Table 2. Storage temperature effects on pH and percent soluble solids of 'Fuya' persimmons.

Two week Storage Temp (C)[z]	Firmness at 3 Weeks	2 Nov. pH	2 Nov. Soluble Solids (%)	9 Nov. pH	9 Nov. Soluble Solids (%)
Initial *(At harvest)*	Firm	5.86 (0.142)[y]	14.6 (1.203)[y]	5.77 (0.144)[y]	13.9[y] (1.300)
0	Firm	5.74 (0.158)	16.2 (2.869)	5.64 (0.179)	14.1 (1.024)
0	Soft	5.29 (0.046)	13.8 (0.824)	5.43 (0.162)	13.6 (0.716)
5	Firm	---------- none ----------		---------- none ----------	
5	Soft	5.54 (0.263)	14.6 (0.824)	5.42 (0.086)	14.2 (1.530)
10	Firm	5.78 (0.134)	13.9 (0.640)	5.32 (0.089)	13.4 (0.824)
10	Soft	5.41 (0.055)	13.1 (0.531)	5.43 (0.153)	13.3 (1.275)
20	Firm	5.96 (0.074)	15.2 (0.839)	5.83 (0.117)	13.5 (0.768)
20	Soft	5.74 (0.107)	15.0 (1.176)	5.40 (0.071)	13.6 (0.839)

[z]Fruit harvested 2 Nov. and 9 Nov. 1992. Stored at 0, 5, 10 or 20C for 2 weeks, followed by 1 week at 20C. After 3 weeks storage, five firm and five soft fruit selected.
[y]Data are means of five fruit. (Sd).

should be performed to determine practical postharvest treatments to enhance uniform ripening and to develop appropriate methods for handling and packaging.

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Yamazeki, Toshihiko, Katsuyuki Suzuki, Shoji Murase, and Satoshi

History

One of the earliest and longest papers on Feijoa was by F. W. (Wilson) Popenoe (1912). Its first sentence - "Among the fruits which have been offered as commercial possibilities in California, there are few which possess such intrinsic merit as this one here considered." He describes its beauty, fine flavor, hardiness and good keeping qualities. He states "Upon returning from South America in 1890, the late Dr. Eduard Andre, one of the most noted French botanists and horticulturists of his day, brought with him from La Plata, Brazil, a layered plant of *Feijoa sellowiana*." Those who read this non-critically assume this original introduction to the rest of the world came from Brazil. La Plata is in Argentina, not Brazil, and later in his paper, he makes it plain that the plant's home was Uruguay. Only recently have Brazilian horticulturists begun working with this plant (Raseira, 1992; Ducroquet, 1993). Some seed importations from Uruguay to France were made after 1890. From these sources, seeds and plants were obtained for trial in California and Florida. Later seeds from Argentina were also obtained in California. The plants in Florida were tried mostly in the southern part of the state and were not fruitful.

Feijoa germplasm base outside its area of origin appears rather narrow; coming mostly from Uruguay to France to California and subsequently to New Zealand and other countries. This may be a factor in adaptation to Florida, as discussed later under winter chilling need. Feijoa may not be native in Argentina and Paraguay (Ducroquet, F. P., EPAGRI, Videira, S. C. Brazil, pers. comm., 1993).

Popenoe (1912) suggested Feijoa (fay-zhó-a) as a common name in English. In Brazil, it is goiabeira serrana; in Uruguay, guayabo. Recently there has been a claim that the genus name should be *Acca* not *Feijoa* (Landrum, 1986; Agricultural Research Service, 1992). It seems that Berg described *Acca* in 1856 and *Feijoa* in 1858. Then Landrum studied Feijoa and a related plant *Acca lanuginosa* and stated that "I agree with Burret that *Acca* and *Feijoa* should be united". Because of this combining of three species under *Acca* and the priority of *Acca sellowiana* Berg. some literature from New Zealand since 1985 reflects this change with Feijoa appearing as a common name. In the U.S.A. the plant is also commonly called Pineapple Guava; it has several other Spanish and Portuguese names in its native home.

The other two species placed with *sellowiana* in the genus *Acca* are found wild on the eastern slopes of the Andes in Peru. The nearest relative is found at elevations of 1800 to 2400 m and Landrum (1986) thinks it might "hybridize" with *sellowiana* and perhaps would make an interesting ornamental. He does not guess at its cold-hardiness. The other species was collected at 2800 to 3000 m. For Florida, we need tropical, not montane, adaptation.

A rather extensive and complete summary of literature is by Morton (1987) although specific references are not given. She notes "Few fruit bearers have received as much high level attention and yet have amounted to so little as this member of the *Myrtaceae*." She notes failure to fruit in warm areas, pollination problems, and difficult clonal propagation. She might also have added problems of judging fruit maturity since the fruits are green and drop to the ground at maturity. With such problems and only 100 years of domestication, and limited scientific study, it is little wonder the plant has not lived up to its potential or expectations. A good discussion of culture is given by Franklin (1985).

Climatic Needs and Winter Chilling

The Feijoa is native from 26° to 35° south latitude. In Brazil, it grows in Rio Grande do Sul and Santa Catarina, mostly at elevations of 400 to 1400 m. It thrived in the Mediterranean climates of France and California, and much literature states it needs the cool winters and dry summers of this climate. In contrast, its native habitat is warm and moderately wet in summer. There can be great variation in rainfall, with droughts, but it occurs with the Butia palm (*Cocos* spp.) and the majestic *Araucaria* forests of Santa Caterina, Brazil. This region has cold enough winters to nearly satisfy the winter chilling need of 'Gala' and other apples and enough for 600 chilling hour plus peaches at 800 to 1000 m elevation. The coldest month mean temperatures and winter chilling in Uruguay, France, and coastal California, where it thrives, are even lower, about 9 to 12C. Porto Alegre, Brazil, on the coast, is similar to Gainesville, 14C (57F) and coastal Santa Caterina is still warmer, but we do not know of native Feijoa in these areas.

Ortho books (1985) is the only specific reference to amount of chilling needed, 100 to 200 hours, (presumably at 7C). Many others (Morton, 1987; Maxwell, 1991; Popenoe, 1920) emphasize its subtropical adaptation. Whatley, 1989, in a list of cultivars states 'Coolidge' and 'Nazemetz' do not need chilling, but this may not refer to fruiting. We think the coldest month mean temperature should be no higher than 16C (61F) for good flowering and fruiting. The oldest trees at the University of Florida, of unknown origin, flower later than the younger plants raised from local produced fruits, possibly indicating some progress in adaptation.

Feijoa, like the olive, (Hartmann, 1952; Chandler, 1958) appears to need winter chilling to initiate flowers on the new growth. There is little or no flowering of Feijoa at Miami and poor flowering south of Melbourne, Orlando, and St. Petersburg, Florida. Vegetative growth of olive is not particularly affected in warmer regions, but there is little observation of effects on Feijoa. Neither Mowry et al. (1953) or Watkins and Sheehan (1969) comment on adaptation to warmer areas of Florida. There are a few quite vigorous plants as far south as Miami, although none are fruitful. There is a need to determine the relative influences of winter chilling and self-sterility as factors in poor fruiting.

Cultivars

Since 1912 when Popenoe described the first cultivars, there have been perhaps 40 others named, mostly in Uruguay, California, or New Zealand. There are frequently differences in description, and in some cases seedlings are named the same as the parent, as in a California and New Zealand 'Coolidge' and 'Superba' (Bailey, 1952). Also, Bailey states the first Feijoas came to New Zealand from Australia and misleads Morton (1987) into thinking the first named cultivars also came from Australia instead of California. This is repeated in Facciola (1990), which otherwise appears to be an excellent listing of 21 cultivars and nursery sources. The cultivars in question 'Coolidge', 'Chociana', and 'Superba', were in pollination studies by Clark (1926) in California and are of California origin

(Dawes and Pringle, 1983). Franklin (1985) also has an assessment of 12 cultivars in New Zealand and states "of the older varieties, only two—'Triumph' and 'Mammoth' are suitable for fresh market and even they have serious deficiences". He also implied that without adequate pollination, 'Mammoth' can be hollow, lacking in seed and pulp development. We have also noted this failing in Florida. 'Coolidge', one of the most reliable bearers, and completely self-fertile, is not rated high in flavor by Dawes. We believe that best flavor occurs when fruit are ripening under cool conditions, usually late in the season. The Division of Horticulture and Processing, DSIR, New Zealand, in a program to select improved cultivars, has patented 'Apollo' a self-fertile type of good flavor and texture. Average size is given as 45 × 70 mm. Facciola (1990) and Morton (1987) report it is subject to bruising and purpling, defects in fresh marketing.

Evidently that perfect cultivar has not yet been found. Dawes (1983) has a list of pointers to guide the seeker, including self-fertility, consistently high yields of evenly-sized fruits, smooth skin with no purple or blue color, minimal grittiness and only in outer skin, a good flavor and sweetness, and long storage and shelf life. Faccicola (1990) notes the cultivar 'Nazemetz' is unique in having non-browning flesh, which would seem important as it is in peaches. Giacometti (1992) also suggests yellowing or red color at maturity should be desirable in judging time to pick and possibly offering greater attraction in the market. He mentions selection M-4 in Uruguay as "bello amarillo rojisa". However, Mattos (1986) studied 11 selections in the Department of Montivideo, Uruguay in mid-April, 1975. Among these was 'Botali', a leading market-type and M-4, a rough skinned, or rugose skin-type, green, slightly yellowish, not reddish. Many of these selections had fruits over 40 mm diameter × 60 mm in length. A yellow-fruited selection is reported in Brazil (Ducroquet, pers. comm., 1993), and there were at one time (1959) two plants on the campus of Mississippi State University in northern Mississippi that had large crops of yellow fruit (W. B. Sherman, University of Florida, pers. comm.). These have now been lost, unfortunately. Do some cultivars degreen as does citrus in cold weather or is this a viable genetic character of interest? Fruit of one 1993 selection, that was light green at maturity, turned yellow after a month's storage at 4C.

Since 1992, we have observed nine cultivars grown at Turkeytown Orchards near Chiefland (Table 1). 'Coolidge' and 'Mammoth' were rated as heavy cropped. Other labeled cultivars were 'Superba', 'Pineapple Gem', 'Nazemetz', 'Triumph', 'Edenvale Supreme', 'Edenvale Coolidge Improved', and 'Trask', none of which were rated as well-cropped. The latter ripened 2 weeks later than others on October 29 and was rated as superior in flavor. But there is a question of correct identification, as Facciola lists 'Trask' as early ripening. The 1993 crop was light on all cultivars.

Beginning in 1991, we have surveyed about 3000 local seedlings, and found eight selections that appear to be self-fertile; two with fruits weighing 32 g and measuring 40 × 60 mm. 'Mammoth', 'Trask', and 'Coolidge' were in 1993 cross-pollinations. Researchers in Brazil have 2000 to 3000 young seedlings from selections in Rio Grande do Sul and Santa Caterina (M. Raseira, pers. comm., 1993; J. H. P. Ducroquet, pers. com., 1993). Some of their selections have fruits weighing 190 g.

Self-sterility and Pollination

Many references list cultivars as self-fertile, but add that cross-pollination improves fruit set or development. Popenoe (1920) placed more emphasis on self-sterility as a cause of poor fruit set than in his 1912 paper. Authors since then have almost universally emphasized the problem of self-sterility. 'Coolidge' is one cultivar that appears to have no problem of fruit set even in isolation (C. Rick, Dept. of Vegetable Crops, Univ. of Calif., Davis, CA. pers. com., 1992). Clark (1926) studied 'Coolidge', 'Choiciana', and 'Superba', finding only 'Coolidge' setting well without cross-pollination. Schroeder (1949) studied these cultivars, also 'Bliss' and 'Hirschvogel', finding that all but 'Coolidge' had better fruit set if cross-pollinated. Patterson (1990) studied 'Apollo', a supposedly self-fertile cultivar in New

Table 1. Feijoa fruit diameter (mm) and seeds per fruit.

Seedling Selections									
H		FB		H[z]		A		LC[z]	
Diam.	Seeds	Diam.	Seeds	Diam.	Seeds	Diam.	Seeds	Diam.	Seeds
10	2	14	8	9	4	13	3	24	11
14	24	16	11	15	16	18	8	32	13
21	31	23	19	20	23	23	13	34	35
26	65	27	19	25	42	32	36	37	45
29	61	30	21	33	161	37	68	40	71

Named Cultivars							
Triumph		Coolidge[y]		Coolidge[x]		Mammoth[z]	
Diam.	Seeds	Diam.	Seeds	Diam.	Seeds	Diam.	Seeds
28	63	31	30	28	6	33	52
28	71	33	19	34	24	37	124
30	52	35	34	36	25	40	—
—		37	74	38	45	45	—
		39	58	42	86	—	

[z]Outcross - all others open pollinated.
[y]Source, California.
[x]Source, Chiefland, Florida - other varieties and seedlings, Gainesville, Fla.

Zealand and reported cross-pollination gave higher fruit set, fruit weight, pulp development, and seed count. He also reported correlations of seed count and fruit quality and uniformity.

We made seed counts in fruits of varying size of several cultivars in Gainesville in 1992 (Table 1). The trend was for higher seed counts with increase in fruit size. The trend for a genetic potential for fruit size is also apparent in these samples, regardless of seed count.

Since the Feijoa is generally self-sterile, and fruit quality is greatly affected by pollination, it is essential to learn more about pollinators. Popenoe (1920) mentions birds as pollinators. Landrum (1986) and Texeira (1954) quote several observers that the flower petals attract birds. Stewart and Crane (1989) made extensive study in California, New Zealand, and Japan of all the visitors to the flowers. They conclude that only rather large birds are effective pollinators and that contrary to many previous reports, bees are not effective as they are seeking pollen and do not make much contact with the stigma. They list blackbirds (*Turdus merula*) and mynas (*Acridotheres tristis*) as the most efficient cross-pollinators. They suggest that wind and gravity may not ensure enough pollen, even in self-fertile cultivars, to set heavy crops. This, however, does not seem to be a problem with 'Coolidge' and perhaps should not discourage all breeding and selection for self-fertility.

In Gainesville, we see no bees or other insects regularly visiting the flowers. In at least three locations, we observed mocking birds (*Mimus polyglottas*) regularly feeding on the petals. The migratory cedar wax wing (*Bombycilla cedrorum*) had passed through before the late April and May flowering season. If we could have Feijoa in flower in early April, it would be interesting to see if the bird might like the petals as well as it does blueberries. In spite of much feeding by mocking birds, two plants situated 16 m apart set poorly without hand cross-pollination; mockers tend to be very territorial, so may not visit between the plants.

The old answer to insure good pollination has been to plant more than one variety close together. Stewart and Crane suggest small blocks of 0.5 ha, encouragement of birds, but not to use bees.

Propagation

Feijoa is not easy to propagate clonally. Layering and grafting have drawbacks; cuttings would be more desirable. Franklin (1985) and Bailey (1952) give rather specific information under New Zealand conditions. Semi-ripe cuttings, in fall and early winter in the warmer areas, are taken from the lower parts of the plant. Two top leaves are left, cuttings dipped in 2000 ppm indolebutyric acid, and set in a friable media under intermittent mist at 21C (70F). They should be ready for removal from the bench in 8 to 12 weeks. Dirr (1987) states the published literature is not very specific or encouraging relative to success of rooting. Taylor and Joiner (1959) report no success with cuttings taken in July in Florida and placed under constant daytime mist. Cuttings taken in February rooted 90% after 2 months, they report. Dirr (1987) and others have reported that much variability exists in different clones (or perhaps local conditions). We have made cuttings in May without success, October with much success for 'Mammoth' but not three other selections, but only after some 6 months. Such slow-rooting requires retention of good leaves on the cuttings and this is a function of health of the mother plant, its exposure to light, and perhaps cultivar variation, as in blueberries. Interestingly, Bellini (1989) cited Russian research comparing cuttings taken from lower, middle and upper parts of the plant, giving respectively 87%, 63%, and 9% rooting. The use of in vitro propagation as for native Florida plants (Kane et al., 1991) has not been reported for Feijoa, but would seem to be worth trying.

Cleft or whip grafts, as for camellias protected by covers, have been quite successful; however, suckering is common and must be guarded against. Seeds easily germinate in about 3 weeks and form 1-m-high plants by fall under good conditions. We have had some flowering on 2-year-old plants, but do not know if thinning out non-fruiting plants can be done on such juvenile plants. Unfortunately, fully self-fertile cultivars such as 'Coolidge', are reported to give some self-sterile seedlings. Only breeding studies can tell us how to get more fully fertile types. Fruit size is thought to be related positively to leaf size; we also see large cotyledon leaves in seedlings from large fruited selections.

Production Areas and Yields

Commercial production of fruit has been on a modest scale in Uruguay, California, New Zealand, and Russia. Giacometti (1992) states production in Uruguay has been practiced for 50 years, and lists two cultivars of interest, but many plantings are seedlings with low productivity. The Mediterranean area was the first to spread interest to other countries, but the fruit is still not widely known in the region apparently. Ogawa (1991) reports 360 ha planted in California, with 200 in production.

New Zealand has had the most interest in the crop, starting with export trials starting in the 1980s. Dawes (1983) reports 400 MT produced in 1980 on 142 ha, with 57% processed and 43% fresh. Patterson (1990) gives 1986 production of 1650 MT on 217 ha with only 66 MT exported. Variability of quality from seedlings and lack of good fruit set are given as problems.

Munoz reports (C. Munoz, Instituto de Investigaciones Agrropecuarias, Chile, pers. comm., 1993) that growers in Chile have lost interest in Feijoa as a potential fresh and export crop. Georgia and Azerbaidzhan in southern Russia have recently been increasing plantings in areas too cold for citrus.

There is no commercial fresh fruit production in Florida; some attempts to introduce the fruit to the public are being made by the Rural Development Station at Tifton, Georgia. Samples of the fruit are generally well accepted, but it is not easy to introduce a new fruit commercially. Our goal is to find acceptable cultivars for dual use of fruit and ornamental value. The nursery industry, with better propagation methods, could benefit commercially and home owners could have an excellent plant to add to their gardens.

Post-harvest Handling and Uses of Fruit

Initially, it was thought that the Feijoa had storage and export potentials like the Kiwi, but this has not yet materialized. Problems of bruising and fresh fruit quality were reported by Klein and Thorp (1987). They report commercial storage life of 4 weeks at 4C with 5 days shelf-life at 20C. For some cultivars chilling injury was found at 0C storage. Berger et al. (1991) reported rather similar results

with 'Triumph' and 'Mammoth' cultivars. While this is quite impressive, it does not suggest fresh fruit marketing can be as successful as once hoped. Reports of the fine quality of fresh and processed products of Feijoa are enthusiastic and numerous (Morton, 1987; Schneider, 1986). Texeira (1954) notes that some people in Brazil consider marmalade from Feijoa superior to that of the less cold hardy guavas.

Schneider (1986) lists nine recipes for the fruit, though failing to confirm that the petals are as well liked by people as by birds. Where plentiful as in New Zealand, the fruit is used to make jelly, fruit butter, chutney, pies, relish, fritters—just about everything you think of making with apples. Morton (1987) records vitamin C content of 28-35 mg per 100 g of edible portion. Fruit is high in pectin so that 1.4 kg (3 lbs) of jelly can be made from 0.45 kg (1 lb) of fruit, one author states. The author (RHS) was given a sample of preserves by a garage saler who made it by grinding whole fruit. Use of the whole fruit made it gritty. It was also dark brown. We hope to get some fruits of 'Nazemetz', which is reported to be non-browning and use only the pulp and seeds. We found one selection in Gainesville with thin skin and no grittiness. The calyx was removed and the whole fruit put through a blender. Though lacking high flavor, the product was quite good.

Disease and Pests

A few pest problems are reported. Some scales attack plants in New Zealand. Insects hiding in the calyx can be a problem in fresh fruit (Franklin, 1985). Ogawa (1991) and Wehlburg et al. (1975) list several diseases identified on Feijoa, but none appear very serious on hedge or specimen plants in Florida. Our fruit-loving squirrels have not yet found the fruit good to eat. In Brazil, anthracnose (*Colletotrichum gloesporioides* Penz.) has caused fruit rot and death of plants (Andrade, E. R. de, et al., 1992).

Giacometti (1992) lists fruit flies, *Anastrepha* sp. and *Ceratitis capitata* as parasites in some highlands of South America and the Mediterranean, though Mattos (1986) says 'Botali', M-1 and M-6 were little infected in Uruguay. Fortunately, these flies are not established in areas of southern U.S. where the Feijoa thrives. Hickel and Ducroquet (1993) list *Anastrepha*, thrips, a leaf scale, a shoot moth, and an eriophyid mite as pests in an exhaustive study of fauna associated with Feijoa in its native home.

Major Problems in Improvement

The germplasm base would appear to be limited as noted earlier. Even so, there is enough variability that slow progress has been made in improvement of the fruit. It is very encouraging to learn of researchers in southern Brazil (Raseira, 1992; Ducroquet, 1993) beginning study of the plant in its extensive native habit. There are enough good features in present cultivars that a plant breeder could combine some of them like the self-fertility of 'Coolidge', the size and relatively easy propagation of 'Mammoth', the reported quality of 'Apollo' and others, the non-browning flesh reported in 'Nazemetz', and the yellow color of mature fruit.

Breeding could be quite rapid, because of the large seed count per fruit and ease of germination. The seedlings can be grown at very close spacings and the possibility of generations in 2 or 3 years compares favorably with that of peach and blueberry in Florida.

The major problem is probably that of personnel and funding. No crop of minor commercial importance receives public funding any more. A dedicated individual would need several years of part-time effort to achieve good results. But millions of people in north Florida and along the Gulf Coast would benefit from having a dual use ornamental and home fruit of great merit. If more tropical adaptation could be obtained, millions more in central and south Florida would benefit. From 13 cross combinations made in spring 1993 at Gainesville, and from 11 selections, we have about 2000 seedlings to plant in 1994.

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EFFECT OF HURRICANE ANDREW ON TROPICAL FRUIT TREES

JONATHAN H. CRANE
Tropical Research and Education Center
University of Florida, IFAS
Homestead, FL 33031-3314

RICHARD J. CAMPBELL
Fairchild Tropical Garden
Miami, FL 33156

CARLOS F. BALERDI
Dade, IFAS Cooperative Extension Service
University of Florida, IFAS
Homestead, FL 33030

Additional index words. Persea americana Mill., *Citrus latifolia* Tanaka, *Mangifera indica* L., *Pouteria sapota* (Jacq.) H.E. Morre + Stern, *Litchi chinensis* Sonn., *Nephelium longana* (Lam.) Carm., *Annona cherimola* × *A. squamosa*, *Averrhoa carambola* L., *Psidium guajava* L., typhoon.

Abstract. **Hurricane Andrew (24 August, 1992) devastated much of the tropical fruit crops acreage in Dade County. Avocado, 'Tahiti' lime, mango, carambola, guava, longan, lychee, mamey sapote, and atemoya orchards were surveyed 10-15 months after the hurricane to determine the percentage of trees that were toppled (tipped over), stumped (reduced to major scaffold limbs), destroyed (blank tree hole or dead tree), or standing (upright tree with major scaffold limbs) after the storm. Three to seven orchards of each fruit crop were surveyed. Orchards were sampled in diagonal corners and in the center and ranged from 1 to 120 acres in area. Trees ranged from 2 to 46 years old, and from 6 to 25 ft in height prior to the storm. A greater percentage of lime (95%), carambola (93%), atemoya (90%), avocado (87%), mamey sapote (84%), and guava (84%) trees survived the hurricane than mango (71%), longan (70%), and lychee (60%) trees. More atemoya (77%) trees were toppled than any other fruit crop, whereas more lychee (40%), longan (30%), and mango (29%) trees were destroyed compared to other fruit crops surveyed. Mamey sapote (44%) trees had the highest percentage of stumped trees while more carambola (76%), guava (69%), avocado (67%), and grafted lime (66%) trees remained standing compared to other fruit crops. The relationship between tree age and height and the percentages of trees that were toppled, destroyed, stumped, standing, and survived varied among fruit crops.**

On 24 August 1992, Hurricane Andrew made landfall on south Dade County, Florida, devastating the $74 million tropical fruit industry (Mosely, 1990). The National Weather Service reported sustained winds of 145 mph (230 kph) and gusts in excess of 175 mph (280 kph). Only 2 to 4 inches of rainfall were reported during the storm.

Early estimates suggested 40%-45% of the 22,000 acres (8,900 ha) of tropical fruit crops in Dade County were completely destroyed (Crane et al., 1993). Initial observations of tree damage included defruiting, defoliation, breakage of major scaffold limbs, trunk splitting and breakage, tree toppling, extensive bark damage caused by wind-blown rock and debris (sand blasting), and windthrowing (partial and complete uprooting) (Crane et al., 1993). Sunburning of exposed trunks and limbs occurred during the days and months following the storm. More detailed observations of tree damage and post hurricane recovery exposed differences among tree species, cultivars, tree ages (size), tree heights, propagation methods, cultural practices prior to and immediately after the storm, and preplant soil preparation (Campbell et al., 1993; Crane et al., 1994).

The objective of this study was to survey avocado, mango, 'Tahiti' lime, atemoya, carambola, mamey sapote, guava, lychee, and longan orchards and to determine the effect of Hurricane Andrew on the number of trees that were toppled, destroyed, reduced to stumps, and that remained standing after the storm.

Florida Agricultural Experiment Station Journal Series No. N-00905.