useful plants of the upper Amazon. Feline Press, Gainesville, FL.

Hill, A. F. 1937. Economic botany: a textbook of useful plants and plant products. McGraw-Hill Book Company, New York.

Hill, J. 1996. History, power, and identity: Ethnogenesis in the Americas, 1492-1992. University of Iowa Press, Iowa City.

Hylander, C. J., and O. B. Stanley. 1941. Plants and man. The Blakiston Company, Philadelphia.

Janzen, D. E., ed. 1983. Costa Rican natural history. The University of Chicago Press, Chicago.

Jones, S. B., and A. E. Luchsinger. 1986. Plant systematics. McGraw-Hill Inc., New York.

Mors, W. B., and C. T. Rizzini. 1966. Useful plants of Brazil. Holden-Day Inc, San Francisco.

Plotkin, M. J. 1993. Tales of a shaman's apprentice. Penguin Books, New York. Record, S. J., and R. W. Hess. 1943. Timbers of the new world. Yale University Press, New Haven, CT.

Simpson, B. B., and M. C. Ogorzaly. 1995. Economic botany: Plants in our world. McGraw-Hill Inc.,

New York.

Stanfield, M. E. 1998. Red rubber, bleeding trees: violence, slavery, and empire in northwest Amazonia, 1850-1933. University of New Mexico Press, Albuquerque.

Stanford, E. E. 1934. Economic plants. D. Appleton-Century Company, New York.

Terborgh, J. 1992. Diversity and the tropical rain forest. Scientific American Library, New York.

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