

of styler end rot developing in different lots of limes than in limes of different sizes or juice percentages.

4. Other conditions being equal, stor-

age at high temperature and high humidity is more conducive to the development of styler end rot than storage at cooler, less humid conditions.

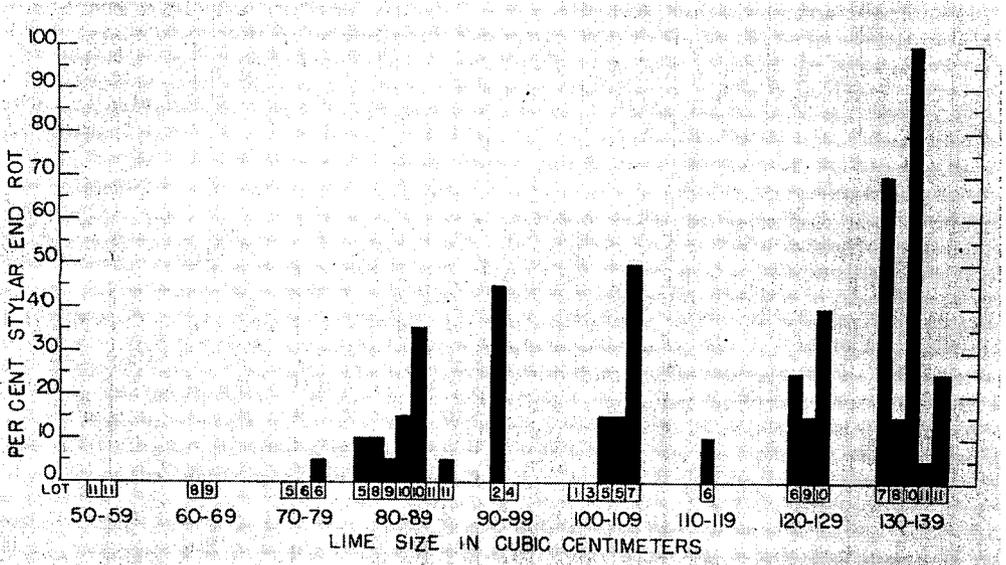


Figure 2. Relationship between fruit size and styler end rot of limes according to lot. Each lot number represents one twenty-fruit sample.

TWENTY YEARS AFTER

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When our chairman asked me to contribute to our program today, it occurred to me at once that it was exactly twenty years since I had first come to Florida and had my first experience with tropical fruits at the newly established Sub-Tropical Experiment Station. I hoped that there might be some small value in pausing to look back and see what progress was evident after two decades. Since I was totally ignorant of all tropical fruits except the banana when I came to Florida, it is rather easy for me to fix

in mind the status of any particular fruit when I first encountered it here.

The avocado was the leading tropical fruit in 1930, although it has had to give place to the lime since 1935. The campaign against the Mediterranean fruit-fly had made necessary a comprehensive census of all the fruit trees which could be hosts to that pest, and we had more accurate data on the number and location of avocado trees in the state in 1930 than at any time since. Incidentally these records were not easily accessible, and Leonard Toy and I spent many hours extracting them from the total census records of fruit-fly hosts. There were still a great many seedling trees, both in dooryard plantings and in

orchard form. The most popular variety was Collinson, with Lula, Waldin and Trapp following. Half of the whole crop was Waldin and Trapp. In 1950 we find many dooryard seedlings but no commercial plantings not of named varieties. Lula is the leading variety, and the concentration of varieties is in the period from October through December. Varieties maturing in late winter and spring were in demand in 1930 but are almost abandoned now because of the heavy competition from California at that season.

Many worthless varieties from the testing period of the early 1920's were still in commercial plantings in 1930. Personally it was a great advantage to have them so, for it was easy to get permission to use these trees in topworking studies. The Medora method of topworking by a fitted cleft graft, perfected by W. J. Krome in 1916, was just beginning to be used extensively, and during the next ten years thousands of profitless varieties and seedlings were worked over to profitable ones.

Commercial nurseries were growing a large percentage of avocado trees in outdoor nursery rows in 1930. This practice has been wholly abandoned in favor of container-grown trees grown in slathouses.

Fertilizer practices for avocados rested on no experimental base, and no two growers fertilized alike. We had not yet entered upon the era of understanding the need for micronutrient elements (except copper) for any horticultural crops. I look back with some satisfaction at having helped to give some firmer basis for fertilizing avocados. Today we know something of how often and how much to fertilize, and that deficiencies of zinc, copper and magnesium must be guarded against.

Studies of avocado maturity were just being carried out by Dr. Stahl, and we

were learning to our dismay that it was not safe to assume that all avocados would have 17% fat content just because an analysis in 1900 had shown that value for one fruit tested. We have made little progress in the past twenty years, however, as regards maturity standards, and have never been able to establish any simple test of maturity suitable for use by packinghouse inspectors to prevent shipment of immature fruit. At one time we contemplated using fixed yearly dates for earliest permissible shipping of standard varieties, based on studies of the curve of fat content. But apart from the necessity for a new set of values for each new variety, it is well that no such law was passed; for today nearly every variety is harvested a month or more earlier than we considered it mature in 1930. I am not sure that this represents progress, but it is a change.

Many improvements and labor-saving devices have come into use in packing and shipping avocados in the past two decades. The bushel crate has been abandoned in favor of the lug, and several variants of this in wood and cardboard are in use. Cool storage in packinghouse and in transit has come into general practice to retard the rate of ripening of the fruit. Mechanical grading machines have largely replaced hand sorting. But we have not given any serious competition to our California friends in matters of controlled marketing and advertising, and after 50 years of commercial avocado growing we still have no organization of avocado growers.

The Persian, or Tahiti, lime is today the leading tropical fruit of Florida, but in 1930 it was just beginning to be grown in a large way. From 1900 to 1928 it was the small, seedy Key lime which was mostly grown in Florida, although small plantings of the large, seedless Persian lime were made as early as 1890. Key lime production was greatly hurt by the

1926 hurricane and never recovered much thereafter. Mainland plantings of the Persian lime began to be seriously considered about 1928, and in 1930 there were about 500 acres of Persian limes and a production of only a few thousand boxes of fruit. Incidentally, I have never found an explanation of the name Persian, as the lime is far too tender to cold for cultivation in Persia. There is some evidence that it may have come to this country from Tahiti, so that alternative name is more reasonable, even if less often used. In 1950, 4600 acres of Persian limes are credited with about 300,000 boxes of fruit.

The principal handicap to development of the Persian lime industry has been the bark disease which has killed so many trees. Its importance became evident only about 1934, and pathologists of the Agricultural Experiment Station have studied it ever since in an effort to find how to prevent or cure it. One or two variant strains of Persian have been selected by growers who thought these were unusually resistant to this disease, but we still look for real progress in the solution of this problem. Studies of rootstocks have been helpful in showing relationship of stocks to yield and juice content. Mention may be made also of very recent development of frozen sweetened lime juices, equivalent to single strength or concentrated frozen orange juice, as an increased outlet for Persian limes.

Perhaps this is the place to recall the rise and fall of the so-called Perrine lemon, the hybrid lemon-lime which was introduced by the U. S. Department of Agriculture about 1931 in the hope that it might enable Florida to compete directly with California for the lemon trade. Extensive plantings were made from 1933 to 1936, especially in Polk and Hillsborough counties, but the freeze of 1934-35 was disastrous for them and

the great susceptibility of the trees to the lime bark disease, especially after cold injury, made growing impractical. It seems doubtful that the fruit could have sold in direct competition for the household lemon trade, since it could not be cured to resemble California lemons in color or texture, but it never had a chance to show what it could do. Today it would be hard to find a bearing tree anywhere.

Mangos were popular with those who knew them in 1930, but not many people qualified. Some 200 acres of mangos were in grove form, almost exclusively of Haden, although there was a considerable number of trees of other varieties scattered about. Many of the commercial plantings were set out as windbreaks around avocado groves. Today there are some 400 acres of mangos in groves, half of them of varieties other than Haden because of the poor bearing of this variety. These newer varieties represent possibly our greatest advance in mango growing during this period. We have become aware of the need to guard against micro-nutrient element deficiencies with all tropical fruits, but we really know little else about fertilizing mangos. Studies of bud differentiation both here and abroad have indicated that the vigor of growth this summer is likely to influence next spring's crop of fruit, but we do not know just how to apply our knowledge because there are so many complicating factors.

The chief obstacle to successful mango culture was thought in 1930 to be anthracnose. Careful studies by Ruehle have shown, however, that even in seasons where this disease was controlled very well, there might be no crop set. Young's researches seemed to eliminate need for cross-pollination of Haden, but still we got few good crops. There is still much to learn.

Papayas have experienced little change

in either the size or the stability of the industry since 1930. There has been some improvement in the variety situation, which was limited largely to Betty and Bluestem when I first knew them. Far too many plantings today are still of badly mixed seedlings, but the U. S. Department of Agriculture has developed some varieties and Stambaugh has done the same. With the passing of Bronson Bayliss, one of the few sources of reliable plants has gone; and a very big problem with a fruit like papaya is having a breeder who will maintain a true line of seed.

The most important advance in papaya culture is probably the genetic studies made during this period independently in South Africa and Hawaii. The inheritance pattern for the basic papaya forms is now well understood. We know very little about fertilizer needs of papayas, the only published experiments having shown mostly the value of frequent applications.

The lychee has been the wonder boy of Florida tropical fruits. In 1930 there were a few scattered trees ranging from Homestead to Winter Park, from Sebring to Auburndale, and from Estero to Clearwater, but they were curiosities. I well remember when one of the grove inspectors of the State Plant Board brought me a cluster of fruit in June 1931 and asked what it was and whether it was edible. Neither of us had seen the fruit before, although he had many years of grove inspection behind him, but I recognized the lychee from its descriptions. Perhaps after the lapse of 19 years I can admit without blushing that I told him the fruit was not palatable, but he was hardly out of the door before I was proving my words false. Today we have more than 10,000 trees planted in orchard form, in tracts ranging from 1 to 20 acres.

In 1930 no one worried about varieties

of lychee. Nearly all bearing trees had been propagated vegetatively from one old specimen at Reasoner Bros. nursery, and it was sufficient to know the species name. As interest in the possibility of commercial culture of lychees developed, it was realized that there were many varieties in China and that we must distinguish ours from other, possibly better, ones. Since the Rev. Mr. Brewster had sent the variety we grow, and we did not know its true identity, we began to speak of it as the Brewster variety. Since W. H. Chen has positively identified it as the Chen Purple variety of his home town in China, we now know the correct name and the history of our lychee variety. As was true of the introduction of the Tanenashi persimmon from Japan in 1870, it is fortunate that the first variety of lychee introduced happened to be one of the best there is. If it had been an inferior variety, there would never have been any interest in promoting it.

We still know almost nothing of the best methods of culture and fertilization of lychees. You are all aware of the great improvement in the technique of propagation introduced by Col. Grove, who has been the moving force in the whole lychee development. We know also that frozen whole lychee fruit retain the texture and flavor of fresh fruit to an unusual extent, and with care the bright red color may be preserved also.

The pineapple had just begun to recover in 1930 from the depths of the depression into which its culture had descended about 1920. A revival of the industry was taking place on the flatwoods soils rather than on the coastal ridges where the pineapple had been grown so extensively earlier, and such varieties as Abakka and Cayenne were being found better suited than the Spanish variety formerly dominant. In recent years Natal and Eleuthera have

come into prominence, but these are also old varieties and we cannot point to any new pineapple varieties of particular adaptation to Florida conditions. Pineapple culture is still rather small scale as an industry, and although there are two or three fairly large plantings, most of them are quite small.

Again we must acknowledge that we have made little advance in our understanding of the nutrition of this fruit. Extensive studies were made between 1900 and 1906, but the results were inconsistent and not applicable to the changed condition of today's industry. We have learned how to control the fruiting season through control of flower-bud differentiation by treatment with certain gases or hormones, but we still have the problem of how to get summer-maturing quality into winter-maturing fruit. We have also learned how to control the most serious insect pest, the mealy-bug, which was long a major handicap to pineapple growing.

The guava has experienced quite a marked increase in commercial importance during the past 20 years. In 1930 there were only two or three orchard plantings of guava of a few acres each. Today there are probably over 400 acres of commercial groves. Propagation has always been difficult except by seed, but now we can multiply a good variety rapidly and cheaply, thanks to Ruehle's studies. Guava nutrition has received no attention except for the usual need of micro-nutrient elements. Jelly making is still the chief outlet for the guava crop, but conditions are favorable now for growing varieties to be used in canning; and perhaps some use of frozen pulp will prove commercially valuable. We should not overlook the usually high vitamin C content of guavas, learned only in the past two decades, nor the equally important fact that varieties differ tremendously in their content of this

item—from almost none to phenomenal values.

Several other tropical fruits deserve briefer mention. Sapodillas were grown only from seed in 1930, and no varieties could be selected. Now we know how to propagate by bud or graft, and several named varieties are available. The ilama was represented in Florida twenty years ago by a single, stunted specimen in Dr. Fairchild's collection which I watched year after year for fruit in vain. Today there are many thriving, fruiting trees in the state of this annona which we have hoped would prove of commercial value in place of the poorly adapted cherimoya. There were also no varieties of the white-sapote in 1930, whereas we have a number to choose from now. The star-apple was very rarely seen—and even less often bore fruit—in 1930, while the grumichama and imbe were almost unknown. Today all of these are widely distributed as fruiting trees. The case of the jaboticaba is even more striking, as no one knew of a fruiting specimen in Florida in 1930, while it is fairly common in tropical fruit collections and in nurseries today. Were it not for its very slow rate of growth, it would probably be planted commercially by now. Both the Barbados-cherry and the carambola were sparingly found when I came to Florida, both in rather sour forms. Introduction of a sweet-fruited carambola from Hawaii and the discovery of sweet-fruited forms of Barbados-cherries have given impetus to wider planting of these fruits; nor has the publicity attending reports of extremely high amounts of vitamin C in the latter fruit injured its popularity. Perhaps I should also say that in 1930 we were hopeful that the large-fruited forms of Chinese jujube would prove adapted to our state, whereas we realize now that these fruits belong in a less humid climate than ours.

Sources of information deserve men-

tion before I close. In 1930 we had Popenoe's "Manual of Tropical and Sub-tropical Fruits," then ten years old, and rather sketchy bulletins on avocado, mango and papaya growing. Those constituted our information on growing tropical fruits in Florida. The picture changed rapidly after 1930. In 1931 came the bulletin by Mowry and Toy on "Miscellaneous Tropical and Subtropical Fruits," in 1934 the bulletin by Wolfe, Toy and Stahl on "Avocado Production in Florida," and in 1940 one on "Papaya Culture in Florida" by Wolfe and Lynch. An important feature of these bulletins has been their frequent revision, so that they have been available fairly constantly since their first publication, but brought up to date every few years. Not until 1949 did any mango bulletin appear—"Mangos in Florida" by Lynch and Mustard—although the speaker had one more than half written in 1936. The booming lychee industry is fortunate in having good bulletins by both Grove and

Cobin almost at its beginning. Stambaugh has presented his ideas on papaya growing—derived from years of first-hand acquaintance—in "The Papaya," issued in 1938 and revised in 1945. Federal scientists have dealt with both avocado and papaya on a national, rather than state, basis in bulletins on "Avocado Production in the United States" in 1941 by Traub, Pomeroy, Robinson and Aldrich, and on "Papaya Production in the United States" by Traub, Robinson and Stevens in 1942. Platts gave us our only modern bulletin on the pineapple in 1945 as "Pineapple A, B, C's," and a long needed bulletin on guava culture was finally provided by Smith late in 1949.

Looking backward, in closing, we can say that the past twenty years have seen great progress made in growing of nearly all tropical fruits. There is still much to learn. May the next twenty years see even more advancement made!

TROPICAL AND SUB-TROPICAL FRUITS IN PINELLAS COUNTY

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Clearwater

The peoples of Pinellas County were among the first in the state to experiment in the planting of tropical and sub-tropical fruits, as is evidenced by the existence, in the county today, of some of the oldest and largest specimen trees. While located farther north than what is generally considered the only tropical zone in America, the topographical nature of the area renders it suitable to the culture of many items that cannot be grown in the inland areas a considerable distance further south in the state. The county is a peninsula, roughly the shape of the State of Florida, extending

south from the western portion of Pasco County, with the Gulf of Mexico lying to the west and south, and old Tampa Bay to the east. Its elevation averages well over 30 feet above sea level, with some large areas between 60 and 75 feet above sea level. The bluffs along Clearwater Bay and a portion of Old Tampa Bay, near Bayview, are among the highest coastal elevations along the entire southeastern seaboard of the United States.

Owing to these high elevations, the close proximity of deep water along the east, west and south coasts the County has a very moderate climate during both summer and winter which, together with its deep sandy loam soil, renders it well