

The data of Savage and Cowart (2) showed that the yields of older trees would not be influenced by initial tree size. This would seem reasonable since all trees eventually develop the maximum bearing surface permitted by the planting space and pruning practices.

Although large nursery trees are to be preferred, this study did not ascertain the upper limit in the size of trees suitable for commercial planting. It is very unlikely that Florida grown, June-budded trees will exceed the maximum of desired size. However, large, older nursery trees require more labor to plant and, if not already branched at a height of 20 to 24 inches, may be difficult to develop with a good frame since buds at this height are sometimes hard to force on such stock.

## SUMMARY

Large June-budded nursery trees produce more fruit than small trees during the early bearing years of the orchard. Under the conditions of this experiment with June-budded 'Flordawon' nursery stock, an increase of 0.1 inch in trunk diameter, at a point 4 inches above the bud union, resulted in a total of  $\frac{1}{8}$ - $\frac{1}{4}$  bushel more fruit per tree during the first 4 years in the orchard.

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## RARE FRUIT COUNCIL ACTIVITIES 1963-64

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The Rare Fruit Council of South Florida held its first monthly meeting, covered by this current paper, on November 8, 1963 at the Simpson Memorial Garden Center. Mrs. Marion Moulds, our speaker of the evening, addressed the Council on her three week trip through Honduras, El-Salvador and Guatemala in August 1963. A visit to the Escuela Agricola Panamericana, Tegucigalpa, Honduras enabled Dr. Wilson Popenoe, who was currently there for two months, to show off the school's experimental fruit plantings. These included citrus (*Citrus sp.*), mangos (*Mangifera indica*), avocados (*Persea americana*), pineapples (*Ananas comosus*), cashew (*Anacardium occidentale*) and other fruits. Prior to returning home Mrs. Moulds observed Spanish-limes (*Melicocca bijuga*), Annonas, mamey colrados (*Calocarpum mammosum*), Spondias and

wax jambo (*Syzygium javanica*) growing in these Central American Countries.

On display for the evening was fruit of the 'Nkonjwa Nshansha' East African plantain sport, a variety with individual fingers 16" long, being similar to the 'Moongil' plantain of India. This new large fruited introduction had been obtained from the Jamaica Banana Research Board in April 1962. Preliminary trials suggest that its compares favorably for cooking with the commercial plantains of the West Indies. Another fruit variety shown for the first time was the 'Mameau' Malay-apple (*Syzygium malaccensis*), a Thailand commercial strain. Introduced as a marcot from Bangkok, it bore its first crop four years later. The tree is a very ornamental, large leafed variety that fruits twice a year, in early fall and spring. The beautiful deep crimson to purple colored fruit are larger than average. Also on display was fruit, grown by Seymour Youngmans, from the first Florida crop of 'Amazon' variety rollinia (*Rollinia sp.*). Scionwood of this clone was introduced from Brazil in 1957 and successfully grafted onto pond-apple (*Annona glabra*) rootstocks which appear to bear well. The flavor and texture of this variety is thought to be superior to existing rollinia strains presently being grown in Florida.

A South American fruit that probably will be more widely grown in Dade County and other warm areas is the abiu (*Pouteria caimito*). Two

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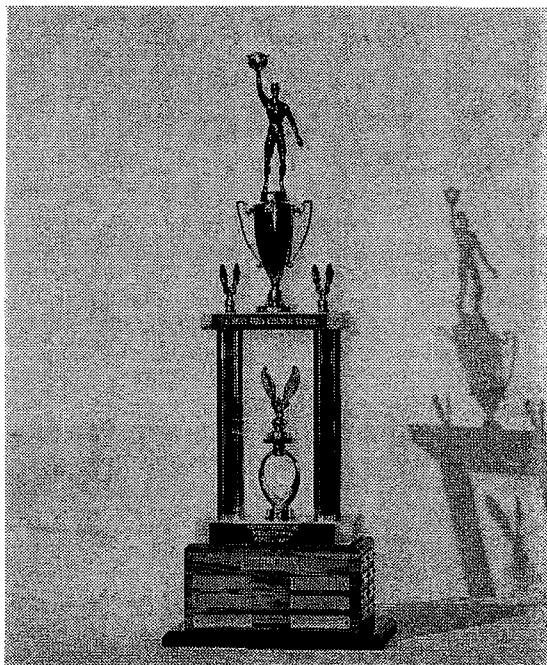
seedling trees, located in Bal Harbour, both bore fall crops producing duck egg size fruit of good flavor. With the newly introduced 'Amazon' abiu variety from Peru fruit of four inches in diameter should be obtained. Prior to the end of the meeting, Council President Dr. Carl Campbell reported on the use of the Rangpur lime (*Citrus aurantifolia*) as a rootstock for citrus. This appears to be especially well adapted to the shallow, rocky limestone soils of South Florida.

The December meeting featured a question and answer period. Among the topics discussed was how lychees (*Litchi chinensis*) can be made to go dormant in winter so as to enhance fruiting during the following spring. One approach to this problem is girdling in early fall. This has been successfully practiced in Hawaii where a warm climate prevails throughout the year and the greater portion of the annual rainfall occurs during the winter months. A pruning saw is used to ring the cambium layer. Another suggestion was a word of caution for dooryard lychee growers to be careful that water intended for the grass does not give their lychees an over abundance of moisture during the fall and winter months. A third course of action would be to experiment with some of the chemical sprays intended to induce dormancy.

In January the Rare Fruit Council met for the first time at the Museum of Science and Natural History, 3280 South Miami Avenue. This was to be the new location for all future meetings; an increase in the membership having created a need for these larger accommodations. The senior author of this paper presented a talk on "Methods of Vegetative Propagation," accompanied by actual demonstrations in grafting, budding and marcotting. Special emphasis was given on how to successfully graft the mamey sapote (*Calocarpum mammosum*), the Spanish lime and other material requiring special techniques. This was followed in February by an address before the Council by Meteorologist Leonard Pardue. Mr. Pardue, who is presently stationed in Miami, had formerly served with the Lakeland Federal-State Frost Warning Service and his talk covered many interesting revelations concerning cold weather, the prediction of frost and affiliated subjects as pertaining to South Florida.

At the March meeting the Rare Fruit Council "Introduction Awards" were displayed for the first time. These consisted of four trophies, the largest of which was the "R. Bruce Ledin Memorial Trophy," a perpetual presentation to

commemorate the name of the late Dr. R. Bruce Ledin, founder member whose enthusiasm and encouragement enabled the Rare Fruit Council to become a reality. One of the Council's most important functions is the introduction into South Florida of new fruits and fruit varieties from other warm climatic regions outside the U.S.A.'s continental limits. The purpose of these annual awards is to encourage more active participation, by the individual members, in the field of plant introductions. Attending this gathering was Lee Moore, a native Miamian who currently is operating a nursery in Iquitos, Peru on the headwaters of the Amazon River. Mr. Moore presented slides of the various fruits and fruit trees indigenous to the Upper Amazon. Among these were the Amazon tree-Grape (*Pourouma cecropiaefolia*) with large 18 inch bunches of grape-like fruit the size of a quarter, the sacha mango (*Gustavia mangua*) whose fruit hang from the trunk like those of the cannon-ball tree (*Couroupita guianensis*), the abiu which Lee Moore claimed to reach diameters of five inches, the South American sapote (*Quararibea cordata*), a four inch diameter dark brown fruit with a very sweet, orange colored flesh and the aguaje



R. Bruce Ledin Memorial Trophy, a perpetual plant introduction award.  
Photo by Wm. F. Whitman

(*Mauritia vinifera*), a dioecious palm from whose fruit a good ice cream is made.

A joint program on bananas followed, with the writer as first speaker. In discussing his introductions in this field three arbitrary classifications were used: Plantains, Regular eating bananas and Hawaiian bananas. Of the plantains, the 'Dwarf Puerto Rican,' a low growing, heavy bearing variety is the most successful. The 'Maiden Plantain,' while producing quality fruit, has to be grown in pot holes or be staked up to prevent its falling over. The 'Nkonjwa Nshansha' plantain was discussed earlier in this paper. Plantains maturing in South Florida during the winter months are frequently under-

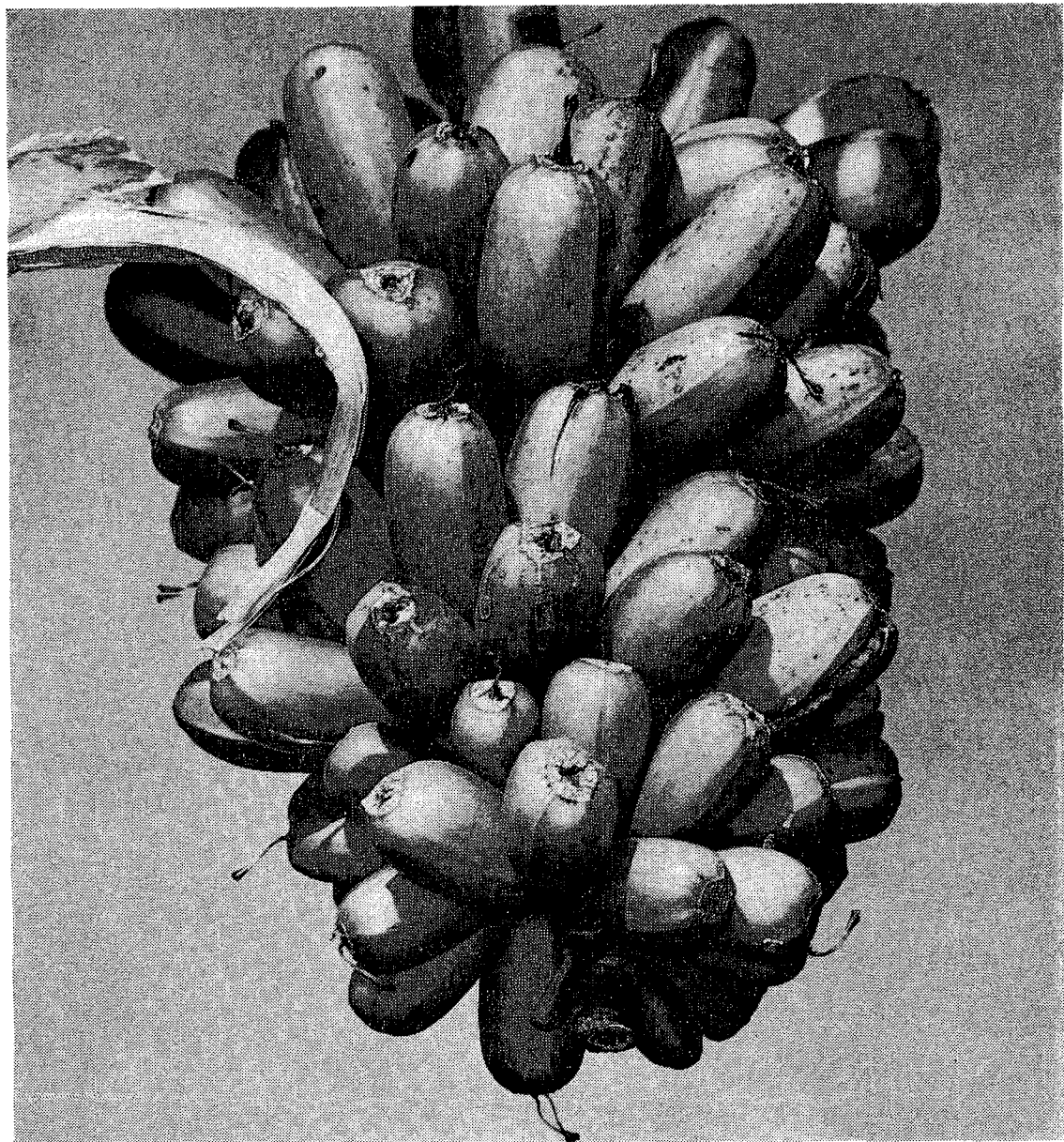
sized and of poor quality. Of the regular eating bananas the 'Williams,' a Cavendish mutation, makes heavier bunches than the Cavendish without the usual tendency towards tip end rot. The 'Double Cavendish' is a freak form producing two or more bunches from one trunk. Being an unstable mutation, its suckers tend to revert back to the normal single bunch fruiting forms. The 'Pisang Radja' is a favorite in the Far East. This easy to grow Indonesian banana has a thin skin surrounding a sweet, light orange colored pulp. The 'Ice Cream' banana looks, grows and tastes like our Orinoco, only its fruit and foliage frequently has a bluish sheen. The 'Lady Finger' (Sucrier, Datil etc.) bears a very



Dr. Adrian Brash of Honolulu, who is reported to have the largest Hawaiian banana (*Musa* sp.) collection in existence.  
—Photo by Wm. F. Whitman

small, rich tasting, thin skinned fruit. The Polynesian-Hawaiian bananas are a most remarkable group, partly because of their many unusual forms. The 'Mahoe,' a Hawaiian word meaning "twin," produces two bunches of fruit from a single, tall trunk. The Iholena Haahaa, a low growing variety with a 6 ft. to 7 ft. trunk

produces medium sized fruit, the bunch turning yellow two weeks prior to ripening. The 'Fehi' (*Musa fehi*) bears orange fruit on a stout stalk that points straight up, instead of arching over and hanging down as is usual with most edible bananas. The AeAe, an extremely ornamental, tall variety has variegated foliage and fruit. The



An unusual full stalk of 'Hua Moa' (*Musa* sp.), a short, blunt fruited Hawaiian variety.

—Photo by Wm. F. Whitman

'Hua Moa' or 'Papaya Banana' bears fruit 5 inches long by 3½ inches in diameter that should be picked prior to ripening to avoid splitting. In a letter dated January 4, 1964 K. Shepherd, Cytogeneticist, Breeding Research Scheme, Banana Board, Jamaica wrote referring to the above banana, "I put them very close to the plantains, botanically, although the girth and bluntness of the fruits is so remarkable." Most Hawaiian banana varieties appear to be well adapted for growing in South Florida.

Dr. John Popenoe, carrying on as speaker for the second half of the banana program, stated that the Sub-Tropical Experiment Station was interested in dwarf varieties that resist the wind better. Commenting on the various clones under observation at the station, he recalled that the 'Gros Michel' suffered from wind damage, cold weather and poor soil. The 'Dwarf Puerto Rican' plantain fruits better than the 'Maiden' plantain or the 'French' plantain. The 'Ice Cream' and 'Pisang Radja' bananas bore well but grew excessively tall. The 'Apple' banana grows well without particular attention. The best adapted variety is the 'Orinoco' which is immune to the banana borer (*Cosmopolites sordidus*), hardy to cold and will produce fruit the year round. The 'Cuban Red,' which grows too tall for this area, bears fruit on the starchy side. The 'My-sore' banana, a variety originally from India, makes small tasty fruit. Commenting on banana culture, Dr. Popenoe suggested thinning plants out so they don't sucker too much, use of mulch and lots of water. The banana root borer which attacks the 'Apple,' Cavendish and plantain varieties can be controlled with Heptachlor. Prior to the adjournment of the meeting Dr. John Popenoe introduced his uncle, Dr. Wilson Popenoe. The elder Popenoe then gave an interesting account of the first banana, the 'Orinoco,' to be brought to the New World. The country to receive this introduction was Hispaniola in the year 1516.

Mr. B. P. Stewart, Inspector in Charge, Miami Plant Inspection Station, addressed the Council in April on the mechanics of obtaining U.S.D.A. permits to import plants for propagation. This was followed in May by a general discussion on miscellaneous tropical and sub-tropical fruits. Mr. Arthur Hill, commercial lychee grower from Vero Beach discussed the problems besetting this industry. Irregular bearing and cold injury were taken up in detail, both of which proved major stumbling blocks to any fur-

ther Florida expansion of large scale lychee growing. Other fruits taken up were the green sapote (*Calocarpum viride*) and the pitomba (*Eugenia luschnathiana*). Dr. D. O. Wolfenbarger, Entomologist at the Sub-Tropical Experiment Station was the June speaker. Colored slides showing insect damage to tropical fruits were projected accompanied by a running commentary. In July Seymour Goldweber, Assistant County Agent, presented a talk on the Agricultural Extension Service which had just passed its fiftieth anniversary.

An informative lecture on nematodes, with special emphasis on those attacking plants, was presented in August by Dr. Simon Malo, Assistant Horticulturist at the Sub-Tropical Experiment Station. In addition to chemical control considerable effort is being expended in the search for nematode resistant rootstocks which appear to give some immunity from infestation. Under new business the Council granted funds to be made available for *Annona* research. This work, which will be carried on by Dr. John Popenoe, will consist in the initial stages of assembling a sizeable collection of new and improved *Annona* varieties to be grown on the Montgomery Foundation. Currently special attention is being concentrated on the illama (*Annona diversifolia*), a fruit whose color and quality frequently varies considerably. Promising illama strains from South and Central America, introduced as graftwood, are being grown for evaluation. A new monthly plant distribution plan went into effect at this August meeting. The novel system enabled members who donated the most plants to have a priority in selecting from the material others presented for distribution. This brought about a great increase in plant exchange activities for which the Council is indebted to member Donald Kiesau and his solution to what had previously been a difficult problem.

Dr. Frank D. Venning, Agricultural Specialist formerly with the U. S. State Department addressed the Council in September on "Why Rare Fruits are Rare." This unique presentation stated that of all tropical fruits only about four, the banana, citrus, pineapple and avocado have attained a commercial status, on a world wide scale comparable with the fruits of the temperate zone. The speaker then went on to contrast the fruits of the tropics with those of the temperate zone, explaining why the former were not in extensive production. Among the problems presented by tropical fruits are poor shipping





Mangosteen (*Garcinia mangostana*) recovering in Saran cloth enclosure after an unsuccessful attempt at growing this fruit tree in full Florida sunlight.  
—Photo by Wm. F. Whitman

and storage qualities, low yield per acre, exacting climatic and soil requirements, slowness to come into bearing, lack of desirable varieties, difficulties in vegetative propagation and the need for additional knowledge concerning disease and insect control. Prior to the conclusion of the evening's activities fresh, ripe mangosteens (*Garcinia mangostana*), imported from Jamaica, were distributed among those present.

The October program covered the writer's recent visit to the Hawaiian Islands. Accom-

panied by Dr. Henry Y. Nakasone, Associate Horticulturist, University of Hawaii, this institution's Poamoho Experiment Station was visited. Among the fruits observed were lychees, mangos, green sapote, mamey sapote, Inga (*Inga sp.*), Annonas, santol (*Sandoricum koetjape*), durian (*Durio zibethinus*) and a 'Queen' variety Spanish-lime. This latter tree, which appeared well adapted to Hawaii had been introduced from Florida about ten years ago. Of possible interest is the 'Fairchild' mango. This sets fruit better



Dr. Henry Y. Nakasone standing beside a 'Queen' variety Spanish-lime (*Melicocca bijuga*) growing at the University of Hawaii's Poamoho Experiment Station.  
—Photo by Wm. F. Whitman

than other varieties tested in Hawaii for areas of high rainfall. Prior to returning home the writer visited Dr. Adrian Brash, where the largest collection of Polynesian bananas in these Pacific islands was observed at his Round Top

Drive residence. Most of the Hawaiian banana varieties existing in Florida today came originally from his collection.

Also on the agenda for the evening was "Hurricanes and the Growing of Tropical Fruits,"



Typical of Hurricane Cleo's destruction was damage to this 'Kohala' longan (*Euphoria longana*) growing in Bal Harbour.  
—Photo by Wm. F. Whitman

a summary covering what protective steps to take prior to and after a hurricane. This presentation by the writer was accompanied by color slides showing recent extensive fruit tree damage, including the loss of a fourteen foot mangosteen. Responsible for this destruction was hurricane Cleo, late August storm with wind gusts up to 125 m.p.h. and a three hour duration as its eye passed over coastal areas in Dade County, Florida. Plants for distribution during this meeting included 38 small potted mangosteens; the donation of Larry Nettles, Council member and fruit tree hobbyist from Key West.

Three years ago, at the suggestion of Council member Robert E. Snow, the International Minerals and Chemical Corporation became interested in undertaking research on the miraculous fruit (*Synsepalum dulcificum*). Initial samples of the fresh fruit were obtained from Florida Council

members and research commenced under the leadership of Dr. F. A. Hoglan, Supervisor of Food Biochemistry and Analytical Chemistry. Later a Senior Food Technologist was sent to Africa where plans were completed for shipping fresh miraculous fruit out of Nigeria, an arrangement that would insure an adequate supply for International Minerals' Food Research Center at Skokie, Illinois. The objective of this study was to develop a new sweetener for both diabetics and low calorie foods and beverages without an unpleasant after-taste.

The unique properties of the miraculous fruit lies in its ability to cause other fruits, and certain foods and beverages, to appear to taste sweet after one of these jelly-bean-sized, red fruits has been eaten. The quality of this induced sweetness is unexcelled, being more desirable than any of the known natural or synthetic



sweeteners. Under its influence limes and lemons (*Citrus limonia*) become a delight to eat, without a trace of sourness. New taste experiences are enjoyed when foods, such as strawberries and rhubarb, are eaten without sugar, which formerly masked delicate flavors which now appear for the first time.

The International Minerals and Chemical Corp. is no longer actively engaged in miraculous fruit research at the present time. In spite of nearly three years work and the expenditure of a considerable amount of money, attempts to isolate the active principle in a pure form have been unsuccessful. The requirement that the miraculous fruit's mucilaginous material first coat the mouth prior to becoming "taste-twisting" active and the further unstability and short life of the responsible enzyme added to the over all

problem. In spite of this major tobacco, chemical and other large industrial corporations are interested in commencing a joint effort for the purpose of exploiting this unusual fruit further. In the meantime the mechanism by which the miraculous fruit works will remain a mystery.

This paper concludes the activities of the Rare Fruit Council of South Florida during its first ten years in operation. In that time membership has grown from an initial ten in 1955 to over one hundred current, paid up members, a trend that is expected to continue. This horticultural group could be considered unique, in that it is possibly the only one in the world specializing in the rare fruits of the tropics. The need for and usefulness of such an organization has long been apparent and it is surprising that it had not come into existence sooner.

## TEMPERATURE HAZARDS TO PEACHES IN FLORIDA

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Winter and spring weather conditions, particularly temperatures, are among the hazards to peach production in Florida. Peaches require chilling during the dormant season for satisfactory subsequent growth and fruiting (1). Horticulturists have observed that the total number of hours a peach is subjected to temperatures of 45° F. and below is an index of chilling and have classified peach varieties on this basis (5). Although this has not been entirely successful (3), it provides an estimate of the adaptability of peach varieties to different climatic areas. The amount of chilling received in Florida varies considerably from year to year and from section to section within the same year. Spring cold waves occasionally bring damaging low temperatures to

the potential peach producing areas of Florida during bloom and after fruit set. This paper presents a climatological analysis of the seasonal total chilling hours of the spring cold hazard in peninsular Florida.

### DATA SOURCES AND ANALYSIS

Temperature data from 22 stations in peninsular Florida, two of which were along the southeast coast, were selected for the chilling hour analysis. All these stations are operated by the Federal-State Frost Warning Service in Lakeland and all have at least 26 years of temperature records. None of the stations are exposed in warm locations. The basic data were supplied by the Lakeland Weather Bureau Office. The station locations are shown in Fig. 1. The two southeast coast stations, Davie and Homestead, were included as examples of locations which receive little chilling. Seasonal chilling hour totals were analyzed for two periods: November 1 through February 15 and November through January 31. Sharpe and Parker (5) have suggested that chilling requirements in central Florida should be satisfied by January 31 and by February 15 in northern Florida.

Seasonal chilling hour totals taken over a period of consecutive years may be analyzed statistically provided: a) the sample data are random with time and b) the analytical form of the population frequency distribution can be