

CMC, prior to storage at -30°F . Pretreatment of fresh blueberries with the CMC mixture gave an acceptable product even after 21 months of storage. Expansion of the freezing processes of rabbiteye blueberries will benefit producers, processors and consumers.

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Proc. Fla. State Hort. Soc. 90:224-225. 1977.

LOW-CHILLING APPLES FOR FLORIDA

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Abstract. Although virtually ubiquitous throughout the temperate zones, geographical distribution of the apple has been excluded from the non-mountainous subtropics by its high winter chilling (rest period) requirement. In recent years, several low-chilling sports have offered the possibility of extending the apple's range into the subtropics. Several such selections have been tested in central Polk County [latitude 28°N , elevation 61m (200 feet) above sea level] and in Gainesville [latitude $29^{\circ} 45' \text{N}$, elevation 55m (180 feet)]. 'Tropical Beauty' (from South Africa), 'Anna' (from Israel) and a strain of 'Dorsett Golden' (originally from the Bahamas, but reselected in South Florida) are particularly promising. Some varieties cannot be grown alone as they may need suitable pollinators.

The apple has been enjoyed by man since prehistoric times in the Old World, both wild and cultivated, being indigenous to the region south of the Caucasus along the Caspian Sea. Although there is no evidence that the forbidden fruit of the Garden of Eden was an apple, Goor and Nurock's "Fruits of the Holy Land" (2) devotes a 19-page chapter to the apple. They describe how fossilized remains of apples have been found in Neolithic sites dating back to 4,000-3,000 B.C. Apples were introduced to the New World by early settlers who brought seeds with them from Europe, and the apple tree now grows from Washington state to North Georgia. Further penetration southward has previously not been possible. However, sufficient low-chilling requirement apples are now available for interested growers to produce acceptable apples in subtropical Central Florida.

Floridians have long tried, usually unsuccessfully, to grow the more popular northern apple varieties. Their

failure has been due to the dormancy needed by apples. This has hitherto required colder winters than normally prevail in Florida.

New hope for apples in Florida was generated by a seedling of 'Golden Delicious' planted in 1953 by Mrs. Irene Dorsett of Nassau, Bahamas (5). Six years later the tree bore fruit and for sometime thereafter had annual heavy crops maturing from June through August. The seedless apples were large, yellow, crisp, juicy, and of very good flavor. This selection was given the name 'Dorsett Golden' and budwood was promoted and distributed throughout Florida.

Since neither hybridization of apples nor selection of potential cultivars had been attempted in Florida as of 1958 (3), I became interested in growing apples in Central Florida (Winter Haven) and collected all the available plant material I could find. For average minimum temperatures for Winter Haven, see Table 1. Chilling requirements is usually expressed as so many hundred hours below 40°F (4.5°C). It is apparent that to succeed in Central Florida, apples need only a slender number of hours below 50°F (10°C). Going on the theory that an early-blooming apple might have a reduced low temperature requirement, I collected a number of other cultivars, usually by purchase from nursery catalogs and magazines. Purchased trees were planted and observations made. Someone from one of the country's leading nurseries² visited me recently and suggested that I publish the findings of my preliminary observations; this is the purpose of this paper.

In Central Florida, the 'Dorsett Golden' has been somewhat of a disappointment, fruiting having been very sparse. A better strain of the 'Dorsett Golden' has now been acquired from South Florida where it had fruited fairly well. This strain fruits abundantly in Gainesville³, and is recommended as a pollinator for 'Anna' in that district (1).

²Martin, D. R., 1977, Personal communication. Mr. Martin is the Eastern U.S. Field Manager for Stark Brothers Nursery and Orchards Co., Louisiana, MO 63853.

³Crocker, T. E., 1977, Personal Communication. University of Florida, Fruit Crops Department, Gainesville, FL 32611.

¹The interest and support of Stark Brothers Nursery and Orchards Co., Louisiana, MO, have been deeply appreciated.

Table 1. Average monthly minimum temperatures at three locations from January, 1976, to May, 1977.*

Location	1976												1977				
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Gainesville	39.3	46.4	54.9	55.4	63.2	67.9	71.0	71.0	68.2	55.5	45.4	44.9	36.2	40.5	56.7	55.5	62.6
Lake Alfred [†]	41.4	47.9	57.8	57.2	64.1	68.0	70.8	70.5	68.2	57.6	53.2	46.5	37.7	42.5	56.6	56.4	60.5
Miami	51.3	58.4	70.2	64.8	71.0	72.8	74.5	75.4	74.5	69.0	64.6	58.5	48.5	55.6	67.1	68.1	70.2

*Climatological Data, Published by NOAA, Environmental Data, National Climate Center, Asheville, NC.

[†]Lake Alfred is about 5 miles from Winter Haven, climatic differences are inconsequential.

Interest should not be abandoned in this selection until further studies have been made in Central Florida.

'Anoka' apple, often called "The Old Folks Apple" because the tree bears at an early age, often the first year after planting, has shown some promise in Central Florida.

The tree is rather small; it fruits well even with very mild winters, and continues to bloom after the first fruit set, sometimes throughout the entire season. Maturity from the first fruit set is the latter part of May and continues until the first of August. Fruit size is medium; color, green to light yellow with faint red streaks; flavor, good; quality, good. Fruit must be picked at the first sign of color break because of its tendency to crack sometimes and to become mealy. It does not need a pollinator and is a very good cooking apple.

'Tropical Beauty' has been tested in Central Florida. This apple was found in Maidston, South Africa. Budwood was introduced to Australia in 1958 where it grew vigorously, fruited abundantly, and had good flavor and quality under tropical and semitropical conditions. Color there was deep red. In Central Florida, 'Tropical Beauty' fruits sparsely and its color is dull green; size, medium to large; flesh, crisp; flavor, insipid; quality, very poor. Definitely not for this area.

The 'Anna' and 'Ein Shemer' varieties, developed in Israel by A. Stein, have grown and fruited quite well in Central Florida. 'Anna' is the most desirable variety but reported not to be self fruitful in Florida (1): fruit size, medium to large; color, 50% blushed red; flavor, excellent; quality, good.

'Ein Shemer' is less prolific in bearing and growth habit; fruit size, medium; color, yellow, flavor, good; quality, good.

'Ein Shemer' is the chief pollinator for 'Anna' at this time; they overlap in bloom in Winter Haven, Florida. Both varieties ripen in late May and early June.

In my observations of these two varieties, the only difference between those grown at the University of Florida, Gainesville, Florida (4), and the ones grown in Winter Haven is that the Gainesville trees tend to yield slightly more fruit due to the longer chilling period.

'Winter Banana' is another promising apple for Florida. In Winter Haven, this tree, grafted on a semi-dwarfing rootstock, fruited in less than a year after planting. It is too early at this time to evaluate performance accurately.

Other varieties of apples being evaluated in Winter Haven at this time are 'Beverly Hills,' 'Zabadani,' 'Molly's Delicious,' 'Yellow Horse,' 'Red Delight,' and two seedling trees from seed sent from Lima, Peru.

Results from these will be published at a later date.

No serious pests or diseases have been noticed in the past 10 years of my observations.

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