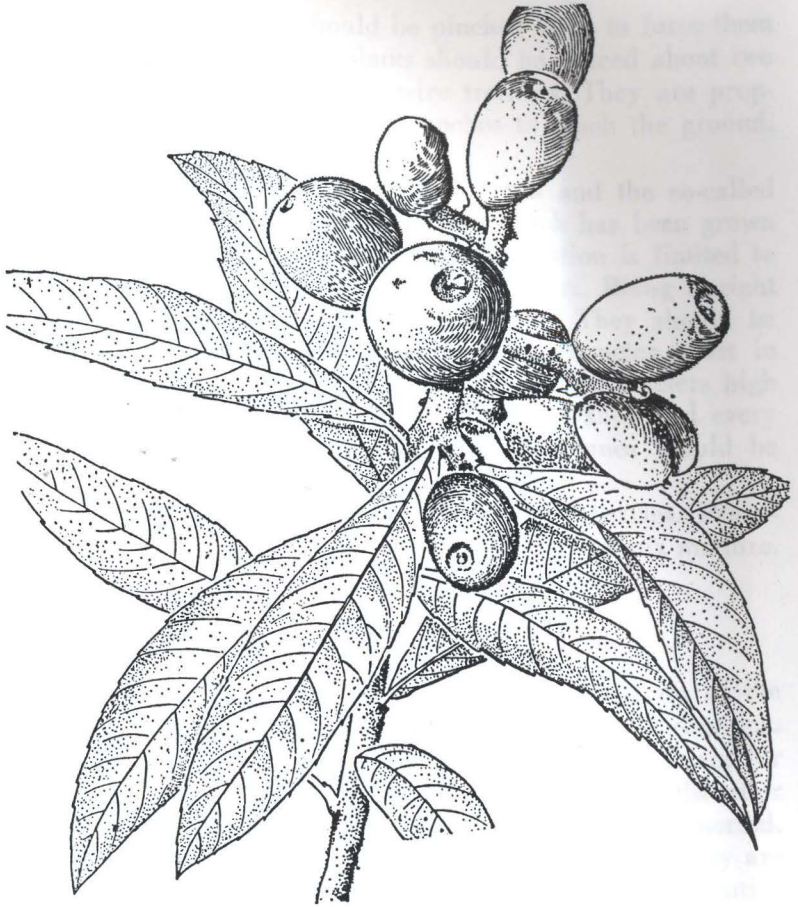
The apricot (*Prunus Armeniaca*) is another important Rosaceous fruit which has been planted experimentally but so far as known has not been successful in any part of this region. This seems rather strange as apricots have been found in California to require less cold weather than many other fruits, but it may perhaps be explained by the statement made in one of the California publications that warm winters result in the shedding of fruit buds. The same publication (Circular 117 of the California Agricultural Extension Service — "Home Fruit Growing in California") says: "For regions of high winter temperatures such as the valleys of Southern California, the new *Earligold* is an early maturing semi-clingstone variety which will produce regular crops." It would seem worth while to test this apricot in Central America at altitudes of 2000 meters or higher.

Quinces (*Cydonia oblonga*) are grown successfully in many parts of this region. They prefer a good soil but withstand much abuse and require little pruning. Near the town of Güinope in Honduras quinces are produced commercially at an altitude of about 1200 meters. They are easily propagated by cuttings. In addition to its value for the production of fruit, the quince is useful as a rootstock for pears and loquats, especially where dwarf trees are desired. Professor Chandler suggests that the *Pineapple* variety might prove of better quality than the ones grown at present in Central America.

Two native trees should also be mentioned. One is the wild cherry, or capulín, *Prunus Capuli (Prunus salicifolia)*, abundant in the highlands of Guatemala. Its fruits are commonly seen in Guatemalan markets. Since it is propagated only by seed there is considerable variation in the size and quality of the fruit, but no forms have been observed which are as large and attractive as some which are grown in the region of Ambato, Ecuador. It would be worth while to introduce the latter into Central America and propagate them by grafting.

The manzanilla, *Crataegus pubescens*, is a large shrub or small tree native to Mexico and Central America. Like the capulín it is usually found at high elevations, 1500 to 2500 meters. Its fruit, which looks like a diminutive apple (whence the common name) is eaten after boiling it in syrup, or it is made into jelly, while the tree itself is sometimes used in Guatemala as a rootstock for apples and pears.



Eriobotrya japonica
Courtesy Chicago Natural History Museum

THE LOQUAT

This Asiatic tree, botanically *Eriobotrya japonica,* commonly called in Central America ciruela japonesa and níspero del Japón, has not yet received the attention it deserves. This is largely due to the fact that improved varieties propagated by grafting have rarely been planted in this part of the world. Its importance elsewhere is indicated by the statement that more than 800 varieties are cultivated in Japan. Several of these have been introduced into the United States where other

good ones have been produced locally by selection. The varieties *Champagne*, *Advance*, *Thales* and *Golden Nugget* are among the best.

The loquat succeeds at elevations between 1000 and 2500 meters. It does not fruit satisfactorily at low elevations. It is not exacting as to soil, but prefers a sandy loam. It is easily propagated by shield budding or patch budding on rootstocks of the same species or on quince. It requires little pruning except to form the tree and it comes into bearing at three or four years of age.

BLACKBERRIES AND RELATED FRUITS

Wild blackberries produced by several species of Rubus are abundant in the markets of many Central American cities and towns. In general these fruits are small, acid, and have rather hard seeds. There are at least two or three native species, however, which merit horticultural attention. The best of these is probably *Rubus glaucus*, commonly called Mora de Castilla, which grows wild in many parts of tropical America and is cultivated here and there in El Salvador, Ecuador and Colombia. Its fruit is large, juicy, of excellent flavor and has small soft seeds. The plant is a straggling shrub which if properly pruned produces abundant crops.

Another good native berry is produced by *Rubus Shankii*, recently discovered on the mountains near Escuela Agrícola Panamericana in Honduras. It is a small plant, not very vigorous in growth, but it produces large blackberries of excellent quality with small, soft seeds.

Central American members of the genus Rubus are fruits of the highlands and the fine cultivated berries of northern latitudes can be grown here only in this same region. Insufficient attention has been devoted to these fruits. They are easily grown if planted at proper elevations and several of them make excellent additions to the home garden. Some of the best are the Boysenberry, the Youngberry and the raspberries.

The Boysenberry and the Youngberry are similar in character. Experience in Guatemala and Honduras indicates that they should be planted at elevations above 1200 or 1400 meters and that the only other problem involved is in connection with pruning. Old canes must be removed when they no longer produce fruit. Young canes should be pinched back to force them to branch more freely. The plants should be spaced about two meters apart and trained upon wire trellises. They are propagated by allowing the tips of branches to touch the ground, where they will take root.

Raspberries are of two kinds, the red and the so-called Black Cap. The former is the only one which has been grown to any extent in Central America. Its cultivation is limited to high elevations, perhaps 1800 to 2500 meters. Being upright growers raspberries do not require trellises. They should be planted in rows about two meters apart, one meter apart in the row. When the young canes are about 50 centimeters high the tops should be cut out to force them to branch and every year after harvesting old and unproductive canes should be removed.

One or more fungus diseases attack raspberries. Probably these can be controlled by spraying with Bordeaux mixture.

THE STRAWBERRY

During the past twenty-five years the popularity of the strawberry has increased in several parts of Central America. It deserves even wider cultivation than it enjoys at present for it is easily grown, it comes into bearing a few months after planting, and continues to produce fruit during a long period.

Most of the cultivated strawberries of the present day are hybrids between two wild species; *Fragaria chiloensis*, a native of the Pacific coast from Alaska to California and in Chile; and *Fragaria virginiana* of North America. In parts of South America, notably Chile, Peru and Ecuador, improved varieties of *Fragaria chiloensis* are rather extensively cultivated, but the fruit though large is not so richly flavored as that of hybrids which are grown in other countries. Many varieties are known in the United States, whence have come most of those now cultivated in Central America. *Missionary* is one of the best. *Klondike* and *Blakemore* also are good.

It is difficult to place exact altitudinal limits for strawberry culture in this part of the world but good results have been obtained between 800 and 2500 meters. The plant, therefore, is rather adaptable with regard to climate. It is influenced not only by temperature but also by the length of day.

At Escuela Agrícola Panamericana, for example, plants of the Missionary variety produce fruit abundantly, but make few if any runners from January to June. From July to December they yield little fruit but during the first part of this period, at least, produce runners abundantly. At higher elevations they seem to fruit over a longer period, due presumably to the cooler climate.

For best results strawberries need loamy soils rich in organic matter. They can, however, be grown on heavy soils if proper attention is given to the maintenance of good cultivation. During dry weather they must be watered frequently.

In northern latitudes strawberry plants will continue in satisfactory production for several years. In Central America it has been found more satisfactory to replant annually. If this is done by transplanting runners in August or September they will come into bearing the following January unless they are in the cold climate of relatively high elevations. If left to produce a second crop they usually degenerate and the fruit is small. They should be planted in rows 50 or 60 cm. apart, thirty or forty cm. between plants in the row. Except on very rich soils, the liberal application of stable manure is highly beneficial.

On heavy soils strawberries have been observed to suffer at times from a root disease the cause of which is not definitely known. Aside from this, few troublesome enemies have been noted in this region.

FAMILY RUTACEAE

Because it includes the well known and universally popular citrus fruits, the family Rutaceae must be placed high in the list of those which contribute to tropical pomology. It is a large family, including a hundred or more genera and perhaps a thousand species.

The genus Citrus, with about a dozen species of horticultural interest, is native to tropical and subtropical Asia. On the other hand, a well known Rutaceous fruit, the Matasano, has its origin in this part of the world.

CITRUS CULTURE IN GENERAL

While the orange is by far the most important of the citrus fruits, several others are commonly grown in Central America and still others deserve to be planted more extensively than is the case at present.

To attain its greatest perfection the orange requires a rather cool, dry climate. Only in such a climate does it develop high color and rich flavor. The grapefruit, on the other hand, is less acid, and therefore preferable to most people, when grown near sea level.

The various species of citrus differ in cold resistance, the lime being one of the most tender, the lemon being somewhat less so, and the orange resisting frost to such an extent that it is cultivated in Guatemala up to elevations above 2000 meters.

All of these fruits thrive best on good, friable soils. When planted in semi-arid regions they must be watered frequently during those months when rainfall is not sufficient to maintain them in good growing condition.

Most orange trees seen today in Central America are seedlings. In spite of this their fruits are remarkably uniform in size and most other characteristics, except flavor, which varies in accordance with environmental conditions.

It might be argued that there is no need here for vegetative propagation. Several advantages are, however, to be gained through this practice. Not only is it possible to cultivate varieties which extend the season, and others which yield fruits practically seedless; but advantage can be taken of rootstocks which are resistant to gummosis, the most troublesome disease of citrus trees in this part of the world, or of those which increase the range of adaptability as regards soils.

The rootstock problem has received much attention in other parts of the world. When citrus trees are grafted in Central America, sour orange has been up to now the rootstock almost invariably employed. Experiments on an extensive scale will be required to determine the advantages of others, though much can be learned from experience elsewhere. It has been found, for example, that the common sweet orange when used as a rootstocks provides resistance to tristeza, or "quick decline", a disease not yet present in Central America (so far as known) but which may eventually reach this region. On the

other hand, it is more susceptible to gummosis than is sour orange. To avoid this very prevalent disease, which usually attacks at the base of the tree, the practice of using sour orange rootstocks and budding them about 50 cms. above the ground is highly to be recommended.

Rough lemon is no more resistant to gummosis than sweet orange, but it is sometimes used for light sandy soils. Most citrus fruits budded on this stock are said to be relatively short-lived.

Grapefruit has been tried; in fact it was at one time considered promising, but later it was found not resistant to gummosis and it is commonly believed that it has an undesirable effect upon fruit quality.

In recent years *Cleopatra Mandarin* has attracted attention, especially in Florida, because of its resistance to gummosis. It seems better suited to heavy soils than some other rootstocks and is now being tried in Central America.

Citrus trees, when not grown from seed, are almost invariably propagated by shield budding. Seeds for the production of rootstocks should be planted, soon after removal from the fruit, in boxes or seeds beds under partial shade. When the young plants are about 15 cm. high they are moved to nursery rows about 75 cms. apart, the plants spaced at 40 cms. in the rows. This latter distance is desirable so that the trees can be dug for transplanting to the orchard with a ball of soil about their roots.

The time needed to produce a seedling of proper size for budding depends upon the climate. In many Central American regions not more than six months is required. Budding can be done at almost any time of the year. When a union has been formed (three to four weeks after the bud is inserted) the seedling should be lopped about 15 cm. above the bud—that is to say, a cut should be made half way through it and the top bent over to the ground. This assists in forcing the bud into growth. When the latter has reached a height of 15 or 20 cms. the top of the seedling can be cut back and the bud should be staked to assure the development of a straight trunk. When the budded tree has reached a height of about 50 cms. it should be forced to develop three or four branches which will ultimately produce a well-balanced crown.

In transplanting the young tree to the orchard it should never be set more deeply than it grew in the nursery. This is a very important detail.

Aside from the necessity of irrigation, which during dry weather should usually be every two or three weeks depending upon the soil, citrus trees usually benefit from fertilization unless the land is naturally rich. Stable manure is the best material but, unfortunately, is not always available in sufficient quantities. Commercial fertilizers are useful but definite recommendations as to quantity, formula, and frequency of application can only be made on the basis of accurate local knowledge.

Volumes have been written about the diseases and insect pests of citrus. The principal ones which must be faced by the Central American horticulturist are gummosis and the various scale insects which attack the foliage of the trees. Gummosis can be avoided to a certain extent by using an appropriate rootstock; by budding high (as mentioned above); by not planting too deeply, and by avoiding heavy, badly drained soils. When it attacks a tree its progress may be retarded by cutting away the patches of diseased bark and painting the injured area with Bordeaux paste.

Scale insects, which cause more trouble in dry regions than in wet ones, can be controlled by spraying with oil emulsions. Unfortunately the small grower is not always equipped to do this work and as a result thousands of orange trees in Central America suffer severely from the attacks of these insects.

THE ORANGE

(Citrus sinensis)

Most Central Americans who plant grafted oranges give preference to the *Washington* or *Bahia Navel*. The popularity of this variety is due largely to its seedlessness. Aside from this feature, however, it is an excellent fruit, especially when grown in the right climate. On the coast it develops neither high color nor its best quality. At elevations between 1000 and 1500 meters in climates which are semi-arid in character, it leaves little to be desired either in appearance or flavor.

A feature of orange culture commonly overlooked is season of ripening. Few efforts have been made to plant oranges

which mature at different times of the year, thus providing a continuous supply for local markets. This is one line along which progress can be expected.

In California, *Valencia* matures at a very different season from *Washington Navel*. *Valencia* is an excellent orange already somewhat known in Central America. The fruits contain numerous seeds, but a selection practically seedless is now available.

The *Hamlin*, a variety well known in Florida, matures earlier than most others and may prove to be a valuable addition to those cultivated in Central America. *Parson Brown* is another early one. The mid-season variety *Pineapple* is excellent but has many seeds.

It will be extremely interesting to see well-conducted trials of the above and other varieties in regions where they are not yet grown and it should be remembered that among the many thousands of seedlings which are to be found in tropical countries, there must be many which for quality, relative seedlessness, season of ripening, and perhaps other features, merit vegetative propagation. This field has scarcely been touched.

THE GRAPEFRUIT

(Citrus maxima)

While in recent years it has commenced to appear on local markets the grapefruit is not yet popular in this part of the world. When grown at elevations above 1000 meters it is almost too acid but when grown on the seacoast it is equal in quality to the grapefruit of Florida, Cuba and Puerto Rico. Two varieties can be recommended: *Marsh* or *Marsh Seedless* contains very few seeds, at times none at all. For this reason it is generally preferred to others. It is a fruit of good size, juicy, but its flavor is not equal to that of *Duncan*. Unfortunately the last-named variety contains numerous seeds. In spite of this, for the home garden it is perhaps the one to plant. Those who want a pink-fleshed grapefruit may plant *Foster* or *Thompson*.

THE LIME

(Citrus aurantiifolia)

The lime undoubtedly ranks next to the orange in popularity. The trees are seedlings, with the exception of some which have been planted in recent years. These latter are mostly of the *Tahiti* or *Persian* variety, quite different from the so-called native lime, larger and practically free from seeds. The tree is a more vigorous grower and bears during a much longer season. It is worthy of wider cultivation than it enjoys at present. Its only disadvantage is this: the fruit does not have the strong and pleasant aroma of the native lime. In this respect it is more like a lemon.

THE MANDARINS AND TANGERINES

(Citrus reticulata)

Mandarins grown from seed are to be found in many parts of Central America. Some of them are excellent. Their fruits are large, of good flavor, and oftentimes highly colored.

The *King* mandarin, also known as *King of Siam*, when grown in appropriate climates is a fine large fruit of excellent quality. It is a late variety. In some regions it does not color up well and contains many seeds. The *Dancy* tangerine is a smaller, thin-skinned fruit, juicy and of excellent quality.

The Satsuma oranges, which belong in this group, are scarcely known in the tropics. Elsewhere they are valued because the trees are quite resistant to cold. This feature might prove valuable in certain parts of Central America. The season of ripening is early and the fruits are almost free from seeds.

The *Cleopatra* mandarin, or tangerine, which has been mentioned above in connection with the discussion of rootstocks, is considered one of the most ornamental of all the citrus group, but its fruits are small and not of the best quality.

THE LEMON

(Citrus Limon)

Throughout Central America considerable confusion exists regarding lemons and limes because both are called "limón" in Spanish. The true lemon more properly is called "limón real".

Lemons which belong to the group cultivated in southern Europe and California are not well adapted to purely tropical conditions. Such varieties as *Eureka* and *Villafranca*, two important commercial sorts, usually do not produce fruits of good quality in the tropics. The *Meyer*, or *Chinese Dwarf* lemon, introduced into the United States about 1908, has proved highly successful in Central America and is worthy of cultivation by those who prefer a lemon to a lime. This variety, incidentally, grows readily from cuttings, or it can be grafted on any of the customary rootstocks if one prefers. The fruits are large, nearly round, juicy, with practically no seeds. The tree is unusually cold-resistant, an additional factor in its favor.

The rough lemon, probably introduced by the Spaniards at a very early day, produces large rough fruits with thick skins, numerous seeds, and not very juicy pulp. It is scarcely worth planting for its fruit. As a rootstock it has value for certain soils, as has been mentioned above.

The *Ponderosa*, or *American Wonder Lemon*, may possibly be a hybrid between the lemon and the grapefruit or citron. Like the *Meyer* lemon, it can be propagated by cuttings. The tree never attains large size and comes into bearing at a very early age. The fruits are tremendous, as large as grapefruits. They have very thick skins and fairly juicy pulp which has the flavor of the true lemon. Commercially they have little value, but the variety is interesting for the home garden.

THE CITRON

(Citrus medica)

This fruit resembles the true lemon in appearance but is much larger. Its thick rind is used in making cakes and other desserts. There are no special varieties to be recommended.

THE SOUR ORANGE

(Citrus Aurantium)

Throughout tropical America the sour orange is common in home gardens. It is hardy, a vigorous grower, and produces large crops of brightly colored, acid fruits. The juice takes the place of vinegar to a certain extent. The fruit is used for making marmalade. Horticulturally the importance of this species lies in its value as a rootstock for other citrus fruits. At present it is probably the best one for general purposes; for many years and in many parts of the world it has been used with very satisfactory results.

OTHER CITRUS FRUITS

Several citrus fruits little known in more northern regions are commonly seen in Central American dooryards. Sweet limes and sweet lemons are perhaps the principal ones. These fruits are juicy but not highly flavored. Nevertheless they are very popular with the people.

The kumquat (*Fortunella japonica*) is a dwarf tree producing a small aromatic fruit which can be eaten whole, skin and all. It is rarely seen in this part of the world, but is an attractive ornamental for the home garden, quite resistant to cold.

In the United States and elsewhere numerous hybrids have been produced in an attempt to combine the valuable qualities of various species of citrus. The tangelos are among the best of these. Their fruits are brightly colored, juicy and highly flavored. *Orlando, Mineola* and *Seminole* are three good varieties. The Limequat, an extremely acid fruit, is a hybrid between the lime and the kumquat.

THE MATASANO AND ZAPOTE BLANCO

Occasionally seen in Mexico, the zapote blanco is a medium-sized tree producing round or oval greenish-yellow fruits up to 10 or 12 cm. in diameter, thin skinned, with soft, sweet pulp and one to five large seeds. Botanically known as *Casimiroa edulis*, both tree and fruit are very similar to those