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Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

Myrtle Bank Hotel
KINGSTON
JAMAICA, B.W.I.

Sacred
memory of
George Washington Reed
Master Commandant in the Navy of the
United States
Born at Philadelphia May 26th 1780,
Captured in the U.S. Brig of war Vixen
under his command,
By H.B.M. Frigate Southampton;
He died a prisoner of War at this place
January 4th 1813.
Unwilling to forsake his companions in
captivity, He declined a proffered parole,
and sunk under a tropical fever.

This Stone
Is inscribed by the hand of affection,
as a memorial of his virtues;
and records the gratitude of his friends
For the Kind offices, which
in the season of sickness and hour of death
He received as the hand of
a generous Foe.

Preliminary Evaluation of New and Uncommon Pear Varieties, Research Bul. 790, Ohio Agri Exp. Station, Freeman S. Howlett. June 1957.

Baldwin. Size medium obovate pyriform or oval, obscure neck. Greenish yellow, dull roughened skin, somewhat similar to Kieffer. Flavor fair to good. First week in October. Keeping quality: relatively short for a var. of Oriental type. Flavor somewhat superior to most vars. of similar inheritance.

Hood. Size medium to below medium. Roundish, obtuse pyriform, neck wanting. Greenish yellow. Flesh yellow, coarse, tender, juicy, subacid; stone cells few, not objectionable, confined to core region. Flavor poor. 2nd week in Sept. Keeping quality: poor.

Kieffer. Flavor poor to fair. Harvest date 3rd week October. Keeping quality good. Blight-resistant. Poor dessert quality. Does not always ripen properly at Wooster.

Lincoln. Source unknown. Size medium; obovate pyriform. Yellow. Flesh white, soft, medium, melting, juicy; sweet. Stone cells abundant, confined to core region. Flavor fair. 1st week Sept. Quality variable. Only fairly attractive. Certainly one of the bitter flavored blight resistant varieties of presumably Oriental inheritance.

Orient. Size very large. Roundish, globular. Greenish yellow with some russet. Juicy, somewhat sweet, lacks depth of flavor. Flavor poor to fair. 2nd week October. Oriental inheritance evident. Reported to be immune to fire blight. Of value only where blight immunity is imperative.

Packhams Triumph (From Tech. Bul. 41, Oregon Agl Exp. Sta., 1957). Medium to large, obtuse pyriform. Surface somewhat rough, greenish yellow or yellow. Flesh white, melting, fine, very juicy, gritz free of grit. Sweet, vinous flavor, rates among best in dessert quality. Season late. Keeps as long as Beurré d'Anjou. Rapidly gaining ground as a commercial pear in this country and abroad.

Worden Seckel Skin smooth, clear yellow in color heavily blushed with crimson. Flesh fairly fine, somewhat granular at center. Tender but not fully buttery, moderately juicy. Very sweet, somewhat insipid in flavor, often astringent. Decidedly inferior to Seckel in dessert quality.

Pineapple. "Fruit of no consequence." Free, highly resistant to blight but somewhat susceptible to winter injury in So. Oregon.

Kieffer. Cross between Sand Pear and Bartlett? Fruit medium to large, ovate, usually pointed at both stem and calyx ends. Skin greenish-yellow, often blushed dull red, numerous large russet dots. Flesh gritty, fairly juicy, tender but not fully buttery. Fair in dessert quality, quite satisfactory for culinary purposes. Improves in quality if harvested at the proper time and ripened at a constant temp. of 65°.

Le Conte. Fruit medium in size, roundish, tapering at both ends. Skin thick, Tough, fairly smooth, pale yellow in color, numerous small dots. Flesh firm, gritty, moderately juicy. Inferior to Kieffer in flavor and texture characteristics. Breaks down at the core if left on the tree too long.

have been seen. Probably all so-called Jaffa trees belong to the round seedy local or Belladi variety of Palestine. Only in one place small trees were found grown from Shamouti seeds so far without fruits but with typical leaves.

b. Mandarines: True mandarines or tangerines like those grown in the mediterranean countries or in USA are very seldom found in India. But India has its own very important types, with probably at least three different varieties (sometimes taken as species) which may best all be called by the local name "Santara". These are grown in Nagpur, in Madya Pradesh, in the south of Bihar and in the hill districts of Bengal and Assam. The fruit peels easily like a tangerine but has some interior characters much more like an orange. It might quite easily be taken for a Tangor - a hybrid between tangerine and sweet orange.

c. Pomelos and Grapefruits: Forms of both these groups are rare in India and probably found only in the collections of the horticultural stations. Some very good pommelos were seen in the South, while grapefruits are to be found - mostly in varieties imported from USA - in Uttar Pradesh and Punjab.

d. Lemon and Limes: Very few true lemons were seen in India and most of the forms, Malta Lemon, Italian Lemon, Seville Lemon, Rajamundry Lemon, look like lemon-lime-hybride. One of these called Hill Lemon or Galgal - is of good size and thin skin, looks very interesting. On the other hand, the lime is the most important citrus fruit of the country and is grown in all but the hill-districts. The two most important types - again it is questionable if they can be called varieties of the same species - are the small acid or Kaghzi lime and the larger Sweet Lime. Another interesting fruit which does

not seem to be grown commercially is the redfleshed lime known as Marmelade Orange, Guinea Lemon, and other names. This is probable the form known as Rangpur Lime in USA.

e. Hybrids: Of the many forms which it would be difficult to bring into any of the former groups the only one of any commercial importance is the Vadlapudi orange of Madras. When first seen by the author it looked to him like an hybrid between pomelo, mandarine, citron and lime. Tanaka has given to this type species rank and has called it Citrus pennivesiculata. A related type called gananimma has been found promising as a rootstock. Another rather rare type of South-India - the Kichili - has been called Citrus madraspatana by Tanaka. The number of probable hybrids is very much greater and a vast number of new species would have to be created to completely identify all the forms. It might be better to give - at least at this stage - a very comprehensive description of these types without attempting to include them into any of the recognized species.

2. Research

Research into problems of citriculture has been carried out since 1935 at Kodur in Madras State, at Poona in Bombay State, and since 1944 at Nagpur in Madya Pradesh and in South-Bihar by the horticulturists of Sabour Station. Much work had for many year been done at Lyallpur in Punjab which is now part of Pakistan. Some of the trial plots - expecially those at Attari now in Eastern Punjab - were re-established after the partition. Very recently work has been started at Saharanpur in Uttar Pradesh.

Most of these places have worked mainly on the questions of rootstock and variety. Some fertilizer and manure trials have been carried out. No irrigation tests were noticed by the author. Other

research work has been done on fruit drop, the splitting of fruit during the rainy season, and the various forms of"die-back". This is a convenient word to cover a diversity of damages due mostly to adverse soil influences and faulty orchard management, such as deficiencies in elements, very low pH value, waterlogging etc. The first step is to recognize that "die-back" is a symptom and not a disease and this knowledge is fortunately now available. Thus practical research on these problems can now begin. Several places have begun work on breeding, but it seems to the author that there are other more promising research problems, especially as citrus breeding can show results only if undertaken on a very large scale.

3. Propagation and Orchard Management

The common acid lime is usually grown as a seedling, but trials at Kodur have shown that grafted trees give higher yields. In some regions Santaras are also grown as seedlings. But most citrus types are grafted by inarching or budding on Rough Lemon. Even the Sweet Lime which is used in Israel as a stock, and is very strongly polyembryonic, gives a practically uniform progeny and is usually grafted.

Planting distances vary but citrus trees are always planted much closer than mango trees. Manure is rather frequently given and fertilizers added in many cases. Even minor elements - e.g. zincsprays - are given in some cases .

But the most remarkable difference between countries is that while mangos are always irrigated in Israel, and in most cases more frequently than citrus, in India most mango orchards are without irrigation facilities while citrus is almost everywhere irrigated.Only in the hill regions with very high rainfall do Santaras depend on rainfall alone. In the south up to 20 irrigations are given

during the dry season, while in some places in the north about one or two irrigations per month seems to be sufficient.

In the near tropical regions citrus trees flower irregularly throughout the year instead of simultaneously. In such situations, it is customary to apply a rather drastic treatment. Trees are left without irrigation for 2 or 2½ months - with or without additional rootpruning - either in early summer before the rainy season or in late autumn. After that, manure and irrigation are applied and the trees are thus forced into bloom. This treatment resembles the one given in Italy to lemons to force them to give fruit in summer. Some trees were seen during the drying period and they looked very much weakened.

Thus the main flowering season may be regulated to take place in February and March or in June and July, and fruit may then be picked either in September and October or in late winter and early spring. Different growers prefer one or the other as their main season, for reasons of fruit quality and market response.

Yields, generally speaking, do not seem to be very high. No special study has been made on this point but most trees seen had not more than 200-300 fruits. Yet citrus growing must be a profitable business as - in contrast to mango-growing - it is constantly expanding.

F. OTHER SUBTROPICAL FRUITS

India grows a very great number of other subtropical fruits and, concerning some of them, points of interest have been recorded. It would be impossible to incorporate into this report a complete description of all of them. Thus - while we shall mention over 20 different species - only relatively short notes will be given on most of them. They will be grouped into those which are grown to a somewhat larger extent and are well known on the markets and those which are

very rarely seen outside of experimental orchards.

1. Fruits grown for the market

a. Jackfruit (Artocarpus integrifolia): While never planted in orchard form, the Jack is one of the most common fruits of India and produces from its 100,000s of trees a very large quantity of food for the local population. Only a very small part of this is marketed. There are said to be very good types but vegetative propagation has been done so far only on an experimental scale. Recently a very precocious type said to bear after 18 months - is becoming popular. The interior of the huge fruits is eaten both fresh and cooked, the seeds can be roasted like chestnuts and the tree is also used for its wood. Selection of superior types combined with vegetative propagation would probably result in a considerable improvement.

b. Guava: The common guava - a native of South-America - has become very popular in India and is grown on a large acreage for the market (over 100,000 acres), especially in the Allahabad and nearby divisions of eastern Uttar Pradesh. Many varieties are known - white - and red fleshed, differing in size and taste and also a seedless one which is said to be triploid. Most trees are still probably seedlings but vegetative propagation, mostly by layering, is quite common and the best types have been standardized in the main growing regions. The culture of the tree is easy and yields are relatively high. Recently a new root disease has done much damage and threatens to wipe out many orchards. Research work has been started and it is hoped that a remedy will be found. Root deseases are normally very difficult to control and it is therefore important to find resistant types which might be used directly or at least as rootstocks.

c. Litchi: This famous Chinese fruit has found a congenial home in the North-Bihar section of the northern plains of India (24,000 acres). Excellent varieties have been imported and selected; propagation is exclusively vegetative by layering. The orchards are given very good care and excellent yields have been reported. Unfortunately, it was impossible to time the visit to Bihar in such a way as to see both Litchi and mango, and thus only some fruit of the late ripening varieties could be seen. But many orchards were observed and made a very good impression. A few insect pests have been found to be troublesome but they seem to be under control.

d. Sapodilla (Achras sapota): This is another American fruit which has become very common in almost all the warmer parts of India. The tree is known to succeed in the hottest and driest regions. Good varieties have been selected and locally named. Two groups may be recognized - those with rather large, round fruits and those with usually smaller, elongated fruits. The best varieties are probably to be found in Bengal. Propagation is almost always vegetative, sometimes by layering and much more frequently by inarching on different rootstocks. The Sapodilla may be grafted on seedlings of the same species but two other species belonging to different genera have been tried - Bassia longifolia which has quite often shown incompatibility and Mimusops hexandra which is probably the best existing rootstock. Yields are not always satisfactory and it seems that much profitable research work could still be done with this species.

e. Papaya: This large herb is very common in India and can be grown everywhere in frost-free localities. In spite of the ease with which it can be grown and its high yields it has not yet become very popular with the general consumer. Important centers are in Bombay State

and in Uttar Pradesh, mostly in irrigated groves. Variety selection, breeding and the study of the heredity of sex - so as to obtain as high a percentage of fruit bearing plants as possible - are some of the most important research lines. Recently a virus disease has done much damage. Virus-free and virus-resistant types will have to be isolated. In addition to the use of the fruit as such papaya can be grown commercially for the production of papain produced from the milky juice extracted from unripe fruits.

f. Pineapple: India has,so far, not developed a major pineapple industry in spite of the fact that the climate of the moister parts of the South and the submontain region of Bengal are very suitable for Pineapple cultivation. In both these regions a few thousand acres are under pineapples and yields seem to be good. Most of the acreage is under large-fruited varieties, Kew or Cayenne. Canning on a rather small scale is carried out.

g. Cashew: This American relative of the mango is one of the most remarkable fruit trees in India. On the humid western coast of the peninsula - in Travancore, Malabar and South-Kanara - the small tree of the cashew has become practically wild and it is estimated to cover over 100,000 acres. The fleshy part - the cashew apple - was formerly much used for fermentation and it is now frequently not used at all. But the cashew nut is gathered and forms an important item in the export of Indian produce to USA. The tree is extremely susceptible to cold weather and can be grown only in absolutely frost-free regions. But it grows with relatively little rain and on the lightest and worst type of soil. So far not much work has been done for this crop but the idea is gaining ground that India could profit much by organized research so as to establish the cashew as an orchard tree.

Finally four important local fruits must be mentioned:

h. Phalsa (Grewia asiatica): If not pruned the Phalsa may grow to be a smallish tree; but in commercial plantations it is usually pruned very heavily - once or even twice yearly - and thus is not higher than about 5 feet. Under these conditions, plants can be set out very closely and yields per acre become quite high. The fruit is a small purplish berry which looks and tastes like the blueberries of Europe. The fruit is very refreshing and is easily sold. It cannot be transported far because it is highly perishable but it might be used for the preparation of jams and beverages. It is quite common, especially, in Bombay State and Uttar Pradesh but not yet grown on a large acreage.

i. Ber (Zizyphus mauritiana Han): Two quite distinct species of the genus Zizyphus are known as fruit-trees. Zizyphus jujuba Miller is grown in China, Central-Asia and the Middle East. The tree is slender, with deciduous, glabrous, slender leaves. The fruit is obovate or almost round. As against this, the ber tree of India Zizyphus mauritiana Han. - is a large straggling tree, practically evergreen, heavily tomentose and the fruits are mostly conical or elongated. It is a very common wild tree, extremely resistant to arid climate, and dry and alkaline soil. Much fruit is gathered from wild trees and small areas are under cultivation. Very good types have been selected and vegetative propagation is possible. Large scale cultivation might become feasible but would need effective control of the fruit fly Carpomya vesuviana.

j. Jaman (Eugenia jambolana): It is a very large forest tree the fruits of which are gathered in large quantities and sold. So far, this species is very seldom planted and even then only as a road side or shade tree. But quite large fruits of superior quality are occas-

ionally seen and it might be worthwhile to locate these trees and start their vegetative propagation.

k. Phyllantus emblica: This species grows in different parts of India under slightly different names, as amla, onla, aunla, or in English, Indian gooseberry. It is a very acid small fruit with a greenish to yellow or reddish color. It is reported to be a rich source of vitamin C. It is so far not grown commercially but recently work has been started for the selection and vegetative propagation of outstanding types.

2. Fruits grown experimentally or on a very small scale

Under this heading another group of 10 species may be mentioned. Naturally many more of still less importance are to be found here and there in India.

a. Loquat: Quite common in the northern plains. Mostly grown from seed but vegetative propagation is known and some good varieties are propagated. The fruit has so far not become very popular probably because it is rather too sour for the local taste. No commercial orchards were seen.

b. Avocado: Very few avocado trees were seen. West-Indian seedlings have been planted in some of the experimental stations in the South and in Uttar Pradesh and a few Mexican seedlings are growing at higher locations. A few budded trees - mainly from material imported from Ceylon - were also seen. The fruit is practically unknown, and no work of any kind is done with this species. Frostfree locations in the hills between 3,000 and 4,000 feet might be favorable for Guatemalan avocado varieties. These fruits with their high fat and considerable protein and vitamin content could be of considerable importance in a vegetarian diet.

c.Passionfruit: Several species of Passiflora are grown on a very small scale in different parts of India. The purple grenadilla - Passiflora edulis - thrives in the hill areas and there are good prospects for commercial development. The yellow Passiflora ligularis and the giant grenadilla Passiflora quadrangularis are found in tropical or semi-tropical climates.

d. Annonaceous fruits: Four species of Annona and probably some hybrids can be seen in India The sour sop-Annona muricata and the bullock's heart, Annona reticulata, are found only as occasional trees in the warmest regions of the south. On the other hand, Annona cherimola has been tried in hill regions and has been quite successfully grown especially in the Nilgiris. Some of the types supposed to belong to this species seem to the author to be hybrids and should more probably be called atemoyas.

The most common species is the sugar apple - Annona squamosa. It is a fruit of the plains and can be grown even on very light soil in a dry climate. It has acclimatised itself extremely well so that very large quantities of fruits are gathered annually. It is commonly grown from seed. The fruits ripen in autumn and therefore were not seen by the author. Considerable variation is said to occur and thus selection and vegetative propagation might be worthwhile.

e. Mangosteen: This wonderful fruit can be grown only under the moist, strictly tropical conditions of Ceylon and some parts of southern India. It is so far grown only to a very small extent but experimental work has been done in the field of rootstocks and vegetative propagation and so the species may reach in time a greater importance.

f. Durian: This is another strictly tropical fruit which can be grown in southern India but has so far not become very common.

2. Figs

Fig trees are quite common in some of the plain districts of India, but nowhere were commercial orchards or varieties of superior merit seen. The summer rainfall makes the drying of figs practically impossible and the highly perishable nature of fresh figs makes them unattractive for market growing.

3. Pomegranate

The pomegranate is very easy to grow and quite common in the dryer parts of the country, especially in the northwest. But it too is playing no important part in the regions visited and superior varieties are probably only to be found in Pakistan.

4. Apple

The apple in all its commercially grown varieties, needs a cold winter. The search for varieties with low chilling requirements which might be used for breeding purposes in Israel - one of the aims of our survey - was unsuccessful. The hill regions of South-India are not well adapted to apple growing and the many trials made in regions such as the Nilgiris were rather unsuccessful .

On the other hand, very good apple orchards were visited in the higher hill regions of the north, especially in Kumaon and Kashmir (about 10,000 acres). The famous Kulu apple orchards could not be visited because the road was swamped by heavy rains. The orchards in the Kumaon hills grow only introduced varieties (mostly English) which were originally planted by Europeans. In the Research Station at Chaubattia much interesting work has been done, but many problems are still unsolved: selection of suitable rootstocks and varieties, problems of plant nutrition in an area with very high summer rainfall and very little livestock and the control of pests and diseases.

Once these problems have been overcome apple growers should find no difficulty in finding a market for their product in the main towns of India.

Kashmir has also a very good collection of foreign varieties - mostly French - but in addition grows some central-asiatic varieties, the most important of which is called Ambri. Unfortunately many of the apple orchards of Kashmir are not well cared for and are deteriorating. San Jose Scale does much damage and too little thinning and unsatisfactory tree nutrition exhaust the trees.

5. Pear

Two different types of pears are grown in India, neither of which is planted on a large scale.

The so-called country pear, varieties belonging to Pyrus serotina, can be grown in the southern hills and in the northern plains. Trees look very good and yields in most cases are very heavy. But the quality of the fruit is not first class due to the well-known grittiness in the varieties of this species.

European varieties of the pear are grown together with apples in the higher hills of the north and in Kashmir and give a very good performance. But the fruits are difficult to transport in good condition to the markets in the larger cities, and now that most of the European population has left there is little market for them.

A few varieties, imported from Kashmir, were seen at Palampur and these might have lower then usual chilling requirements and could thus be of interest to Israel, expecially from a plant breeder's point of view.

6. Peach

Very good northern type peaches can be grown in the cooler regions but transport difficulties make this commercially nearly impossible.

Varieties with low chilling requirements have been selected and can be seen in the southern hills and northern plains; they were not in season at the time of the visit. It is doubtful if they can compete with the large number of newly bred southern peach varieties of the U.S.A.

7. Plum

Three types of plums are grown in India.

Some of the varieties of the diploid Japanyo-American group have become acclimatised in the southern hills and northern plains but non of them - as far as the fruit is concerned - is of top quality.

On the other hand, Kashmir and to a lesser extent the other cold regions produce very good European plums (hexaploid) of well known varieties . But for the same reasons as mentioned before for pears and peaches their cultivation is rather limited and they cannot compete with the apple in commercial production.

A third group of local varieties, probably originally introduced from Central-Asia, may be of considerable interest for the plantbreeder because of their hardiness and willingness to grow under plain conditions in the plains. Without a chromosome count it is not possible to be sure whether they belong to the hexaploid group or are diploids related to the myrobolans. It would be quite interesting to have their chromosome number verified.

8. Quince, appricot, cherry, almond

Trees of these four species are to be found occasionally, but

Their cultivation is of little importance. Cherries are sold in very small quantities and naturally fetch high prices. Almonds are grown to a certain extent in Kashmir, usually as seedling trees and some work has been done on selection and identification of the main types. Very few thin shelled and no really large fruited types have been seen.

H. PLANTATION CROPS

These crops are in the general economy of India of very much greater importance than fruit trees and a very great amount of valuable research work has been done with some of them.

Our study tour was not directly concerned with any of them but for the benefit of his colleagues in Israel the author has occasionally visited some of the places where research with these crops is carried out.

As Israel is climatically not suited to any of the major plantation crops - such as rubber, tea, coffee and cocoa - no study of their problems was undertaken.

Coconut

An exception was made with coconut as it has been frequently suggested that its cultivation should be tried in some parts of the country. The Central Coconut Research Station at Kasagorod in Madras State was visited. Discussions were held there and observations made on the northern limit of commercial coconut production on the West coast of India. These made it quite obvious to the author that nowhere in Israel exists that combination of temperature, high humidity and sufficient water (rain or good irrigation water) which is

neededfor commercial coconut production.

With these remarks we close our description of the observations made during our study tour to India.

We take this opportunity to express our gratitude to the FAO authorities who made this study tour possible and to all the many colleagues in all parts of India and Ceylon without whose help this journey would have been all but impossible.

PART TWO

SUMMARY AND RECOMMENDATION

The Food and Agriculture Organisation has given to the Government of Israel fellowships for the purpose of visiting foreign countries and acquiring from them knowledge that will benefit the agricultural development of Israel.

The knowledge obtained during this study tour to India was mainly in the field of subtropical horticulture. In addition to this, the author has tried to make contacts in other fields of horticulture and agriculture. Thus, summaries will be given under various headings.

Mango

The very great number of mango varieties and its diversification in the different climatic districts of India made it possible, after 28 years of studies with varieties introduced into Israel from many different countries, to obtain a clear picture of the variability of the cultiforms within the species. There is great variability in the regional adaptation of this fruit, and it stands to reason that varieties from Uttar Pradesh and Bihar will be more suitable to the growing conditions in Israel than those from southern India.Some

varieties have been reported to possess a certain amount of resistance to low temperatures and these will be especially interesting - probably more as breeding material than for immediate cultivation. There is also a considerable variation in the innate productivity. The variation in size, form and color is probably not greater in India then in the varieties already present in Israel. Some varieties possess a superior keeping quality which is of great importance for marketing, especially for export. The best varieties in India are superior in taste to all those so far tried in Israel. But naturally it cannot be known beforehand whether this is due to variety alone or to the reaction between variety and growing conditions.

Varieties were selected for trial in Israel and during the studytour budwood of more than 40 varieties was sent to Israel and budded*. Additional varieties were selected and budwood will be obtained during the next budding season e.g. between June and August 1953. We have been promised also layered plants, especially from Saharanpur. A type of mealy bug which is not yet present in Israel was found on the roots of some mango grafts and it will, therefore, be impossible to introduce grafted trees.

Methods of cultivation and propagation of the mango in India are not as such suitable to conditions in Israel. But from the many research projects carried out in India various points of interest were learned. As mango trees are in India usually not irrigated and yet grow fairly well, it seems that we in Israel are probably over-irrigating mango trees. It is not intended to grow mango trees in

* During the years 1952-54 budwood from nearly 100 different mango varieties was obtained from India and most of it successfully budded in Israel. A few of these have already given fruit; Dasheri may be mentioned for its productivity and Alfonso and Lagra for the quality of their fruits.

Israel without irrigation but it is quite possible that the amount and frequency of irrigation may be reduced. This would naturally make mango growing much easier and trials in this connection will be made.*

Banana

The banana industry of Israel is based on one type of the Chinese dwarf banana. It has been felt for a long time that this situation is dangerous and that additional varieties should be introduced and tried out. For this reason, a study of the types of banana grown in India was of the greatest importance. (And it is to be hoped that next year a similar study will be carried out in Australia). At least three different types of dwarf banana exist in India. In addition, a very large collection of tall varieties is grown in the various regions of the country and some of them may be of value to Israel. We should expecially like to try the slightly sub-acid types grown under the names of Poovan, Lal Velchi or Champa.

Due to the presence of bunchy top and to a lesser degree panama disease in most parts of India it was not possible to take plant material this year. It is intended to establish a quarantine station in a non-banana-growing district of Israel and then to import the most interesting varieties.

Banana growing in India is on a much higher level of agrotechnique and organisation than mango growing. Thus many new ideas were noted and will be investigated through trials in Israel. The most important is the method of growing dwarf banana in Bombay State. The combination of very close planting with copious irrigation, manuring and destruction of all competing suckers so as to obtain one harvest

* In the spring of 1956 a new mango orchard was planted with the purpose of investigating various irrigation schedules.

only, but that a very heavy one, may be suitable for certain conditions in the coastal plain of Israel where we have so far obtained only two or three harvests. If it would be possible to obtain the total aggregate yield (or only slightly less) in one harvest - it would be a distinct commercial advantage.

Citrus

It does not seem probable that the highly developed citrus industry of Israel can profit by adaptation of cultural methods used in India. There are also not many varieties grown there which are better than those grown here. Moreover the importation of citrus plant material is prohibited for fear of introducing new pests and diseases.

But there are a number of wild or semi wild citrus types in India which could be used as stocks; they also have breeding value; seeds of these should be imported for trial tests.

In addition, if the citrus scientist of Israel could become acquainted with the many hybrid forms present in India it may be of help in gaining a fuller understanding of the systematics of this difficult genus . In this connection also, the interesting herbaria kept in some places in India could be of considerable help.

Other subtropical fruits

A great number of subtropical fruits are grown in India. Seeds of some of them weretaken this year and more will be introduced next spring. Methods of vegetative propagation have been worked out for many of them; this will enable us to introduce superior types of those already present in the country, and also to learn those methods in cases where we have so far not succeeded with vegetative propag-

ation. Only a few can be mentioned here: Guava varieties expecially from Uttar Pradesh. Litchi varieties from Bihar and Uttar Pradesh, and Sapodilla varieties from Bombay and Bengal. Phalsa, a fruit not yet tried in Israel, will be introduced; also large fruited types of the Jambolan, yellow fruited types of the passion fruit, the sweet Carambola and, if obtainable, the large fruited non adstringent persimmon from Sikkim.

On the other hand, we are convinced that because of climatic conditions it is not worth while to indroduce the Jackfruit, Pine-apple, Cashew, Ber and certainly not the Mangosteen.

Deciduous fruits

The regions visited do not grow those European fruits grown under conditions which are comparable to those of Israel. It is possible that a visit to some regions of Pakistan, especially Beluch-istan, might have given different results. No varieties of apple, peach, apricot, almond or grape were seen which could be introduced into Israel. Some submontain types of pears might be interesting because of their low chilling requirement; some plum varieties seem to be highly resistant to heat and drought. The Kumaon-Hills walnuts, usually grown from seeds could provide material suitable for local selection.

Plantation crops

A special study was made of coconut growing and the author has convinced himself that nowhere in Israel are climatic and soil conditions suitable for this crop.

Exchange of publications

It was found that most of the publications sent out by the Rehovot Research Station did not reach the workers for whom they were

intended. Thus we tried to discover in each State of India the most effective way of exchange. A list of the places in India to which our publications would be sent has been prepared for the librarian of our Station.

In addition it is to be hoped that as a result of this study trip personal relations and exchange of experiences will not only be formed between the author and his colleagues in India but also by other research workers in Israel.

Arabia and North Africa to secure offshoots in quantity and dispatched his two sons, Paul and Wilson, on this mission. This was in the summer of 1912. After visiting northern India to see something of mango culture, these two went to the Persian Gulf where they spent six months assembling 9000 offshoots of the best date varieties cultivated in Oman and the valley of the Tigris and Euphrates; then they visited Algeria and secured some 6000 more. All of these were safely landed in California and gave a tremendous stimulus to a young industry, the development of which was slow because commercial date varieties can be propagated only by offshoots and a palm does not produce many during its lifetime.

David Fairchild, who had known the Popenoe family since early days at the Kansas State Agricultural College, was in charge of the Office of Foreign Seed and Plant Introduction in the Bureau of Plant Industry at Washington. He had visited the West India Gardens in California, and had been interested in the date palm expedition, which in fact was based upon his own visit to the Persian Gulf region some years earlier. The day after Wilson Popenoe reached the United States, he was appointed an Agricultural Explorer in Fairchild's office, a position which he retained for the next 12 years.

For two seasons he worked on problems of mango production in Florida. Then he embarked on a series of lengthy voyages to the American tropics. While concerned primarily with a search for promising avocados for introduction into the United States, many other tropical and subtropical plants were collected, and numerous papers written about them. In 1920, between two of his trips to the tropics, he wrote the "Manual of Tropical and Subtropical Fruits" which was edited by L. H. Bailey and which remained for many years the

the standard work on the subject.

As a result of the contacts made in Latin America, and his sincere efforts to assist in the horticultural development of many tropical and subtropical regions, he was decorated by the President of Chile with the Order of Merit, and slightly later received the same decoration from the President of Ecuador. In 1924 the Universidad Mayor de San Marcos at Lima, Peru - generally conceded to be the oldest University in this hemisphere - conferred on him the degree of Doctor en Ciencias, honoris causa.

During the periods spent between trips in Washington, Wilson Popenoe had made the acquaintance of Leo S. Rowe, Director General of the Pan American Union, and discussed with him the possibility of doing more for the Latin American countries along agricultural lines. Dr Rowe requested him to inaugurate a series of agricultural bulletins in the Spanish language, which was commenced in early 1925. Out of this grew the present Division of Agricultural Cooperation in the Pan American Union.

In 1923, Wilson had married Dorothy Hughes, a British girl who had been trained in botany by Otto Stapf at Kew. With a family coming on, and long voyages of agricultural exploration no longer so attractive, Wilson joined the United Fruit Company in 1925 and moved to Tela, Honduras, where it was proposed to bring together an extensive collection of tropical economic plants, with a view toward developing new crops. Thus was born Lancetilla Experiment Station, today one of the finest collections of such plants in the Americas.

Bananas being the backbone of the United Fruit Company's business, it was obvious that they would come into the picture; hence it was

not long before attention was devoted to cultural problems in connection with that crop. Prof. Lewis Knudson of Cornell University had been coming to the tropics periodically for several years to advise on these problems; and a little group of research workers was rapidly being brought together. Oscar Magistad, Norman J. Volk; George Scarseth and others in the field of soil chemistry; and Otto Reinking and John R. Johnston on the pathological angle; V. C. Dunlap, Alfred Butler, and numerous others.

Banana culture up to this time had been on a rather primitive basis, throughout the Central American countries at least. Under the guidance of Hartley Rowe in the Boston office, this group of workers "brought the banana out of the jungle and put it on the farm". Today banana cultivation is one of the most highly specialised of horticultural industries - if we can call it a horticultural industry. And we can, if we accept Oakes Ames' definition of the difference between agriculture and horticulture.

During the decade 1930-1940 Wilson Popenoe spent much of his time travelling around the Caribbean, visiting the banana divisions of the United Fruit Company to assist in the improvement of cultural practices. At the end of 1932 he had the misfortune to lose his wife, who died at Tela.

In 1934 the United States government became interested in establishing the cultivation of Cinchona in this hemisphere. Merck and Co. Inc., of Rahway N. J., offered to undertake this work, but lacking personnel experienced in tropical agriculture, called upon the United Fruit Co. for assistance. Wilson Popenoe provided two trained plantsmen, and later personally assisted during a period of

six months in organizing and developing Cinchona plantations in Guatemala. This work resulted in his being called upon, in 1943, to travel with Walter Turnbull through the Cinchona producing regions of South America, helping to organise the procurement of Cinchona bark for the armed forces of the United States at that time threatened with a scarcity of anti-malarials.

In 1939 he married Helen Barsaloux of Chicago, who was to be of great assistance to him in the next major project which came his way. For in 1941 Samuel Zemurray, president of United Fruit, announced that the Company would establish an agricultural school, as part of its general program of cooperation with the tropical countries in which it operated.

Wilson Popenoe was named to take charge of this new project. A site was selected near Tegucigalpa, the capital of Honduras. This region was chosen because it was representative of a large area in Central America, and because it had excellent facilities along many lines - communications, water supply, and the like. Here, with the assistance of Harlo von Wald, in charge of construction, and Alfred Butler, in charge of the horticultural end, a beginning was made.

With the philosophy of Samuel Zemurray behind it, and ample funds with which to work, it was inevitable that this school should rapidly attract attention. Its students are drawn from twelve tropical American Spanish-speaking republics. They pay nothing - they are furnished without charge everything from clothing to haircuts. The training is eminently practical; the boys spend their mornings acquiring at first hand the various skills needed by a tropical farmer, while their afternoons are spent in the classroom

[illegible] conscientious to say that one treasure of that day will be the relics of the old world, of planet earth before the species man remade it. Already we are losing the environment we evolved in, and our times are too troubled to care. But there are men coming who will demand to know: what was it like, how did it feel and smell in the veins the old books tell of? Where is the green flame in the quetzal ranges? Why did they hit the crying cats from the mountains of the dead, the slow sea cow from the dark lagoon, the flying [illegible] from Tamaulipas, the [illegible] shadow of the tapir from the jungles of Guatemala?

These things are not part of our tactical dilemma but [illegible] the strategy to think of too. There are different levels of urgency in our obligations to our neighbors. The immediate need is real friendship and an honest sharing of sound technology. But living in the [illegible] will be a changing art. Beyond the just claims of today's neglected men is the voice of their descendants yet born, asking to know not their world once was. That voice has got to be heard now, or else day the roar of its waters will drive the dust of our days.

I set out to keep to practical matters, and I shall. In spite of its visionary ring, what I am going to talk about last is really the most practical matter of all. It concerns one other way in which the knowledge of natural history will be called upon in the changing years we face - the obligation to save samples of wilderness for the far future. The values involved are different from those usually spoken of on economic round tables. The tactical problems of our days loom huge in our eyes. The undergrown societies of the American Isthmus want health, education and the fruits of technical progress. These are the treasures of the new El Dorado. And they are treasures, and must spread into the farthest hills.

But once achieved, these things will be only tortillas and beans; and new masses of men, freed for thinking by new sources of energy, will hold their forbears to account for what we failed to understand. If our line survives the power to destroy itself, economy will one way no longer depend on growing populations. The mindless breeding can stop, and the fevered competition with nature. Freed of the thought of war, the Chamber of Commerce no longer proscribing his dreams, the new man will be able to think straight to what happiness is, and to how many ways there are to make a happy world.

to the raising of morale and of mutual affection throughout the world.

If I seem to have spoken lightly about this fish there is nothing light about its virtues. There is real opportunity in them. The only obstacle to its realization is the dearth of data on the ecology of the cichlid fishes of Central America.

Such a lack is blotting the promise out of another kind of dream - that of exploiting, and yet not destroying, the attractions of hunting, fishing and camping in the tropics nearest the temperate north. Some of the problems, like management of migratory ducks and quail, are of concern to the whole hemisphere. Some are parochial troubles, like the exhaustion of streams and game woods for miles about each of the big Central American cities. From abroad and from among the local people sportsmen each year push farther into the shrinking wilderness after peccaries, curassows, jaguar, or tarpon; or to test the novelty of camping in tropical forest. The traffic is for the moment profitable, and is encouraged by the local governments. But as the Panamerican Highway improves, the rate of depletion will go up sharply, and with timbering, agricultural clearing, and spreading populations just behind the hunters, the wildlife resource will fade with fantastic speed.

Chapter V

In Guatemala

Guisquil

Dahlias

Neanthe bella

In Costa Rica

Pejibaye

In Guatemala, describe trips to Los Altos, ceremonies at Momostenango, visit to Copan and Quirigua ruins, lake Atitlan, Finca Mocá and coffee culture, the wild Dahlias, more about Antigua and the climb up Agua, guisquil cultivation at Sta Maria de Jesus, and collecting pacayito palms in the Verapaz

Spanish language

Marimba

Hempstead's remark on Mocá

Guatemalan plants to be described

guisquil

wild Rubus

Dahlias, popenovii and maxoni

Neanthe bella

Principal native orchids

Differences in Spanish

Mexican plants

~~Vanilla~~

~~Chocolate~~

~~Llama or papaues~~

[Dept. of Middle American Research of Tulane University]

Post Cards in D.M.A.R.

13. Fragments of Maya clay portrait figurines from Ulua Valley, S.Honduras. X has small monkey on right arm. Height of X, 9.5 cm.

14. Polychrome clay vases, Maya, from Ulua Valley, S. Honduras. About 800 A.D. Height of center vase, 17.5 cm.

15. Page of Census of Tepuztlan. Before 1550 A.D. Spanish census of Mexican towns. This page shows town of Tlalnepantla had 447 houses, 477 married Indian men, 42 widowers, 105 widows, 101 young men, 55 young women, 715 children.

16. First page of Mani Ms. (1557) Oldest document in Maya language, written with Latin characters (Ms. no.1164)

17. Letter signed by Cortes, 9 Sept. 1521, twenty-seven days after conquering Mexico City (Ms. no.9210).

18. Part of Codex Tulane, only complete Mixtec pictorial ms. in U.S. A genealogy, painted on deerskin. Before 1512 A.D. (Ms. no.6282)

19. Gold pectoral made by Aztec goldsmith about 1450 A.D. found in Guatemala. Height, 8.3 cm.

20. Clay head. Warrior. Before 1000 A.D. Southern Veracruz, Mexico. Height, top of headdress to floor 33.5 cm.

21. Skull of Maya chief. Teeth filed and inlaid with turquoise; greenstone bead in mouth. Ulua Valley, S. Honduras.

22. Onyx mask, about 1000 A.D. Toltec, Vly. of Mexico, Height, 21 cm.

23. Shrunken human head. Jibaro Indian, Ecuador. Top of head to center of mouth, 6.5 cm.

24. Maya woman with child, dog. Clay, 16.5 cm. high. Vicinity of Palenque, Chiapas, Mexico. About 600 A.D.

25. Maya head, limestone, about 800 A.D. S.Honduras, Height, 52 cm.

ECUADOR

Curdled lamb's blood stew

WASHINGTON

Robert Cook - Fairs & edible fungi

Spanish music

BANANAS

Citrus fruits and pineapples

Avocados

Mangos

The Annonaceous Fruits

Papayas

The Myrtaceous Fruits

The Sapotaceous Fruits

The Litchi or Lychee

The Kaki or Jpanese Persimmon

The Mangosteen

Rosaceous Fruits in the Tropics

CARISSA GRANDIFLORA DC. Apocynaceae

Carissa. Ciruela de Natal.

A compact shrub up to 4 or 5 m. in height, with long bifurcated thorns and glossy, dark green, thick leaves, ovate-acute and 4 or 5 cm. in length. The flowers are star-shaped, white, very fragrant, and 3 to 5 cm. broad, borne in small terminal cymes. The fruit is ovoid or elliptic in form, commonly 3 to 5 cm. long, dark red when ripe, with a thin skin enclosing reddish pulp and a few small, thin, almost circular seeds.

This South African shrub has in recent times been planted in the West Indies and a few other parts of tropical America, where it succeeds from sea level up to elevations which experience occasional frosts. It is highly ornamental in appearance, due to th contrast of its glossy dark-green foliage, it white flowers, and its deep red fruits. It is particularly useful as a hedge plant, since it grows in low, compact form and withstand shearing admirably. The fruit can be eaten out of hand but is not greatly relished by most people; it has something of the flavor of the northern cranberry and like the latter makes an excellent jelly.

Propagation is usually by seeds or layers. Seeds should be planted as soon as possible after removal from the fruit, in pans or shallow boxes of light, porous soil. Layers are made by bending down the lower branches - they should be of the diameter of a lead pencil or slightly larger - and cutting notches in them, then covering with soil for a distance of several inches. If kept moist, roots will form at the notches in a few months' time, after which the layers can be severed from the parent plant.

Cuttings, when made in the usual fashion, are not very successful, but a method was developed by Edward Simmonds in Florida which gives better results. This consists in notching young branchlets while still attached to the plant, making a cut half way through the stem 10 or 15 cm. from the tip. The branchlet is then bent downward and allowed to hang limply for two or three months, by which time a callus will have formed at the notch. The cutting with a callus at its base is removed and planted in sand under half-shade. Roots will form in two or three months time.

The culture of Carissa is simple. It succeeds on a wide variety of soils, from sands to clays, and can even be grown on the beach, in close proximity to the ocean.

Two other species of Carissa are occasionally seen in cultivation: one is the amatungulu of South Africa, C. bispinosa Desf. (C. arduina Lam.), the other C. Carandas L., the Karanda of British India. C. bispinosa can be dinstinguished by its flowers about 1.5 cm broad, and its oblong-obtuse fruit only 1 cm. in length. C. Carandas has oblong-elliptic leaves, with thorns simple in place of bifurcate. Its fruits, 1 to 2 cm long, are used in India for making preserves.

1) Cocoa // Production is increasing, leaving now a small surplus for export.- (Ten years ago we were importing it from Nicaragua

2- Elevation 75-200 ? or 200-750 feet

3- Peten also has hardwoods, formerly exported through the Usumacinta to ports in Yucatan

4- Rice has not been imported for several years.

5- I believe we have depended too much on Coffee, and lately bananas for our exports.- We should protect the cultivation of rubber, cinchona, and textile plants looking to producing a higher percentage needed by our cotton mills and to manufacture with domestic henequen all sacks for coffee exports.- We have been importing cotton from Salvador and the U.S. and all of our sacks are imported from India, Salvador + Mexico

The introduction of new varieties of Sugar Cane has created a surplus for which there is at present no market.- Manufacture of White Sugar and panela is now under Quotas limiting production to the needs of domestic Consumption.
Studies should be made to find some export market for alcohol and brandy or to foster use of alcohol as fuel for internal Combustion engines.-

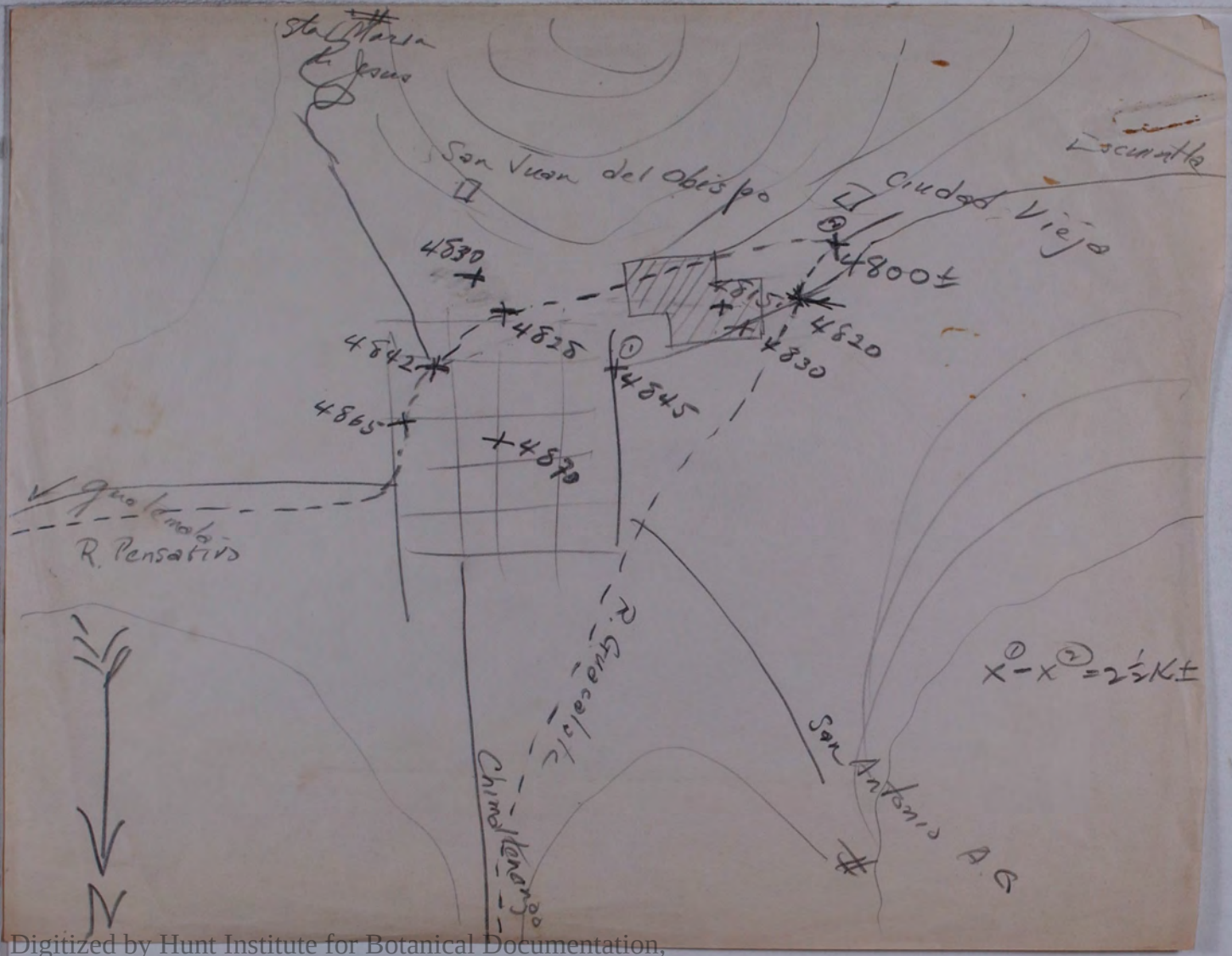
Vanilla

Drainage of areas in cane and contiguous low areas below it is entirely feasible drainage through to either Graciosa or Pensaquitos. Junction of both streams is at elev. 4800' ± (Barometric datum) - giving minimum fall of 7.5 ft per mile.

Investigation by leveling should be made for economical locations.

Was unable to see either rivers or roads from hillsides due to high coffee shade trees, hence no additional sketch.

El. San Juan Obispo
5350 ± (corrected)



PERSEA AMERICANA, Miller (P. gratissima, Gaertn.)

A large tree, varying from erect and slender to low and spreading in habit of growth, commonly forming a broad cylindrical crown, rounded at the apex, and densely foliated when grown under favorable conditions. It sometimes reaches a height of 20 meters, though 12 to 16 meters is more common. The trunk is short, often branching at the base to form 3 or 4 main axes, but sometimes ascending to a height of 1 to 3 meters before it divides or gives off any horizontal branches. The bark is brownish gray, nearly smooth on the young wood, on old trunks exhibiting numerous deep, narrow longitudinal fissures and narrower and shorter horizontal ones. Branches horizontal or ascending, sometimes showing a tendency to droop, the wood very brittle.

Leaves persistent, in some localities almost deciduous, the tree being nearly naked for a month or two, alternate, exstipulate, entire, petiolate. Leaf blades varying from oblong-lanceolate or elliptic lanceolate to broadly oval or obovate, the apex acute or shortly acuminate, sometimes almost blunt, the base acute to truncate, frequently rounded, 12 - 24 cm long, 5 - 12 cm broad, light green, glabrous above, glaucous with the midrib and primary transverse veins and fine reticulations prominent below, midrib and larger veins being slightly pubescent; petiole 2 - 5 cm long, flattened to subcanaliculate above.

Flowers regular perfect, shortly pedicellate in broad, compact panicles about 6 cm long and 12 cm across, at the ends of the young branchlets. The primary axis of the

panicle sometimes terminates in a small cluster of leaves. Bracts and bracteoles oblong-acute, concave, 2 - 5 mm long. Pedicel 4-8 mm long, slender, finely pubescent. Flowers about 1 cm across, the corolla wanting, the calyx 6-parted, with pale greenish, oblong-lanceolate, acute, slightly concave lobes 5 mm long, 2 mm broad, finely pubescent. Stamens 9, opposite the calyx lobes, in 3 series, inserted at the base of the ovary; each stamen of the innermost series bears just above its base 2 oval, flattened, orange colored glands 0.5 mm long, attached to the filament by a very short stalk, and just within the inner 3 stamens, and alternating with them, are 3 short staminodes, triangular, flattened, orange colored, and produced upon very short fleshy stalks; filaments 2 - 3 mm long, slender, finely hairy, the anthers oblong-ovate, slightly more than 1 mm long, dehiscing by 4 valves hinged distally, the 2 outer series dehiscing introrsely, the inner series with the 2 distal valves dehiscing introserly and the proximal pair dehiscing extrorsely. Ovary superior, 1-celled, ovate-elliptic, 2 mm long, both it and the slender, attenuate style, which is about 3 mm long, finely pubescent; stigma simple.

Fruit varying from cylindrical to globose through numerous gradations, commonly ovoid, pyriform, or obovate, in diameter from 3 to 15 cm, commonly 8 or 10 cm, the surface smooth and shining to rough and tuberculate, greenish, yellowish, reddish or purplish in color. Epicarp thin, membranous, or thick and leathery or thick, hard

and granular, up to 5 mm in thickness? Mesocarp soft and butyraceous, pale yellowish, often tinged with green. Seed 1, conical to oblate, commonly 4 - 6 cm in length, inverted, exalbuminous, the seed coats 2, one or both frequently adhering to the cotyledons but sometimes separate, coarsely reticulated or finely granular on the surface, thin and chartaceous in character, the cotyledons whitish or greenish in color.

Miami, Florida, March 6, 1915.

OF THE SPANISH PEAR.

This is a reasonable high and well-spread Tree, whose leaves are smooth, and of a pale green colour; the Fruit is of the fashion of a Fig, but very smooth on the out-side, and as big in bulk as a Slipper-Pear; of a brown colour, having a stone in the middle as big as an Apricock, but round, hard and smooth; the outer paring or rinde is, as it were, a Kind of a shell, almost like an Acorn-shell, but not altogether so tough; yet the middle substance (I mean between the stone and the paring, or outer crusty rinde) is very soft and tender, almost as soft as the pulp of a Pippin not over-roasted.

Place.

It groweth in divers places in Jamaica, and the truth is, I never saw it elsewhere; but it is possible it may be in other Islands adjacent, which are not much different in Latitude.

Name.

I never heard it called by any other name than the Spanish Pear, or by some the Shell-Pear; and I suppose it is so called only by the English (knowing no other name for it) because it was there planted by the Spaniards before our Countrymen had any being there; or else because it hath a kinde of shell or crusty out-side.

Use.

I think it to be one of the most rare and most pleasant Fruits of that Island; it nourisheth and strengtheneth the body, corroborating the vital spirits, and procuring lust

exceedingly; the Pulp being taken out and macerated ~~within~~ in some convenient thing, and eaten with a little Vinegar and Pepper, or several other ways, is very delicious meat.

Hughes, The American Physitian,
1672. pp40-42

This is a curious little work. The title page says "The American Physitian, or, A Treatise of the Roots, Plants, Trees, Shrubs, Fruit, Herbs, &c. growing in the English Plantations in America. Describing the Place, Time, Names, Kindes, Temperature, Vertues and Uses of them, either for Diet, Physick, &c. Whereunto is added A Discourse of the Cacao-Nut Tree, And the use of its fruit, with all the ways of making Chocolate. The like never extant before. By W. Hughes." London, Printed by J.C. for William Crook, at the Green Dragon without Temple Bar, 1672.

1. Persea Drymifolia Cham. and Schlecht.

General appearance of tree different from that of other avocados - leaves smaller - sharply pointed. Flowers more pubescent. Fruit obovoid, small, thin skinned. Cultivars have larger fruits, almost round to long pyriform, green or purple-black. Perianth segments ?

Foliage usually anise-scented, but occasionally not. Flower to maturity Highlands. 6-8 mos.

2. Persea americana Miller

~~Great~~ matalan var nubigena Cloud forest 5000-9000 ft Oaxaca To Nicaragua. Foliage larger, were colored when young. Flowers less pubescent. Fruit 2 ins. diam, dark green thick skinned, oblate to round - no neck, nail head pedunc, long stemmed; a year or more from flower to maturity.

Cultivars round to long pyriform, green to dark purple, skin varies in thickness but never thin.

Wild in cloud forest, 5000 to 9000 ft.
Hybridized in Mexico and elsewhere

2. Persea americana Miller. First avocado to be described botanically. Known only in Costa Rica, up to now but probably extended in Tropical forests in Colombia and perhaps Ecuador, lowlands up to 2000 ft or so.
Less pubescence - almost glabrous at Times. Fruit 6-8 months to maturity, round or oblate, ~~thick~~ 3 ins or more in diameter, green, skin thick and leathery but not coarsely granular, stem shorter than in nubigena. Cultivars oblate or round, to long pyriform, yellowish green to purple grown in prehistoric times from Central America south to Peru, Peru Not found at high elevations.
Has crossed naturally with nubigena ~~in Mex~~ when cult alongside with it, especially in Florida

Late in the month of February I received a letter from Dr. D. Maggs of the CSIRO Division of Horticul ural Research in Victoria, Australia from which I quote:

"In preparing an account of the history and development of avocado growing in the Murray Valley, Don Alexander and myself have had to examine and classify a number of seedlings and nameless scion varieties. This has led us to examine the systematics of P.americana, and from the literature available here we concluded that all the forms were variants of a single species. In view of the considerable human migrations in the avocado homelands it seemed to us possible that some of the variations could be due to crossing with any local varieties or even species and subsequent variation. My purpose in writing this letter is to ask whether you still regard P. americana as a sinvle comprehensive species, and how far you consider introgressions from the fringe species (e.g. P.schiedeana from various localities) is the main cause of the great variation found in P.americana."

Of course this letter flattered me no end, for my colleagues here in the Americas know that I am not a taxonomic botanist, but I sat down and wrote Dr. Maggs a long letter in which I set forth my views as of the present day, and mentioned that Lucille E. Kopp published in 1966, as one of the Memoirs of the New York Botanical Garden, "A Taxonomic Revision of the Genus Persea in the Western Hemisphere", which was based an exhaustive study of herbarium specimens. Dr Maggs later wrote that he had received this publication, but that not knowing the various species he was rather more confused than before, and that their purpose of sorting out seedlings from commercial varieties he and his colleague

Dr Alexander would follow my lead and put them all under *Americana*.

I began to wonder if a review of the situation, in the light of wht myself and numerous other avocado enthusiasts have observed in the field over a period of fifty years might throw some light upon the situation, or would it merely add to the confusion? I was encouraged to stick my neck out by Lucille Kepp's statement (p. 18) "the whole P. americana complex needs much genetic and field study before many of the problems can be solved. Its origin in the Honduras-Guatemala-southern Mexico area as indicated by the natural occurrence of the greatest number of species and individuals of this subgenus."

She terms one group of hortocultural forms, apparently what we call the West Indian race, as a botanical variety, P. americana var. americana; the Mexican race is (as it has been considered by numerous botanical taxonomists of bygone days, P. americana var. drymifolia, and two wild avocados of Guatemala, which were described by Louis O. Williams as distinct species, P. nubigena and P. gigantea, as P. americana var. nubigena - in other words, one botanical avriety instead of two botanical species.

And details which are handle to handle when one is limited to herbarium specimens, "Back anise-scented" is a key character of P. americana var. drimyfolia. Allright; buf we have that rare wild avocado of Honduras, Costa Rica and probably elsewhere which has more anise oder in the bark, leaves and fruits than most of the avocados which we call Mexicans. And way back yonder, Sidney Blake descfibed the Trapp avocado of Florida as a distinct species, P. leiogyna, which has not been accepted by botanists in general and later was not accepted by my good friend Blake himself. It was based on nearly glabrous floral parts, It

is a well known West Indian avocado. Baker described on the basic of a few herbarium specimens available to him. In all the others the floral parts were more pubescent.

Here is where the taxonomists are really up against it. One herbarium specimens has narrow, rather leathery, acute leaves; another has bread leaves obtuse at the apex; they were young leaves and they often are not so leathery. And it is prety hard for the taxonomist, working in the herbarium, to learn much about the fruit. There are plenty of Mexican avocados which are green, not all of them are black. But this does not matter very much.

West Indian Race

Most of the avocados seen in the tropical American lowlands belong to this horticultural race. They are less cold resistant than avocados of the other two races, hence are not often seen above 5000 feet near the Equator, about 3500 feet farther north or south. The leaves are devoid of the anise-like odor which characterises the Mexican race. The fruits, which are borne on short stems, are quite variable in size, from 6 or 8 ounces up to three pounds, but commonly about a pound; they vary in shape from oblate to long pyriform; in color from yellowish green to dark purple. The skin is commonly about 1/16 in thick, leathery and pliable. The seed is large, and often loose in its cavity. The two seed coats are often somwhat separate; the cotyledons are typically rather rough on the surface. While the oil content is usually lower than in the Guatemalan race, and much lower than in the Mexican, the flavor of good varieties is pleasing.

The Guatemalan Race

Considerably more cold resistant than the West Indian, this is the only race cultivated in the Guatemalan highlands (4000 to 8000 feet); it also occurs in a few places in Mexico (notably the town of Atlixco, State of Puebla); in other parts of Central America and recently in South America. There is no anise-odor in the leaves. The fruits remain much longer on the tree before reaching maturity (10 to 15) months than those of the other two races, this being one of the most useful characteristics in differentiating it from the West Indian. The much longer fruit stem is also useful in this conneftion, as well

as the thicker skin, more coarsely granular in texture, sometimes hard, and ~~commonly~~ somewhat rough on the surface. This last-named characteristic, however, is variable; there are varieties with surfaces as smooth as some of the West Indians, others so pebbled or "warty" as to be unattractive. Varies with climatic conditions? Like fruits of the other two races, they vary from green to dark purple in color - usually a darker green than that of the West Indians, ~~however~~. The weight is commonly about a pound, but there are varieties, such as Hass, that rarely weigh more than 10 ounces, and others which weigh two pounds or more. The seeds, which tend to be smaller than those of the West Indian race, (in relation to the size of the fruit, are never loose in the cavity (commercially, an advantage); ~~while~~ the two seed coats adhere closely to the smooth cotyledons. The oil content of mature fruits commonly varies from 15 to 20%; the quality of good varieties is ~~really~~ excellent.

xx~~The Mexican Race~~

The Mexican Race.

Easily distinguished from the West Indian and Guatemalan by the anise-like odor of the leaves when crushed in the hand, as well as by certain characteristics of the fruit - notably the small size and thin skin. The time from flowering to maturity of the fruit corresponds closely to that of the West Indian race - 6 to 8 months. This race will tolerate more cold weather than either of the others, hence it is cultivated in Mexico, far from the Equator, at elevations as high as 8000 feet. The fruits, which are produced on much shorter stems than those of the Guatemalan race, may vary in form and color as do those of the latter, but they are much smaller, ~~in size~~, varying from a few ounces to 6 or 8 (occasionally a few ounces more); but they have thin skins, commonly not much thicker than that of an apple . In seedlings and

some grafted varieties, there may be dark-colored fibers running through the flesh which detract from the quality of the fruit. The seed is large, ~~usually~~ commonly (but not always) tight in its cavity; the seed-coats usually ~~but not always~~ adhering to the smooth cotyledons. Fruits of this race may contain as much as 25% of oil, and are characterised by a rich, nutty flavor, somewhat distinct from that of the West Indians and Guatemalans.

related to the anise odor?

J

Oppenheimer says in Israel on coastal plain Mex and Guate rootstocks are used. In interior valleys only W.I. can withstand the high salt content of irrigation water.

"Duke should be considered seriously as a commercial rootstock in California"

From Pit No. 1, Finca Las Charcas, Kaminaljuyu, Guatemala.

"Isolated from the charred wood and ash included in the sample from Pit No. 1 were six unrelated parts of large seeds, a number of small seeds and seed fragments, and several small pieces of the shell of a fruit. The two largest specimens of the first group measured 37 mm by 28 mm, and 37 mm by 25 mm respectively. These were identified as the cotyledons of seeds of the avocado, Persea americana Mill. Howevere, these two were obviously not parts of the same seed,

Margaret Ashley Towle
Botanical Museum of Harvard University

BOTANY

The botanical classification of cultivated plants is frequently difficult, due to the presence of variations at times strictly horticultural in character, ~~and~~ again so well-marked as to demand botanical recognition. In studying the diverse forms of the avocado which are grown in tropical America, early botanists were inclined to ~~give botanical standing to~~ recognize varieties differing only in ~~the~~ shape and size of leaf. Later, as herbarium material became available in larger quantities, these so-called botanical varieties were found to be linked together by intermediate forms, and had to be abandoned.

Again, the ~~group of~~ avocados known horticulturally as ~~the~~ Mexican ~~race~~ are, in the majority of cases, so distinct from others that they have been considered together to form a distinct species. Yet, when many specimens are examined, it is impossible to find a single dependable character by which they can be differentiated. This has made it necessary to include nearly all of the cultivated avocados in the one species, Persea americana Mill. The only exceptions are two varieties of Florida origin, Trapp and Family, which are botanically so distinct as to merit specific standing. These have been described by Blake as Persea leiogyna. They differ from other avocados only in having the ovary and staminodia glabrous, and the perianth and stamens less pubescent. ~~Since~~ These characters ~~differences~~ are horticulturally of no significance, Persea leiogyna will ~~need not receive further attention in this paper.~~

The latest systematic treatment of the cultivated avocados is that of Blake, from whom the following description is taken:

Persea americana Mill. Gard. Dict. ed. VIII. 1768.

Copy from Blake's paper

Blake recpgnizes the Mexican avocados as Persea americana drymifolia (P. drymifolia Schlecht. & Cham., P. gratissima drymifolia Mex), and gives the distinguishing characteristics as follows: "Leaves anise- or sassafras-scented when crushed, usually smaller than in P. americana, elliptic, and acute or acuminate at each end, but sometimes broadly oval as in P. americana, and showing the same variation in pubescence; perianth equaling that of the larger-flowered examples of P. americana, its segments usually persistent in young fruit or even to maturity; fruit thin-skinned." It will be noted that these characters can not be relied upon in every instance; indeed, an examination of numerous herbarium specimens shows that it many cases it is impossible to tell whether the plant is representative of the typical form, or of P. americana drymifolia.

A preliminary revision of the North American and West Indian avocados, in Journ. Wash. Acad. Sci., vol 10, No 1, 1920.

Blake has discussed the botany of cultivated avocados in a paper entitled "A preliminary revision of the North American and West

The Avocado

The US [illegible] to the New, in tropical fruits, Citrus, bananas, mangos

The New World gave pineapple avocado, ameras, sapodillas papayas, guavas

The tropical world offers a greater variety of good fruits than the Temperate Zone. Several of the most important - the orange, the banana

You see more plants around the homes of the Indians at elevations of 3000 to 6000 feet than you do in the cold country - the Quiché. What plants did they have in their dooryards in pre-Columbian days? We can only base a guess on what they have today. Undoubtedly dahlias - especially maxoni, of all four kinds, single and double lavender and single and double white. They probably had the native canna. And cosmos and marigolds and zinnias - all interesting as the sources of our present-day varieties. Wigandia

Today most of the plants around Indian homes are exotics. Roses and cannas and hibiscus and calla lilies and gladiolus and carnations and watsonias and many others.

What changes did the Conquest make? Not much in the Indian gardens except the species cultivated. What about the Spanish garden? We must remember that it is divided geographically, the gardens of northern Spain which are European in character and those of southern Spain, especially Andalucia, which are definitely Moorish. This is the type which was brought to the New World, becuase most of the colonists were from southern Spain.

The Spanish garden is Urban. Outside of the cities you do not see formal gardens. You see potted plants around the houses. The formal Moorish garden is to be seen in patios and cloisters. Few flowering plants are cultivated. There is a combination of polychrome tiles and greenery. Running water and a few pot-plants. Perhaps the reason there are so few flowering plants was the scarcity of water - that is, in the Arab background.

The true Spanish gardens are only to be seen in the larger towns, especially the older ones. Raised beds -arriates such as the ones in our house. They are disappearing.

Now as to the Guatemalan garden of today. You have seen a fine example at Carmona. Not much order, and no beds all of one species. Plants are stuck in from time to time, wherever there is room. And a volunteer plant is usually left wherever it springs up. This may be a corn plant, or a tomato, or almost anything which is edible and the product is used.

The Mexicans were greater gardeners than the Maya. Many plants are depicted in their picture-writing. The only botanic garden in the New World is believed to have been Huastepec. And their nomenclature was wonderful - they were the first taxonomists. Logical and descriptive. Macpalxochiquauhuitl.(Not much more difficult than Chiranthodendron pentadactylon, at that). Easier, because you can split the name into its component words.

The Maya concentrated on corn. Several deities were involved. They still pray to them at Chichicastenango and elsewhere in the Quiché.

Commercial fruit culture has not progessed, in most tropical American republics, as rapidly as has the prpduction of such staple crops as cane sugar and coffee. There are many reasons for this, some of them being a stronger demand in world markets, and the perishable nature of most fruits.

Of course there are exceptions, perhaps the most notable of which are the banana and the pineapple. It is worthy of note that in both cases, commercial varieties are easily propagated by vegetative means. This has led to the development of superior varieties, almost in prehistoric times, and it facilitated the rapid expansion of commercial cultivation without the intervention of elaborate horticultural techniques.

The present century has witnessed, and is witnessing, the development of other tropical fruit industries. The prpduction of citrus fruits has become important in many regions. And latterly, the avocado or aguacate has come in for its due share of attention, though it is to be noted that much of the work done with this crop to date has not been in the tropics themselves, where the tree is indigenous, but in the subtropical regions of California and Florida, where horticulturists were prepared by long experience in other fields, to attack the complex problems of production which the avocado has presented.

In an era in which the ~~growing~~ production of foodstuffs is an all-important issue, further ~~attention to~~ consideration of the possibilities of avocado growing takes on added interest. For here is a fruit which not only can be grown over an immense range of territory, but which at the same time offers, in highly attractive form, ~~and with~~

and in yield per acre attained by few other crops, energy-producing food much richer in vitamins than the root-crops and the cereals.

It is high time, therefore, that avocado culture received more attention in tropical America.

History

At the time of the Discovery, avocados were growing on the American mainland from northern Mexico southward to the warm valleys near Cuzco, in Peru. They do not seem to have been known East of the Andes, and it is clear that they had not reached the West Indies. Forms varying in size and other ~~fruit~~ characteristies probably are native to Mexico and Central America, extendig southward perhaps into Colombia; and throughout all this region they had long been cultivated by the Indians, who by selection had produced many varieties superior to those found in the wild.

We have no evidence that the Very Magnificent Lord don Cristobal Colón became familiar with this fruit during the course of his voyages. As has been mentioned, the tree was not then growing in the West Indies, where most of the Great Admiral's time was spent. But there is ample historic record to prove that the conquistadores who followed him ~~reported~~ ~~discoverer~~ noted its presence in many ~~regions~~ parts of Tierra Firme. Almost without exception, their comments stress the valuable characteristics which only recently have commenced to be appreciated in their fullness.

Martin Fernandez de Enciso seems to have been the man who first made the avocado known to Europeans. In his "Suma de Geografia", published at Seville in 1519, he tells of having seen, on the coast near Santa Marta, Colombia, a fruit "which looks like an orange, and when it is ready for eating it turns yellowish; and that which it contains is like butter and of marvelous flavor, so good and pleasing to the palate that it is a marvelous thing."

A few years later Gonzalo Fernandes de Oviedo, one of the great chroniclers of the Conquest, described the avocado, which he had seen in Nicaragua as well as in Colombia. Then Cieza de Leon, who travelled southward to Peru, saw many trees in the coastal valleys and was the first to report that the fruit was known as "palta" as well as "aguacate". Later writers have pointed out that the tree was taken from the province of the Palta Indians in southern Ecuador to the region of Cuzco in Peru; while the name "aguacate" was an adaptation of the Mexican name "ahuacatl", used by the Nahuatl or Aztec people. There were many other names, in the indigenous languages of tropical America; but these two only have survived in general use - the first in Argentina, Chile, and Peru; the second throughout the Caribbean region and North America, and in the Old World. Our English name for the fruit, avocado, is a corruption of the Spanish aguacate which appears to have been adopted by the British when they seized Jamaica from the Spaniards at the middle of the XVII century. By that time the Spanairds had taken the tree to their West Indian colonies.

THE CREATION AND DECLINE OF AGRICULTURAL SCIENTIFIC SOCIETIES IN SPANISH AMERICA

In recent years there has been a noticeably trend to create new scientific societies in Latin America, that reflects on the need and growing easy of communication. However, the appearance of very different international groups does not necessarily guarantee this permanence, or indeed their success. Many have come and gone.

We offer consideration of some of the underlying reasons for failure as well as for the success. Over the last two decades a good many of the societies that were formed never really got off the ground or only showed some activity for a very short span, what were the factors that have been responsible for this lack of growth? The first reason is geographical. Most societies have usually been started during the fervor and enthusiasm engendered at international meetings. Then the problem of geographical isolation or separation becomes a determining reason for the group to start to fall appart, particularly if the same members, or a certain proportion of them do not meet again at successive meetings. In successive meetings there is too much turn over and there is lack of continuity. Secondly, the good intentions of the governing body, or officers, are not carried out perhaps too often because they set themselves too high or too complicated goals to attain in the first year or so. Many societies try to start off writing a constitution or a complete set of rules, some attempt from the start a periodical publication, which it is practically hopeless to maitain. Thirdly, and most important, the groups that do not grow after their creation, just do not have in their midst a small group of dedicated indificuals who are willing to push the aims of the society, persistently and in a never faltering way, with enthusiasm, and through a period of several years. In this group, one individual may well be the creative force or motor unit that gives the momentum, inspiration and continuity to his two or three associates.

The authors, each of whom have served five years as Secretary-Treasurer of the Caribbean Region of the American Society for Horticultural Science, offer as an example some points that have worked with their organization. The Caribbean Region is now in its eleventh year and it is believed that comparatively speaking, it shows a very good record. The

The group has grown, in ten years, from a dozen horticulturists, to over 300 regional members in 14 countries, with annual meetings that have averaged 100 in attendance the last three years. The Caribbean Region has issued 45 Newsletters and six annual regional proceedings.

The following points, not necessarily in the same order of precedence, are a basis for success of a scientific society in Spanish America:

One, it takes one or two dedicated individuals to keep the organization and the central idea alive over the first years - they should expect to be reelected several times or perform their duties without formal reelection.

Two, the individual, who may be a Secretary, should send out at least two, and preferably four Newsletters a year to keep listed members informed and to bring in new people into the group. It is much preferable to keep the Newsletters ordinarily no longer than one page, although occasionally, if the event deserves wider treatment, a couple of pages may be needed. The theory, which works out in practice, is that one page is read, and then may be discarded. But it is read immediately upon arrival.

Three, at the beginning nothing should be required of the members. Not even dues. But if dues are collected, then they should be low and a form provided for sending a check without need of writing a letter. Initial high dues, donations or other obligatory actions of the members of a new group are an adverse factor. Dues may be proposed after the first few years.

Four, the international group, true to its nature, should meet in different countries each time, and at least two residents of the country where the meeting is to be held should be elected as local officers for that year. The Secretary may continue to reside and operate in another country, and from there continue to send out his communications.

Five, a publication or proceedings should be attempted only where there is sufficient material and a reasonably degree of financing or support. This may come from outside sources for the first years, but a group should plan to pay its own publication costs within five years. The proceedings should be a modest volume, which may be built up gradually. The proceedings should be available only to dues-paying members and by

by subscription, except for such limited donations to libraries and schools as may be deemed worthwhile. The price should be kept low, just enough to cover costs and a small margin, but it should not be considered to be a money-making proposition for the first 5 to 10 years.

Six, a constitution, or by-laws if the group is a part of a parent society, may not be required for the first five years or so, but when a decision to provide them is made, they should be as simple as possible, brief, and as an aid to further the natural trend and easy procedures established by the society. In fact, the by-laws could be a group of guide lines to give the group its legal standing in the area it covers, but never a complicated set of rules that hinder operations and take considerable time in preparing and approving.

Some new scientific groups may be following these or similar ideas. There are at present about scientific societies in Latin America.

A new over-all society called A.L.A.F. to group agricultural scientists in Latin America and to embrace other smaller specialized groups has been formed.

"Blackberry and Raspberry Improvement" by George M Darrow, in Yearbook of the U S Dept of Agriculture, 1937:

"Three other raspberries are grown slightly in some parts of the world - the Andes black raspberry (Rubus glaucus Benth.) in northern South America; R. niveus Thunb. (R.lasiocarpus Sm.) in northern India and Burma; and the wineberry (R. phoenicolasius Maxim.) introduced from Japan in the northeastern United States. p.511

"Some of the species of Asia and elsewhere are already being crossed. The Hawaiian station and the Armstrong nurseries are working with several forms of the Akala raspberry of Hawaii. Crosses have been made between both Rubus biflorus Buch., a Chinese species, and the salmonberry, R. spectabilis, and red-raspberry varieties at the Oregon station. At the Willard and Beltsville stations and at the Tennessee station R. kuntzeanus of Asia and the Van Fleet are being used. At the United States Horticultural Field Station, Cheyenne, Wyoming, R. deliciosus Torr. of the Rocky Mountains is being crossed with red raspberries. At the Beltsville and Willard stations there are about 2,000 crosses of R. parviflorus L., and Asiatic trailing raspberry, with red, black, and purple varieties. R. niveus has been used by B.M.Young of Morgan City, La., and at the Beltsville station. William B. Whitehouse, of the Department, has succeeded recently in introducing several other species, and they are now available to breeders. The wooly raspberry, R. lasiostylus Focke, is a very large fruited species from Asia. Allthe raspberry species so far studied have seven chromosomes in the reporductive cells, as have most of the cultivated varieties. Raspberry species so far tried in breeding have crossed readily, though many of the seedlings have not been fertile. Some of these species that have superior germ plasm of value are: For size of fruit, Akala and R. biflorus; for vigor of plant, Golden Evergreen (R. ellipticus) and R. biflprus; for resistance to disease, R. biflorus, R. ellipticus, R. coreanus Miq., the Andes berry (R. glaucus), R. kuntzeanus, R. innominatus Moore. Most of the breeding work with raspberries lies ahead." p.513

EXTRACTS FROM " NOTES ON FRUIT
AND VEGETABLES IN JAMAICA" BY
W. HARRIS, F.L.S - 1913

Blacbberry, Nilgiri. Rubus racemosus. (Rosaceae)

This blackberry is a native of the Nilgiri Mountains. It is a vigorous grower with stout stems and branches which are densely pulverulent and armed with straight or hooked prickles.

The fruits, which are produced in abundance during the summer months, are black in colour, large, juicy and delicious. They may be eaten without any preparation, or crushed and served with cream, or made into tarts and pies. This very desirable berry was introduced about 1883. It grows only in the hills from about 3,000 to 5,000 feet altitude and has not yet spread to any great extent. It will probably never become quite naturalized as it appears to be unable to hold its own against the native vegetation and soon dies out unless it gets established in open situations.

Blackberries. Rubus spp. (Rosaceae)

There are two blackberries native of Jamaica, and apparently they are confined to Jamaica.

Rubus jamaicensis is found in the lower hills and up to about 4,000 feet altitude. It has prickly trailing branches and leaves which are very tomentose beneath.

Rubus alpinus is only found in the higher mountains. In habit it is very similar to the preceding but the leaves are almost entirely destitute of hairs, and the branches and panicles are reddish.

The fruits of both species resemble the wild blackberry of Europe but are smaller and not so juicy.

They are very palatable, however, and are used for making tarts and pies.

Rasberry, Himalayan. Rubus ellipticus. (Rosaceae).

This bramble is a native of the temperate and sub-tropical Himalaya, Burma and Ceylon at altitudes between 4,000 and 7,000 feet.

It is a tall sub-erect bush, with stout stems and branches which are prickly and densely covered with spreading, reddish hairs.

The fruit is yellow and has the flavour of a raspberry. It is not equal to the cultivated European raspberry but is a very good substitute, and as it fruits abundantly during the greater part of the year in the mountains it is a desirable plant.

The fruit may either be eaten raw or made into tarts or a preserve.

Seeds of this plant were obtained from Queensland in 1894 and grown at the Government Hill Gardens.

The plant has now become quite naturalized in the

neighbouring hills and has been detected growing wild at a distance of ten miles from the Gardens.

NOTE ON RUBUS ELLIPTICUS, Sm. (No. 9,131):- Seeds of this fruit plant were received from the Acclimatisation Society of Queensland early in 1894 and sown at the Hill Gardens, Cinchona, and the species has now become quite naturalized in the neighbourhood. Birds eagerly eat the berries, and as the seeds are excreted uninjured, they grow readily when dropped in suitable places. The plant has been detected growing wild at a distance of ten miles from the Hill Gardens.

W. Harris
23/12/05.

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p. 509. "It may be possible to utilise some of the immense-fruited blackberries of northern South America in breeding. They belong to a very diffe ent group from North American blackberries; but it is possible that hy rids with this group might be large-fruited seedlings that would reproduce exactly from seed, as do certain European varieties resulting from wide crosses."

See this article also for notes entitled "Technique of Blackberry and Raspberry Crossing."

Rubus glaucus

Gardening in India, by G. Marshall Woodrow F.R.H.S, Bombay, 18[illegible] 308-309

"RUBUS LASIOCARPUS. The raspberry of the Western Ghauts, Rajpooree. This fine fruit is of easy culture at an altitude ofer 3,000 feet, but at lower elevations does not repay the cost of cultivation, though it grows well. At the proper altitude cuttings of the lower part of the stem put in during the rainy season bear fruit during the following hot season if the weeds are kept down. At the annual dressing about the end of the rainy season the stems that have f uited should be cut down, and any branches that have not f uited should be arched over and tied to those of an adjoining plant; they will probably fruit early the following season."

Standley, Trees and Shrubs of Mexico (Contrb. U S National Herbarium, Vol 23, Part 1, Washington 1920)

Ecuador is the type locality of Rubus glaucus. Distributed Morelos to Chiapas, Southward to Ecuador.

R. urticaefolius Focke (not R. urticaefolius Poir) is a synonym of R. trichomallus Schlecht. Distribution ~~Central~~ Veracruz and Chiapas; Central Am. and Colombia.

Rubus adenotrichos Schlecht. Veracruz, Morelos, Oaxaca and Chiapas; Guatemala to Costa Rica.

Progress and Problems

Rootstocks - for mangos, for avocados, for citrus fruits, for the Temperate zone fruits

Propagation - the veneer graft for so many fruit trees. The shield bud still the thing for citrus and can be used for avocados and some temperate zone fruits, e.g., peaches. The place of the crown graft. The use of air layers especially for lychee.

Progress with various fruits

Citrus - The zone for Navel oranges. The Valencia group. Ruby blood is late? Grapefruit not yet popular. Tangelos?

The limes - plant more Tahitis? The Meyer lemon.

Avocados - We should encourage extension of the season by planting in the proper zones. Hass, etc.

Mangos - It seems hard to encourage planting of grafted varieties - why? Plant more Hadens and some of the Florida varieties. Carrie for home use.

~~The asiatic fruits~~ -

The annonas. Climatic adaptations - the pollination problem. Rootstocks.

The lychee. Proper climates. Varieties.

The Asiatic fruits - rambutan etc

The berries. Rubus spp and vars. Climates for them.

The strawberries - vars. and climate

The problem of the grapes.

The peaches - climates and varieties

The plums

The pears

The apples

Systematic pomology - it would be of great use to us.

labranza de la plantación. Parece que la destrucción de las plantas o matas enfermas y medidas sanitarias controlan esta enfermedad que afortunadamente no tiene todavía la importancia que tiene la Sigatoka y el Mal de Panamá en los grandes centros bananeros.

En la actualidad las tres enfermedades arriba descritas a grandes rastos, probablemente constituyen las peores, aunque en varias partes del mundo existen otras que pueden causar daños considerables como por ejemplo el "Bunchy-top" en Australia y el Sur Pacífico, causada por un virus.

Algunos insectos a veces, y en algunas partes dan que hacer al horticultor.

El Gorgojo Cosmopolites sordidus. Es una plaga en muchas regiones. Varios horticultores opinan que este insecto ataca mas las matas de "Plátanos Vianda" que las de"Plátanos frutas" y probablemente molesta mas en plantaciones que carecen de cuido adecuado. Es un coleóptero grande, cuyas larvas taladran los rizomas de la planta, a veces hasta el punto de que éstas se desploman al suelo. En pocas regiones este insecto constituye un problema realmente grave en plantaciones bien cuidadas y donde se ha sembrado material de multiplicación limpio.

Como ejemplo de otro insecto perjudicial se puede mentionar la Morrocoyita de Colombia que se llama técnicamente Colaspis hypochlora. Esta plaga ha causado pérdidas considerables a los horticultores de aquel país debido a que desfigura las frutas al punto de que nó la reciben en los mercados del exterior. Este coleóptero se cría en la grama que muchas veces abunda en la plantación, y también en matas jóvenes de banano hasta que al fin llega a atacar un racimo de fruta ya casi desarrollado, dañando la cáscara de la fruta hasta dejarla en

un estado muy poco presentable para el mercado. Parece que el mejor método de controlar este insecto es sencillo pero a veces caro pues consiste en mantener la plantación completamente libre de grama y de hierbas donde se puedan criar estos insectos.

En algunas partes las escamas o cóccidos, tan conocidas en casi todo el mundo como enemigos de frutales cítricos y muchas otras plantas cultivadas, llegan a infestar un bananal hasta constituir una plaga que demanda medios de control. En algunas partes los insectos conocidos como trípsidos causan una decoloración de la fruta. Esto se debe a los ataques de los trípsidos cuando se presentan en números grandes y perforan la epidermis de la fruta para comerla o para poner sus huevecillos.

Mono mbryonics

1. Mulgoba, because it laid the beginnings of the grafted mango industry in the Western Hemisphere.

2. Haden, which has become the most important so far.

3. Pairi, (Paheri, Pirie, sometimes called Bombay in NWI), one of the finest but irregular in bearing.

4. Amini, has not proved valuable commercially, but is as good producer, small, very aromatic, but now sweet enough for some tastes.

Sandersha. Too overlooked; bears young and heavily, a large fruit, very useful for cultinary purposes; could be compared to certain European fruits not so good for eating out of hand but valuable.

Monoembryonic

6. Julie. Has become popular for its regular bearing. Not too free from fiber, but of good taste. Small tree.

Polyembryonic

7. The Filipino or Manila Group. Carabao is best known as a Philippine variety. Cambodiana and Saigon. The seedling Manila and Filipinos of Cuba and Mexico.

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1. Roses. To be grown for cut flowers, not for decorating the garden.
2. Hibiscus, Mar Pacifico, ornamental all the year round, use the Hybrids.
3. Cannas, for dooryard decoration. About 10 fine varieties available at Zamorano. Must be given water and rich soil and divided every year.
4. Geraniums. "Fish" varieties. Pelargoniums? Keep out of rain and in light soil.
5. Dahlias. Large flowered cactus varieties. Easy to grow but flower only a few months
6. Begonias - for patios and some in open sun.

Lay off the African violets - except Jean Walter and a few others. Use anthuriums if you can get them, dwarf palms, and Abanthus. Gesneras, orchids for the hard job, nothing else.

J.P. A.W.

Suggestions for the experimental planting at Santa Lastenia, aragua, elevation 5000 to 5200 feet. Planting material should be dered in November, for arrival in January or February at latest. The mber of plants is what I consider should be the minimum; if sufficient ace is available, get more.

From the California Nursery Company, Niles, California:

10 apple, Winter Banana
10 " ~~Red~~ Delicious (Yellow)
10 " ~~Red Gravenstein~~
10 " ~~Red McIntosh~~
10 crabapple Transcendent
10 " Yellow Siberian

10 pear, Seckel

10 plum, Santa Rosa
10 " Wickson
10 " Satsuma

10 peach Early Babcock
10 " Indian Free
10 " Strawberry Free

10 Japanese Persimmon (Kaki) Hachiya
" Fuyu

25 Grape Isabella
25 " Niagara
25 " Golden Muscat
25 " Catawba

From the Glen Saint Mary Nurseries, Glen Saint Mary, Florida.

10 peach Angel
10 " Jewel
10 " Waldo

10 pear Kieffer
10 " Baldwin

10 Loquat Gold Nugget
10 " Champagne

10 plum, Kelsey and Formosa

25 grape, Lake Emerald
25 " Tar Heel

From the Kilgore Seed Company, Plant City, Florida.

500 strawberry plants, Arkansas, Missiinary
500 " " Florida 90
Klondike

Algunos frutales prometedores, y donde conseguirlos:

Manzanos: Winter Banana, Red Delicious, Yellow Delicious, Gravenstein, y McIntosh, del California Nursery Co., Niles, California/

Perales: Bartlett, Seckel, de la California Nursery Co.

Ciruelos: Burmosa, Duarte, Santa Rosa, Satsuma y Wickson, de la California Nursery Co. Abundance, Burbank y Kelsey de Glen Saint Mary, Florida.

Duraznos (Melocotones): Jewel, Angel and Waldo, de Glen Saint Mary. Indian Free, Rio Oso Gem and Babcock de la California Nursery Co.

Loquats: Champagne, Gold Nugget and Tanaka fr la Glen Saint Mary Nursery.

Uvas Americanas: Catawba, Golden Muscat, Isabella, Niagara y Pierce, de La California Nursery Co. Lake Emerald de Glen Saint Mary, tambien de la misma casa, Tar-Heel, una de las uvas muscadinias.

Nispero (Kaki) Hachiya y Fuyu de la California Nursery Co, nada de Glen Saint Mary pues ellos usan de patron Diospyros virgininiana, y no conviene para los trópicos.

Manzano silvestre (crab apple) Transcendent, de la California Nursery Co.

Fresas: Klondike, Florida 90, y Missionary, Arkansas Stock, Kilgore

Mora de Castilla (Rubus glaucus) habrá de pedirlo a don Chico de Sola, San Salvador. Boysenberry y Youngberry de la California Nursery Co.

a fine list of good fruits, but their prices are twice as high as other nurseries - e.g., the California Nursery Company. You should get the catalogs of all three nurseries mentioned, California, Glen Saint Mary, and Armstrong. I think only Armstrong offers Gold Nugget loquat and it is the best. You should get about 5 trees and later propagate from them. You may need a few other things from Armstrong; perhaps plums. We will take this up later by correspondence; trees cannot be shipped from the U.S. (deciduous fruits) before December, and usually we get them in January and February.

Strawberries: We discussed these a good many times on our trips and looked for plants. We saw very few and got almost no encouraging reports, but I do not feel that sufficient attention has been given to this fruit; why does it succeed so well in El Salvador and Guatemala? It will be easy to get plants from the States and it will not take long to find out why those which have been planted here in the past have not given better results. Those we saw near Santa Lastenia, I believe it was Dr. Rizo's place, looked well. I think insufficient attention has been given to strawberries here. Strawberries need altitude. Though we have grown them successfully in Honduras at 2,500 feet, I think 4,000 to 5,000 is better. In the second place, they need soft soils with lots of organic matter, and as much stable manure as possible. And in the third place, the plants should not be kept many years; on the basis of our experience in Honduras and Guatemala, I am recommending that you plant new "runners" every year. These runners or hijos usually appear in August and September. As soon as they have made good roots, transplant them and forget the old plants. The new plants should commence to produce fruit in February or March; will continue in production until July probably; then make new runners.

Now here's a problem for you: ROOTSTOCKS.

We had a pretty bad time with French pears (probably Brtlett) when we grew them at 6800 feet feet. Bartlett seems to be recognized as having a high chilling requirement. It has fruited well at Totonicapa (8400 feet) and looks hopeful at Quezaltenango, 7600 feet. We have to take into consideration the microcimlates of the places where Bartlett has been grown. We do not know much yet, on the basis of experience.

A recent price list, reminds us that Malling Metons have Northern Spy as one parent. We have reason to beljeve that Northern Spy has a high chilling requirement. Wehave no experience with it in Guatemala.

We are having trouble with tme Malling Metton rootstocks for apples. Is Northern Spy blood a factor?

Think it over.

Propagating material of the following melocotones was collected at Santa Maria de Jesus, Sacatepequez, elevation 6500 feet, on 20 August 1967.

SANTA MARIA. Tree in front of the house of Alejandro Osoy. Belongs to the group of large-sized yellow melocotones with no red color on cheek. This type seems to be less productive than the other (the red-cheeked melocotones of which OSOY is a variety) but must be tested because of its large size - which may not, however, be an advantage.

FELICIANA. Tree in back of Osoy sitio. Heavy bearer, much like OSOY, with red cheek where exposed to sun.

MARCELO. In sitio of Marcelo Marroquin, just above the small pilita along the roadside, not far from Osoy's house toward the church. Similar to Feliciana. Looks rather promising.

VOLCAN. Also in sitio of Marcelo Marroquin. A melocoton of good size, and bearing a pretty good crop. Also belongs to the Feliciana type.

Message
Wire from Gelch ~~Florida~~ in West Palm Beach
~~Palm Beach~~ asking where you are
Florida and ~~have~~ announced that
I had heard from you for
~~bt~~ y in Chicago — am
worried about you — wire
me ~~at once~~ if G. do not hear
from you will wire Dad.

Supposing there were males and females among them, one will have to conclude that chance causes plants spring from these to have met in the same garden, and from that comes their fecundity.

Duke p 164

VVM

[illegible] than this, I believe the Andean
[illegible] still holds many treasures; some
[illegible] wild plants whose economic possibilities
[illegible] remain to be realized, others cultivated species
[illegible] which [illegible] so far escaped the attention of the
outside world.

Further than this, I believe the Andean region
will yield

[illegible] of Plant [illegible]

Parasites Dodder, Orobanche. Pilostyles 5 Shers 22

reduction of leaves in Ruscus. Cactae usually the stems are then modified & enlarged to contain water in time of drought, other not as in broom

reduction in Parasite Dodder leaves represented by very small yellowish scales only & stems yellow in lieu of green

In Rafflesiaceae the plants are so reduced that the flower represents the whole plant. R. Arnoldi from Sumatra, flowers metre wide, the largest flowers in existence, they are situated directly on a species of Cissus (parasite

Foliage leaves — are the leaf structures on which devolve the task of providing nourishment for the plant (Shashunga 32)

Insectivorous plants Nepenthes Utricularia Drosera, Pinguicula, Venus fly trap Dionaea.

Xerophytes — Almost all higher plants ~~possess~~ ~~facult~~ are capable of checking transpiration during temporary insufficiency of water supply

In districts subject to drought of weeks or months duration such as deserts, rocky country & other regions with little rainfall only such plants can flourish as are able either to ~~with~~ withstand complete drying up without injury. etc

protection by formation of cork & cuticula
covering of bark etc.
rolling up of stomatiferous surface.
reduction of transpiring surface by suppression
of leaves & dense crowding of branches to form a
cushion — Raoulia mamillaris from
New Zealand. (vegetable sheep)
succulents — Cactaceae. Euphorbia globosa
Dischidia Rafflesiana some of whose leaves form a
deep but small mouthed sac into which the
branching roots grow

respiratory roots of Mangrove Avicennia nitida
Rhizophora mangrina, Cypress knees

Welwitschia mirabilis

Acanthosicyos horrida

The plant in relation to its environment.

Plant in relation to its environment
adaptations

Plants may be divided according to their mode of nutrition —

1 Those which take in all their food as simple inorganic compounds
parasites which or part from other plants by haustoria
eg Loranthaceae, Rafflesiaceae etc
partial or whole Willis 176.
inflorescences little degraded in structure.

2 Saprophytes no green tissue at all, & take in their carbon in the form of complex organic compounds
Willis 177

3 Insectivorous plants leaf modifications

La familia

recuerdo from recordar — to remind, recollect

mimar — to coax, caress, fond

buzón canal, letterbox

los demás las demás — the rest, others

detallar — to relate minutely.

imprimir — print.

encargar — charge, commission:

cambio — bill, notice

Bad weather.

The sky is very dark; it is covered with clouds. It is beginning to rain, drops fall. Open your umbrella. Now we are protected from the rain of the sky, but the pavement is very bad, the street is flooded, & with each step that we take we get dirty. Let us return home. The weather is too bad to be outside.

This room is very pleasant. Let us take off our wet clothes & put on other dry ones. What a disagreable day. Look, already (now) it is beginning to snow. Some flakes of snow mingled with drops of rain, fall against the window panes. We seem to be very advanced for snow we are in May, but the weather is that of December. It is very cold.

Sit down near the fire, warm yourself. The fire is almost out. John, look if there is a little coal.

Are you still cold? Not now. Thank you. Put your feet on the fender. Take off your shoes, they are soaked with water; it is dangerous to have wet feet.

Look at that man. It is so windy that he has to hold (take hold of) his hat with his hand. The wind turns the umbrella inside out. This wind makes the weather still more unpleasant.

But the clouds are lifting. It is beginning to clear already.

Here in Madrid it has rained much this year, more than usual; the sun shines little & seldom is it fine. How unpleasant. One cannot go out now without getting wet, & also it is always necessary to carry an umbrella. In Seville the weather is better, it rains sometimes, but it is generally fine.

mojado — wet
la vidriera de la ventana — window pane
avanzada — advanced
echar — throw on, out
barandilla de chimenea — fender
empapar — to drench, soak
dañoso — hurtful, harmful
coger — to seize, hold of
alcier
mas que usual — muy a menudo
menester — necessity, need, want.

Some effects of Irregular nutrition on Plant Life.

Animal life, though dependent upon food that is far more complex than that required by plants, does not show great diversity of structure to ~~meet~~ adapt it to environmental conditions.

~~An animal is~~ The metabolism of an animal consists in breaking down complex substances into more simple substances the energy thus freed. And it may be that the ability of an animal to move from place to place in search of food often abandon the insects unfavorable spots for more productive regions, ~~too~~ account for so much uniformity in structure of the digestive organs throughout the animal kingdom ~~The question here is not to be~~

This is not an attempt to raise the most question as to ~~whether the environment has is~~ responsible for the evolution of the specific forms to be found, how the forms in existence today evolved, but rather an effort to show how ~~where~~ ~~insufficient food supply~~ the relegated places devoid of an adequate food supply as the places where the most remarkable forms of plant life are to be found.

~~No~~ so with plants. They have to build up complex food material from its elements —

the chief being oxygen, carbon, hydrogen
nitrogen.

Balance of food supply — structure modified
to meet conditions of superfluity as well as of deficiency
carbon assimilation = hampered
Desert plants & little water
Cactus, reduced leaves, stem. Rafflesia xerophytes
Swamp plants too much water
epiphyte

parasites where there is lack of chlorophyll
saprophytes

lack of nitrogen — insectivorous plants

lack of oxygen — respiratory roots of Mangroves,
cypress knees.

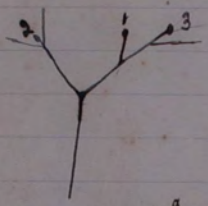
Fragaria chiloensis.

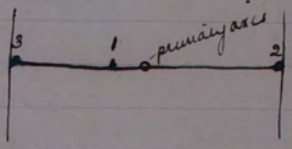
Morphology of flower parts.

The inflorescence under study corresponds exactly to the description by W. D. Valleau in Journ. Agr. Res.

The primary flower is inserted on near the base of the fork of the two secondary branches on the smaller of the two.

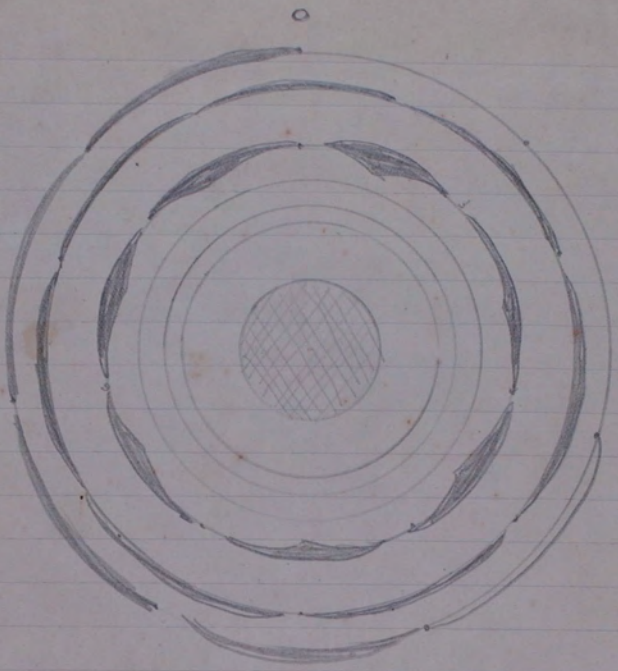
Stamens all perfect in the first three flowers.





Description of each flower.

No.	epicalyx	calyx	petals	stamens	carpels	diam. of receptacle
1.	7	7	7	all perfect	all perfect	1/8" diam
2	7	7	7	" "	"	1" "
				"		7/8" "
3	6	6	6	"	ust abt. perfect / some abortive	1/2



Historia Natural y Moral ①
de las Indias -- Padre
Joseph de Acosta. - Seville -
1590

Cap. 24 - Libro Quarto

De los Maneyes, y
Guayavos, y Paltos.

~~Estas~~ "

"Estas que hemos dicho,
son las plantas de mas
grangeria y vivienda en Indias.
--- Las Paltas al reves
son caliétes y delicadas, Es
el Palto arbol grande, y
bien hecho, y de buena copa,
y su fruta de la figura
de peras grandes:

tiene dentro un hueso
grandezillo: lo demas es
carne blanda, y quando
estan bien maduras, es
como mánteca, y el gusto
delicado y mantecoso. En
el Piru son grandes las
paltas, y tienen cascara
dura, que toda entera se
quita. En Mexico por la mayor
parte son pequeñas, y la
cascara delgada que se
monda como de manzanas;
tienenla por comida sana, y
que algo declina a calida,
como he dicho.----"

Palmer, Edwin O. History of Hollywood p.66. L.A., 1937.

"Mr. Jacob Miller was born in Germany in 1830, came to St. Louis in 1850, where he engaged in marble cutting; worked in the mines of Mariposa County and came to Los Angeles in 1872. On the Isthmus he contracted remittent fever which handicapped him for the rest of his life. He established the Pioneer Marble Works on Main Street.

"In 1877 Mr. Miller bought 60 acres and half the water-rights at the mouth of Miller Canyon at the north end of Miller Avenue from Mr. Nichols. He employed Chinamen to raise tomatoes and green peppers for the San Francisco market. He moved to his Hollywood ranch in 1881, driving daily to Los Angeles to his marbel works for about three years until his health failed him further and confined him to his home. In 1878 he had married Miss Dora Grelck, also from Germany. Her uncle, Mr. John Grelck, brought from Lima, Peru, many fruit trees and established a nursery in Los Angeles where he found the climate too severe for the most delicate. He therefore brought to the Miller ranch in the frostless belt tea, coffee, avocado, cherimoys, papaya, and sapote trees, all of which thrived and were admired for years by the local ranchers and tourists. The original avocado is still bearing the best of its kind in California, and has continuously been in demand for budding."