THE CULTURE OF THE LYCHEE

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INTRODUCTION

For many centuries the lychee has been cultivated in China and esteemed as the king of all fruits; but it was unknown or neglected outside of China until the 19th century. This was largely due to the fact that lychee seeds are very short-lived. If not given special treatment, they lose their viability within a few days under ordinary conditions. In the past century the lychee has been introduced to Java, India, Cuba, the Philippines, Australia, Hawaii, South Africa, California and Florida. This little known fruit has gradually established a new home in the tropics and in subtropical regions outside of its native home, and is now grown on a commercial scale in some of these countries.

Only Kwantung, Fukien and Szechwan provinces grow the lychee in China. The Canton district of Kwantung is an important lychee center and perhaps the one best known to the world, but the most extensive production of lychee fruit is in Fukien, around Foochow, Hinghwa, Chuanchow and Changchow, among which Hinghwa has been most famous from ancient times until the present time. The Chen variety of lychee which the Rev. Mr. Brewster introduced from Hinghwa to this state in 1907 is the one my ancestors began cultivating many centuries ago. Mrs. Brewster was my English teacher in high school, and she still lives in Hinghwa. Tsai Hsiang and Sung Kao, who wrote the classical monographs on the lychee in the 11th century, were natives of my district. I have been intimately familiar with lychee growing from my earliest years. With this background and training, I can hardly fail to know something about lychee culture. In recent months I have received many letters from people in different parts of this state, asking me about the history and culture of the lychee. In this paper I have tried to bring together as much information as possible on these subjects, in hopes that it may be helpful to those who are developing a lychee industry in Florida. It is not possible in a short paper to give a complete discussion of an industry as complex as lychee growing in China today, but it may be of value to state some basic principles.

HISTORY

It is generally agreed that the lychee is native to South China, but the exact area is not known. I have studied many old Chinese writings about the lychee without being able to determine its exact origin. It is recorded in ancient Chinese history that the emperor Wu Ti, about 100 B. C. conquered the Nan Yueh, a small nation about where Tonkin now is. He transplanted hundreds of lychee trees thence to his capital at Chang An (the modern Sian) in Shensi province, and built a palace called Exalted Lychee Palace. In the next century the emperor Yung Yuan established fast runners every 5 miles to carry lychee fruits to Chang An from Kwangsi province, next to Tonkin, a distance of some 800 miles over mountains and rivers. In the 5th century A. D. the favorite concubine of the emperor Teng Pao was very fond of lychees. These were first obtained for her from Pei Chow in nearby Szechwan province (near Chunking), but it was learned that much better quality fruit was grown near Canton, and again fast runners carried fresh lychees some 800 miles as tribute each year. In the 11th century the capital was moved from Chang An to Ling An in Chekiang province, near Hangchow. This is the province next to Fukien, and about this time the Chen Purple and Sung Fragrant lychees of Hinghwa begin to be recorded as outstanding. It seems clear, therefore, that culture was first established near the border between China and Indo-China, and spread next to the Canton area and later into Fukien province. The lychee has not yet been found in truly wild form. The first Chen ancestor settled in Hinghwa around 400 A. D., and by the 11th century the Chen Purple lychee was

already famous, with some trees reputed to be 300 years old. Most of the ancient trees have been cut down, but there are still two trees of very great age at Hinghwa, one being nearly 6 feet in diameter and 75 feet high.

Natural Requirements

The lychee is adapted to the warm subtropics, thriving best in regions of brief winters with little frost and long hot summers with high humidity. Hinghwa is at latitude 25° N, about like Homestead. There is much fog in February and March, and rain or cloudy weather is common during April and May, so that one may not see the sun for a month or more. The lack of this type of spring weather in Florida is probably responsible for the tip-burn so often seen on lychee leaves here. A mature lychee tree about 100 years old with strong branches and deep roots, whose shade covers a quarter-acre, can endure considerable cold without injury. A heavy frost will only kill it back a little at the twig tips, and it will still blossom and fruit in spring. A young tree is, of course, much more sensitive, and the same heavy frost would kill it to the ground. The Chinese lychee grower burns straw under his young trees to protect them from cold. I have seen temperatures down to 9°F. in lychee orchards, with heavy snow on the ground (a most unusual sight in Hinghwa), and under these conditions the mature trees were killed back several feet. They did not bear again for two years, but were not permanently injured. In fully dormant condition mature trees have endured 11°F. with little injury. The winter temperatures at Gainesville are not so low as at Hinghwa, and I was much surprised to be told that it is too cold for lychees there. Later I understood that it is not consistently cool enough in North Florida for lychee trees to become and remain fully dormant.

Heavy rains during blooming are harmful, but during the period of fruit development, from April to June, it is essential to have abundant soil moisture. These are months of good rainfall in Fukien and Kwantung provinces, and in addition the trees are commonly grown along canal banks or on the edge of rice fields. A location with 4 or 5 feet of alluvial soil of high humus content, underlaid by a heavy clay, is best for both vigor of tree and quality of fruit. As we grow it at home, the Chen Purple lychee has 90% of its fruit with partly developed or shrunken seeds, which we call "chicken-tongued." This same variety here in Florida produce almost 100% of fully developed seeds, perhaps because of dry, sunshiny weather during pollination here.

Propagation

For a thousand years it has been the custom to propagate the best lychee seedlings by air-layering, a process often called "Chinese layering." A ring of bark is removed from a lychee branch about 1 to 2 inches in diameter, and the wound is covered with a mixture of mud and straw. This is held in place by wrapping of burlap and kept moist until roots have developed in the mud ball. The branch is then cut off just below the ball and set in the ground under the shade of mature lychee trees, where it remains for a year before being set out in a new planting. Various devices are used to maintain a proper moisture content in the ball during rooting. Air-layering is usually started in spring as soon as the tree begins active growth, and it takes about three months for a sufficient root system to develop to support the branch independently. This ancient method has been much improved by Col. W. R. Grove here in Florida, using sphagnum moss enclosed in a plastic film to eliminate need for periodic moistening of the rooting medium.

Lychee seeds are very short-lived, but germinate readily for several days after being taken from the ripe fruit. They are rarely used for propagation because of the uncertainty as to the kind of fruit they will produce, and also because seedling trees are very slow to bear. Some may bear at 5 years of age, but others may be 25 years old before they bear.

Grafting is rarely practiced with lychees in China. Many people, both in and out of China, have been impressed with the vigor of growth made by the longan, which is a close relative of the lychee, and have attempted to use it as

a root-stock. So far as can be learned, none of these attempts has been permanently successful.

Grove Management

Lychee trees are usually planted along canal banks and on the edge of rice-fields in the lowlands in China, highland plantings being rare. At planting, a considerable amount of well rotted manure or canal mud is placed in the hole under the tree. Young trees are fertilized heavily with chicken or duck manure, and night soil is applied several times a year. Mature trees are usually fertilized only twice a year—in early spring and after harvest in summer. From 100 to 200 lbs. of night soil are applied to each tree in a shallow trench dug just beyond the drip of the tree. Soybean cake or peanut meal may be used at 5 to 10 lbs. per tree, or mud from canals and fish ponds may be piled under the tree. as fertilizer. Chemical fertilizers are never used on lychees in China.

Neither pruning nor thinning of fruit is commonly done to lychee trees, although both practices are regularly used on longans. Lychee fruits are harvested by clipping the clusters with part of the twigs bearing them, and this provides a mild degree of pruning.

The Crop

A layered tree frequently flowers the first year after setting out, but any fruit set the first or second year should be removed. By the third year a few pounds of fruit may be allowed to set, and by the fourth year the tree should be able to carry what it sets safely.

The lychee may continue to bear for centuries, but usually it is most productive from 40 to 100 years of age. A crop of 200 to 600 lbs. is commonly produced by matures trees in good condition, while exceptional trees may bear up to 2000 lbs. The yield is greatly affected by climatic conditions, being seriously reduced by severe cold, by heavy rains continuously for several days in the middle of the blooming season, or by a typhoon during the period between bloom and harvest.

The earliest varieties mature in May and the latest ones in August, but the bulk of the crop ripens in June and July. After harvest, the fruits lose their bright red color within a few days, unless precautions are taken to keep humidity very high around them. In ancient days lychees were packed in a section of green bamboo sealed with clay for transport by runner from Hinghwa to Pekin as tribute, and today some merchants still ship to distant market in this way. Lychee fruit seems well adapted to quick freezing. I have eaten fruits which after being frozen for two years still had good flavor.

The majority of the lychee crop in China is dried, producing what are mistakenly known as lychee "nuts." Drying is done either by exposure to the sun for several weeks, or by use of a brick stove. Fruit dried in the sun brings the better price. It takes 4 lbs. of fresh fruit to make 1 lb. of "nuts."

In recent years quite an industry has developed in China for preserving lychees by canning in sirup. Over 3,000 boxes of canned lychees were exported from Fukien province two years ago. A good portion of the crop is also used to make wine. Minor quantities of fruit go into making lychee sauce, spiced lychee, sweet pickled lychee and preserved lychee.

Pests

One of the stink bugs (*Tesaratoma papillosa*) is the most common and destructive insect pest of lychees in China. It sucks the sap from tender twigs, often killing them, and causes much dropping of young fruit. In 1934 the lychee crop of Hinghwa was completely destroyed by this bug, and during the following winter we collected four tons of adult bugs and burned them with kerosene. No spray has been effective thus far, but various parasites help to keep it in check somewhat. Jarring the trees in winter and collecting the fallen bugs in a bucket of kerosene is the most effective means of control.

There is a small moth (*Acrocercops cramerella*) whose larvae eat developing seeds and the pith of young twigs, causing loss of young fruits and new shoots. It is partly checked by a small wasp parasite, and partly controlled by burning in winter all leaves which have fallen.

A small mite (*Eriophes* sp.) closely related to the citrus rust mite, attacks the leaves and causes small wart-like galls on the upper surface, while the under side becomes hairy. Eventually the infested leaves are of little value to the tree. Nicotine sulfate controls this mite.

Minor pests include a small June-bug closely related to the blossom anomala which attacks avocados and mangos, a web caterpillar, and a bark borer with habits akin to those of the peach tree borer.

Varieties

More than 100 varieties of lychee have been described in the three ancient treatises on lychee culture in Fukien, Kwantung and Szechwan provinces respectively, but many of the names are probably synonymous and others may no longer be represented in cultivation. No modern descriptions of varieties are available for the most part. Only a few varieties are grown in Hinghwa area, and these are briefly characterized here.

Chen Purple is the most famous variety in Hinghwa and is the same as the variety grown in Florida as Brewster. It ripens from July 15 to August 15 and is very good quality. The shell of the fruit is very rough with sharp points.

Red Jade Hall is another variety commonly grown, with some trees over 500 years old. It ripens in late June and early July and is good quality. The shell is rough but without sharp points, and similar to Chen Purple in size but more rounded.

Mid-Autumn Red is a variety of great vigor, making large trees, whose fruits are oval and have smooth shells. They ripen in late July and are sweet but acidulous, of excellent quality.

Fire Mountain is the earliest variety, maturing in late May, and is rather rare. The fruits have thin yellowish flesh, somewhat sour, and sell only because no other variety is yet in season.

Black Leaf is a variety introduced in 1910 from Canton and is very rare. The quality is excellent, the flesh fragrant and sweet.

Hanging Green is another Cantonese variety introduced to Hinghwa long ago, but is also very rare there. The delicious fragrant fruits are mostly used as gifts.

Ten other varieties of less importance are cultivated in Hinghwa.

PACKAGING AND STORAGE OF MANGOS AND AVOCADOS

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The information on packaging of mangos and avocados presented here is a report of the investigations completed to date at the Tropical Plant and Food Research Center of the University of Miami. It is presented at this time in answer to numerous requests by individuals interested in the progress of this investigation and should not be interpreted to mean that we have arrived at final conclusions with regard to the packaging materials to be used. Before such conclusions can be reached, it will be necessary to further investigate the factors responsible for the pathological and physiological breakdown which occur both in mangos and avocados during storage. The following information does show clearly, however, that a number of wrapping materials will retard ripening and moisture loss from these fruits during storage.

Mangos

The work done during the 1947 and 1948 seasons was directed at determining the effectiveness of different wrapping materials in the retardation of moisture loss and rate of ripening of Fascell and Haden mangos. During the 1948 season, the effect of storage temperature on the storage life of mangos wrapped in a number of materials was investigated.