

## THE INTRODUCTION OF WEST INDIAN AVOCADOS TO SOUTH FLORIDA

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**Abstract.** The avocado (*Persea americana* Miller) is an important fruit crop for subsistence farmers and small- and large-scale producers throughout the tropics. In the lowlands of Tropical America, local selections of West Indian avocados dominate regional markets. These local West Indian avocado selections are often of superior fruit quality and adaptation to the climatic and edaphic conditions of the area. There has been little effort exerted into the systematic identification, collection and maintenance of these West Indian avocado genetic resources from Tropical America. West Indian avocado selections have promise for South Florida as cultivars for plantation and estate agriculture. As a genetic resource, these selections hold promise for the improvement of disease resistance, fruit quality and productivity of avocado throughout Tropical America and the world. Fairchild Tropical Botanic Garden (FTBG) has initiated a 2-year project for the collection of West Indian avocados in lowland Costa Rica, Nicaragua, El Salvador, Guatemala and Panama. Working with local collaborators we have identified superior selections within localized areas of diversity, collected budwood and established a living collection at the Williams Grove Genetic Resource Center of FTBG in South Florida. Evaluation of fruit and tree characteristics began in 2005.

Avocados (*Persea americana* Miller) are traditional fruit crops of Tropical America, originating in Southeast-Central Mexico and Guatemala. At least three major edible types were prevalent among pre-Columbian peoples—classified as Mexican (*P. americana* var. *drymifolia*), Guatemalan (*P. americana* var. *guatemalensis*) and West Indian (*P. americana* var. *americana*) races (Williams, 1977) (Fig. 1). Cave deposits in the Mexican states of Puebla and Oaxaca demonstrate the use and selection of avocados by pre-conquest peoples as early as 8000 to 7000 B.C. (Smith, 1966, 1969). By the time of the Spanish conquest of the region, edible *Persea* were found throughout Central America and northern South America (Williams, 1977). Among *Persea americana*, the Mexican race is prevalent from 1500 to 3000 m in Central and Southern Mexico, the Guatemalan race dominant from 1000 to 2000 m from Guatemala to Costa Rica, and the West Indian race from sea level to 1000 m throughout Central America (Leon, 1987).

West Indian race avocados dominate the Insular Caribbean and adjacent coastal lowlands of Central and South America. They are grown as a commercial orchard crop, as a key component of subsistence agriculture, and are prevalent in



Fig. 1. Typical West Indian avocado (*Persea americana* var. *americana*).

patio gardens throughout the region. The avocado's international importance has grown over the past century, becoming an international commodity, with a 3-fold growth in world commerce over the last 3 decades (Knight and Campbell, 1999). West Indian avocados are a major component of the overall avocado market growth and are common both locally and in international trade throughout the world.

A diverse genetic resource base of the West Indian avocados has been key to their success; however, there are significant risks to the long term survival of this diversity, including loss of habitat, and the adoption of uniform cultivars for commercial production. There has been a coordinated local, regional and international effort to protect avocado genetic resources, but the focus of these projects has been limited to Mexican and Guatemalan races. The West Indian race, despite its importance throughout the lowland tropics, has been largely ignored and consequently is poorly represented in genetic collections.

This work outlines the efforts of Fairchild Tropical Botanic Garden in the collection of West Indian avocados throughout Central America and the establishment of a permanent living genetic collection in South Florida, USA.

### Method of Collection

West Indian avocados are prevalent throughout the lowlands of Tropical America. Naturalized seedlings occur in suitable habitats, particularly in association with human activity, along roadsides, or as remnant trees left after the clearing of forests. Although of local interest and potential genetic value, collecting these highly variable and often horticulturally inferior individuals is not practical in light of the archeological evidence for the selection for specific horticultural traits spanning the last 10,000 years (Smith, 1966, 1969). Our efforts have concentrated instead on superior selections of West Indian avocados in the patio gardens, and small or-

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chards of Costa Rica (Fig. 2), the Dominican Republic, Nicaragua, El Salvador, Guatemala and Panama. When present and of superior quality, *Persea schiedeana* (locally termed chinini or coyo) have also been collected for inclusion in the living collection.

The difficulty lies in the efficient identification and location of superior selections. We have drawn on past field experience with the avocado in Tropical America to identify localized centers of diversity. Useful information has been drawn from various sources. Travel reports, diaries, and the personal experiences of field horticulturists from Fairchild Tropical Botanic Garden, the United States Department of Agriculture and private growers/collaborators offered a starting point in the location of superior genetic resources. However, to locate specific superior trees across such large regions we have relied most heavily on local collaborators within each region. Collaborators are a diverse group made up of local growers and hobbyists, university and non-governmental organization employees. The common link among these collaborators is the personal, practical experience in superior genetic resources of avocado, a willingness to cooperate in collecting, and practical horticultural experience and expertise.

Collecting expeditions are organized to coincide with the major fruiting season in each region, allowing for first-hand evaluation of the fruit in its environment. In many regions, such as Southern Nicaragua, the fruiting season is spread over

several months, requiring multiple visits to the same region. Local collaborators provide additional information about each selection, such as the optimal growing conditions, adaptability of the selections and any special considerations or traits.

### Propagation of Selections and Establishment of Living Genetic Collections

Each individual selection is collected as budwood (10 cm in length) to maintain the clone. Appropriate quality budwood is available on an avocado tree at most times of the year if the tree is healthy. The preferred timing for the collection of budwood is during the cool season in South Florida. This ensures an optimal survival rate of the grafts. However, grafting of superior selections has been conducted from January through November during this project due to the realities of fruiting seasons in target areas and collecting expedition schedules. Veneer or cleft grafts are used on 'Waldin' rootstocks. The imported material is often subjected to a 1-year post-entry quarantine, during which time it is maintained in a quarantine greenhouse separated from other plant collections. The new selections are planted as a single tree replicate in a permanent living collection at the Williams Grove Genetic Facility in South Florida and managed under a typical commercial avocado maintenance program for South Florida. The selections are screened for the presence of the sunblotch viroid at the time of establishment in the field. A duplicate replicate of each clone will be propagated and placed with the United States Department of Agriculture Subtropical Horticultural Unit in Palmetto Bay, Fla. Duplicate collections will also be propagated and housed with local institutions, community groups or growers within each country where the collecting was conducted.



Fig. 2. Edwin Quiros holding 'Edwin' on the Nicoya Peninsula, Costa Rica.

Table 1. West Indian avocado and *Persea schiedeana* selections currently growing in the living collections at FTBG, South Florida, USA.

Selection	Origin	Initial observations
Amapola	Nicoya, Costa Rica	300 g, purple, good quality
Baldelomar	Rivas, Nicaragua	750 g, green, elongated
Blas	Orotina, Costa Rica	Productive, good quality
Cano	Costa Rica	Productive
Consección	Rivas, Nicaragua	450 g, red, pear-shaped
Darien	Panama	Potential as rootstock
El Pidio	Orotina, Costa Rica	Small, productive
Escuela	Jesus Maria, Costa Rica	Pear-shaped, large, quality.
Fernandez	Costa Rica	Good quality
Kukra Hill	Campos Azules, Nicaragua	Productive, multiple crops
Largo	Costa Rica	Elongated, large fruit
Laurent	Orotina, Costa Rica	Purple, good quality
Linea	Orotina, Costa Rica	Productive, good quality
Lizano	Orotina, Costa Rica	Productive, elongated
Lola	Costa Rica	Excellent quality
Marta	Rivas, Nicaragua	400 g, green, multiple crops
Nidia	Rivas, Nicaragua	400 g, green, pear-shaped
Norma	Nicoya, Costa Rica	400 g, green, good quality
Orotinense	Orotina, Costa Rica	Multiple crops, productive
Pepita	Costa Rica	Productive, good quality
Pila	Costa Rica	Productive, good quality
Rivas - 1	Rivas, Nicaragua	Excellent quality
Rivas - 2	Rivas, Nicaragua	450 g, elongated, schiedeana?
Torres	Nicaragua	Productive
Urroz	Costa Rica	Productive
Kala Lu	Hawaii	400 g, pear-shaped

### Avocado Material Targeted

For the current collecting effort in Tropical America we have targeted West Indian race avocados and *Persea schiedeana* selections. Selection criteria include heavy production, multiple cropping, superior fruit size and quality, a small seed and to a lesser extent potential as a rootstock. Table 1 contains the selections currently planted at the Williams Grove Genetic Facility in South Florida, their origins and observations at the time of collecting. All collections were made at elevations below 700 m and were restricted to local or regional selections. Because we are only 6 months into the 2 year project, the majority of the selections presented are from Costa Rica and Nicaragua. It is too early to comment on the adaptation and performance of these selections in South Florida, but our observations at the time of collecting the material indicate that among these selections there is considerable potential in

terms of fruit quality. A few of the selections have been collected from flooded soils near the sea. These selections may be of interest for root rot resistance, but no assessment was made of the presence of the root rot pathogen in the soils.

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