CHICLE EXPLOITATION IN THE SAPODILLA FOREST OF THE YUCATAN PENINSULA[1]

Cyrus Longworth Lundell

The dominant forest tree of the virgin bush areas of the Yucatan Peninsula is the sapodilla, *Achras Zapota* L., important commercially as the source of chicle, the basis of chewing gum. From Cape Catoche to Lake Petén it is one of the most frequent species, characterizing this limestone region, which is a phytogeographic unit with a typical flora.

Various attempts have been made to account for the abundance of sapodilla trees in the forested areas of Yucatan (Fig. 1). An estimate, based upon actual counts of the number of trees per acre in representative areas, and the total area covered by the sapodilla forest indicates a minimum of one hundred million trees today in the region. That this tree was important to the ancient Maya as a source of timber, gum and fruit is well known, hence, the theory has been advanced that the tree was planted by the Maya. Professor H. H. Bartlett suggests the possibility that when the Indians made their *milpas* (agricultural clearings), they spared the sapodilla, which thus secured advantage over the other vegetation when the areas were abandoned to the jungle. Even today the Maya leave some of the *zapote* and

[1] **"Papers From the Department of Botany of the University of Michigan, No. 438."** The present article is based on data gathered by the writer during four seasons of study and exploration in the Yucatan Peninsula. The first two seasons, June, 1928, to January, 1929, and July to November, 1929, were spent in British Honduras as assistant physiologist of the Tropical Plant Research Foundation, supervising field experiments on **Achras Zapota**, under the direction of Dr. J. S. Karling of Columbia University. From October, 1931, to May, 1932, the writer was studying the sapodilla forest in Campeche and the Department of Petén, Guatemala in the interests of the chicle industry. The fourth season was spent in the savanna country of central Petén, from March to July, 1933, as botanist of the third Biological Expedition of the Carnegie Institution and the University of Michigan to the Maya area.

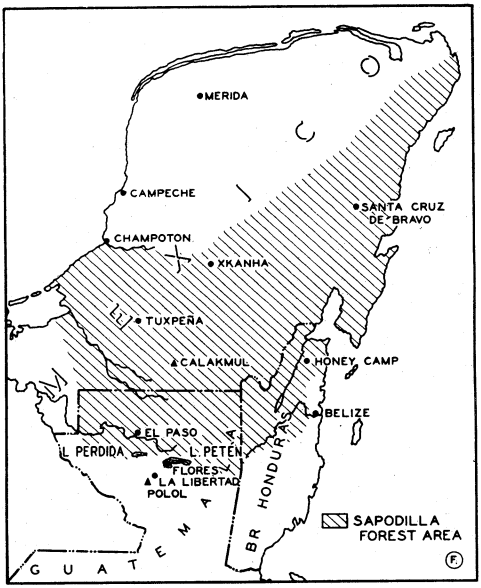

Fig. 1. Area covered by the sapodilla forest on the Yucatan Peninsula.

certain other trees in making a *milpa*, and this may well be an ancient practice that has survived the centuries. A critical study of *Achras Zapota* and its distribution suggests that its longevity has been an important factor in survival. The sapodilla has outlived the other trees, continued to reproduce, and thus made the virgin bush areas of the Yucatan Peninsula a forest of this species. The tree is tolerant, and many of the larger trees, some of which are three feet in diameter and one hundred and fifty feet high must date back to the time of the Southern Maya Culture, being at least a thousand years old.

Two extreme varieties of the tree, *zapote colorado* and *zapote blanco*, can easily be detected in the forest by the trained eye. These native names are based primarily on the color of the latex. The former variety is the more frequent with latex always reddish. The outer bark of *zapote colorado* can be readily distinguished by its continuous fissures. *Zapote blanco* has a whitish latex, often tinged pink.

On young trees the fissures of the outer bark of this variety appear shallow and not continuous. The cortex of *zapote blanco* is less fibrous than that of the red variety. As a result, in tapping, the cuts are cleaner, and this may account, in part, for the fact that the white variety gives a higher yield of gum.

The chicleros, native tappers, recognize a third variety, *zapote morado*. In supervising more than six thousand tappings in experiments on *Achras Zapote* at Honey Camp, British Honduras, the writer, however, saw only two trees said to be of this variety. Except for the fact that the latex was a darker red and slightly purple in color, these two trees could not be distinguished from the *zapote colorado* forms. Although botanical characters may not be found to characterize these varieties definitely in herbarium material, the extreme forms of the species designated as the red and white varieties are sufficiently distinct to be recognized.

The sapodilla is known in the Yucatan Peninsula under various names, of which no single one is used exclusively in any section. In the states of Yucatan and Campeche, and the Territory of Quintana Roo in Mexico, the most common vernacular name of the tree is *zapote*, while in the Department of Petén, Guatemala, it is *chicozapote*. In British Honduras the creole name is *sapodilly*. Throughout the Yucatan Peninsula, the Maya name for the tree is *ya*. A virgin rain forest area where *Achras Zapote* dominates is called a *zapotal*, an ecological term which I have adopted in my classification of the vegetational zones of the region.

Commercial Importance

Achras Zapota is important commercially as the source of chicle, the gum which gives the elastic qualities to chewing gum. As a durable hardwood timber tree of importance it was used extensively by the ancient Maya builders for lintels and supporting beams in their construction. Although planted throughout the tropical and sub-tropical world for its fruit, the "naseberry", so far as known, it grows only in the Maya area in sufficient numbers to be

tapped for gum. Here it is indigenous, and the only high-grade chicle is now obtained from trees growing in the Yucatan Peninsula. The area around Tuxpam, State of Vera Cruz, Mexico, was formerly a center of production, but the forest there has been largely depleted.

Chicle, as properly defined, is obtained from only one species, *Achras Zapota*. During 1927, 1928 and 1929, years of peak production, more than twelve million pounds of gum were annually exported from the chicle producing areas.

Tapping

The sapodilla is tapped during the wet season from June to February. The entire boles of the trees up to the crotch, and even the limbs are bled. The sole tool used is the machete, a long cutlass. The oblique series of tapping cuts extend around the bole, each series being about sixteen inches above the one below. They form a zig-zag or feather-stitch vertical channel where they meet, a modified herring-bone system of tapping; and down this channel the latex drains to the base, there to be caught in canvas bags (Fig. 2).

In the oblique series, the separate successive step-like cuts overlap enough to catch the latex from the ones above. A small bit of cortex is left undamaged between individual cuts, thus preventing the tree from being completely girdled, even though the tapping cuts extend completely around the tree and up the entire bole.

All the latex in the cortex eight inches above and eight inches below the cuts is drained out, and no more latex can be obtained from the drained area for a long period. The tapping wounds heal slowly, generally taking from two to five years, depending on the extent of the injuries to the cortex. Observations indicate that at least five per cent. of the trees die after each tapping. No tapped area will yield enough latex to justify retapping within five years at the least, and a longer rest period is preferable.

The thick, creamy latex drains slowly, and the collecting bags are often left attached overnight. Yields vary greatly, but the average production for the whole chicle area is less

than one pound of gum per tree from each tapping. In the Department of Petén the average yield per tree is higher, but it is rapidly declining. Although there have been reports of trees yielding as much as sixty pounds of gum in a single tapping, my own experience indicates a maximum yield now of less than five pounds from a tree.

Size of tree is no criterion of its potential yield, for very often small trees will yield more than those three feet in diameter. The chiclero chooses a tree by making a test cut in the cortex to determine if the latex flow is good. In interior regions where exploitation has not depleted the forest, only trees ranging from ten inches to two and a half feet in diameter are tapped. In more accessible areas which have been worked for many years, the chicleros tap every yielding tree ranging in diameter from six inches upwards.

Fig. 2. A chiclero at work with his long machete, the sole tool used in tapping the sapodilla tree, **Achras Zapota** L. Note the zigzag oblique series of step-like tapping cuts which form a feather-stitch vertical channel where they meet. The latex drains into a canvas bag at the base through this channel.

Gum Preparation

As latex ferments rapidly, it must be coagulated weekly. The latex is placed in metal kettles holding as much as fifty gallons, and boiled slowly until coagulation takes place. Constant stirring is necessary to prevent scorching. At first a few gallons are poured into the kettle, and then more added from time to time as coagulation takes place.

To obtain first quality, well-cooked chicle, the boiling requires from three to six hours. Latex coagulated in shorter time with a hot fire is likely to be scorched and smoked with some of the milk remaining uncoagulated in the gum, thus making the chicle crude, of inferior quality, and subject to early oxidation. The slow cooking is best accomplished by using red-hot coals obtained from burning hardwoods, that of the sapodilla wood itself being preferable.

When the moisture content of the gum reaches about thirty-three per cent. the chicle is well cooked. It is then placed in greased molds, forming blocks of from fifteen to thirty pounds weight. The chicle hardens in one day and is then ready for the long haul out of the jungle. From three to eight blocks are packed in a bale, and two bales make a mule load. As well cooked chicle retains its peculiar physical properties for about five years, it can be stored in considerable quantities.

Forest Destruction

Chicleros are paid by the pound for the gum they produce, so they obtain the largest possible yield from each tree, not giving heed to the damage done to the forest by injuring the trees. The cambium is severed by most of the cuts, and the cortex dries out, exposing the wood before callus has time to cover it. The trees are then attacked by bacteria, fungi and insects among which the woodborer *Strongylaspis corticaria*[2], is one of the worst pests.

A large part of the sapodilla forest in the Maya area has already been killed, and as estimated above, at least five per

[2]Thanks are due to Mr. A. J. Mutchler of the American Museum of Natural History for the determination of this beetle.

cent. of the trees die after each tapping. The present method of exploitation, although destructive, is nevertheless the most practical method under the conditions obtaining in the chicle producing areas. The cost of placing the chicleros under control would be prohibitive. There are probably as many as ten good chicle producing trees per acre in some of the least exploited areas in the interior. To obtain the twelve million pound production of 1927, 1928 and 1929, a minimum of twelve million trees would have to be tapped annually, calculating an average high yield of one pound per tree. As a general rule, not more than two trees on each acre could be tapped each year. It would therefore take a minimum of six million acres of the best sapodilla forest to yield the peak productions. To try to supervise tapping over such an extensive, wild territory covered with rain forest would be far too costly.

Conclusions

Achras Zapota is not a tree for plantation culture because of its apparently slow rate of growth and of the fact that a healing period of about five years is necessary betweeen successive tappings. Attempts to conserve the forest by substituting new tapping methods and tools less damaging to the tree, or by legislation reducing the area of the bole of the tree to be tapped annually are alike doomed to failure, unless the work of the chiclero is effectively supervised. As that would be impractical, because of the cost, the present system of exploitation will doubtless continue.

Since 1929, the demand for chicle has decreased annually until the 1933 production is only a small fraction of its former volume. This decline in the exploitation of the sapodilla forest has given the trees a rest and healing period of immeasurable benefit to the forest. Periodical rest periods for the producing areas would be a practical method of conservation which could be enforced.