the money-making ability of the Wealthy apple.

Baldwin, Delicious and Rome

Baldwin and Delicious were quite slow in reaching bearing age. Rome produced about double the yield of Baldwin and Delicious when 8 to 12 years of age but was only about half as productive as McIntosh and Cortland during this period. The yields of Baldwin, Delicious, and Rome from the 13th to 17th years were about half as great as those of McIntosh and Cortland.

If a commercial fruit grower is to make a reasonable profit, the bearing apple trees in his orchard should average close to 5 bushels per tree. This is certainly a conservative requirement. Under the conditions which existed in the orchards being discussed here, the McIntosh and Cortland varieties were the most productive and should as a rule give the highest return per tree and per acre. Baldwin, Delicious, Rome, and Spy were satisfactory varieties but required a rather long period of investment before they began to show any profit.

Avocado Varieties in Puerto Rico

By Edward P. Hume
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Commercial avocado culture in Puerto Rico has gained little headway. One reason for this is the fact that avocados can be grown in many sections of the island without special culture and still bear fair crops of marketable fruit. Propagation is almost entirely by seeds except for plants distributed by governmental agencies; these are grafted or budded with improved varieties.

West Indian Varieties

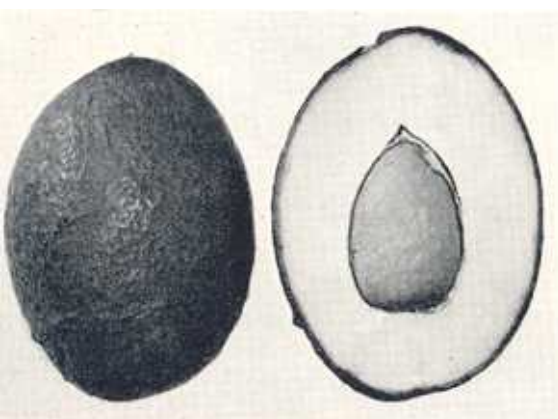
The West Indian race is grown in all sections. Avocados of the Guatemalan race are just beginning to appear on the market, coming from the mountainous sections of the central part of the island. Efforts to establish commercial avocado nurseries have all failed for one reason or another, but horticulturists who have worked with avocados have selected and named about 20 varieties, chiefly of the West Indian race. These varieties have not been thoroughly tested, but some of the better types as indicated by limited

trials and observations include Amador, Avila, Faria, Garcia, Gimenez, Hernandez, Monje, St. Just, Torres, and Triyillo.

Guatemalan Varieties

In 1931 a planting consisting chiefly of "off-season" Guatemalan varieties was made by the Federal Experiment Station in the municipality of Guayanilla near the south coast of the island and at an elevation of about 300 feet. The rainfall in this area is approximately 50 inches, falling chiefly from August to November. The soil is Aguilita stony clay with an alkaline reaction. Wind damage, lack of water for spraying, and poor accessibility have been factors contributing to relatively low production. Accurate yield and maturity data have been difficult to obtain because of larceny encouraged by the high price of "off-season" avocados in Puerto Rico. The price is often 10 times that of fruits sold at the September peak production of West Indian seedlings.

Detailed comparisons of 23 Guatemalan varieties are available but space does not permit their publication in this report. Popenoe* has already described the fruit characters of most of these varieties.



Nimlioh is well suited to the Puerto Rican taste for large sized fruits.

A typical young avocado tree growing by chance along a Puerto Rican roadside.

Collinson and Winslowson Best

For early winter production the Guatemalan-West Indian hybrids Collinson and Winslowson were superior for yield and quality. Nimlioh has given the best results for a slightly later season. It has fruit too large for the export demand but the large size is highly desirable for local market.

For spring production Itzamma and Panchoy were superior. Itzamma carries its fruit far below the branches and frequently sunburns; Panchoy has an objectionably thick skin, so neither can be

* Popenoe, Wilson. The Avocado in Guatemala. U. S. Dept. Agr. Bul. 743. 1919.

considered entirely satisfactory. Dickinson, a reciprocal pollinator for Itzamna and Panchoy, has also proved good; Manik showed some merit.

Commercial Planting of Guatemalan Varieties

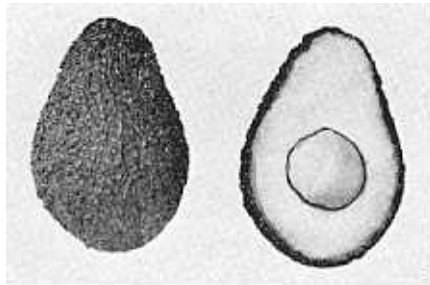
A commercial planting of Guatemalan varieties and seedlings at El Semil near Villalba has grown better and apparently produced greater yields than the planting at Guayanilla. This planting is in Cialitos clay soil types on a steeply sloping hillside at an altitude of 1,600 to 2,200 feet. The soil contains a large proportion of rock which facilitates drainage. The rainfall and percentage of cloud cover are higher and the temperature somewhat lower in this area. Apparently these conditions are better suited to the growth of avocados of the Guatemalan race.

There appears to be no pollination problem with West Indian trees, but the Guatemalan and Mexican races and hybrids flowering at different times frequently fail to set fruit. The blooming period extends from January to late May and may vary from year to year.

Diseases

For the island as a whole, the most serious disease is a root rot which more or less limits commercial production to the better-drained lands. Anthracnose is also a general problem; it attacks leaves causing defoliation and spotting of the fruit particularly in the drier areas is the Cercospora spot.

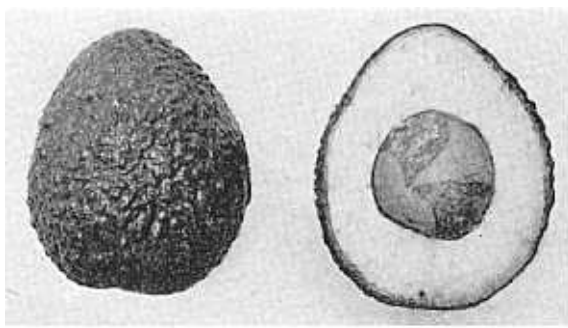
The chief insect damage is caused by the adults of the sugarcane weevil root borer, *Diaprepes abreviatus* L., which riddles the leaves with pencil-sized holes or removes large areas along the margins. The grounds termite or "comejen" is commonly found attacking through dead or broken branches and eventually kills healthy wood also.



Dickinson is a small fruited variety desirable for spring harvesting in Puerto Rico.

Exportation of Avocados

Puerto Rico does not export any appreciable number of avocados to the continental United States although 33 million fruits were produced in 1940. These fruits of the West Indian race would have to compete with the Cuban supply which matures at the same season. The Cuban fruits, although of the same race, have a harder skin which makes them better adapted for shipping; they also enter



The Panchoy has a thick skin but the flesh has a rich and nutty flavor.

duty free and have a shorter distance to continental markets. Guatemalan and Guatemalan-West Indian hybrids appear to be the only types of avocados adapted to the development of an export trade from Puerto Rico. However, production of these avocados is still so small that the local market will continue for some time to absorb the entire crop at a relatively high price.

Let's Take Another Look at Hardiness

By W. G. Brierley,
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Our knowledge of plant behavior often is advanced materially when some general problem is broken down into specific factors. It seems likely that more rapid progress may be made in the study of winter hardiness, or more particularly cold resistance of woody plants, if a careful analysis of the problem is made to determine what specific factors are involved. A perusal of the numerous contributions on the subject of hardiness in woody fruit plants will reveal that the majority deal only with survival. Over the years these records of survival have been useful, but often they do not explain the difference noted in plant behavior under different conditions. Fortunately some reports have dealt with the effects of specific factors but it is evident that this approach should be used more extensively.

The introduction within recent years of many new fruit varieties has intensified the need for studies to determine the detailed nature of ability to survive winter conditions. Many of these new varieties are the results of fruit breeding programs directed towards superior cold resistance. These varieties usually are considered hardy at their place of origin because there they have survived many winters. But what enables them to survive? And why are these "hardy" plants sometimes severely injured or winter killed? Is it lack of cold resistance or lack of something else which leads to injury? To answer such questions, and to gain a clearer understanding of the reaction of both old and new varieties to winter conditions it is apparent that we should attempt to recognize the specific factors which make up the hardiness complex, and study the role of each relative to