the jelly palm. A recent report indicates the possibility of some susceptibility to lethal yellowing by this species, however.

In the most tropical parts of Florida the peach palm, *Bactris gassipaes* HBK., is found in many collections. This palm produces an excellent, highly nutritious fruit which is eaten after cooking. This palm must be grown in protected areas where the humidity is kept high and supplemental water provided during dry weather. Peach palms have survived the January freeze with little damage where they were in protected places. No species of *Bactris* has been susceptible to lethal yellowing so far.

There is much variation in the peach palm but no selecting has been done for varieties particularly suitable to Florida. The peach palm comes from the humid tropics of the new world and is a true rain forest species. Perhaps somewhere individuals adapted to a slightly cooler and drier area will be found and we will get selections that are better adapted to South Florida conditions.

The salak palm, *Salacca edulis* Reinwardt, is highly esteemed for its fruits in Malaysia and Indonesia. It is generally eaten raw as a dessert fruit but is also cooked and canned. A few specimens of this species have been growing in South Florida for many years but have not been known to produce fruit. Ordinarily the species is dioecious but apparently only males have flowered in Florida. In the last few years many seeds have been brought in, partly under the auspices of the Rare Fruit Council International and the Palm Society, and a fairly good population of plants has been established. Since many of these new plants came through the freeze undamaged, it is to be anticipated that female flowers will be produced in time and we will have fruits from this palm.

Seeds from an alleged monoecious or perfect flowered strain of this species growing on Bali have been introduced, and we may soon find out whether or not this characteristic is reproducible under our conditions.

The salak palm is another palm from a high rainfall area and requires moist, warm conditions for optimum growth. Unless this palm is planted in a very moist area, supplemental watering will be necessary. The palm does not produce a trunk above ground and has long leaves that are very spiny. It is generally grown in partial shade which helps to keep the humidity high. Lethal yellowing has not affected this species so far.

Many other palms in Florida produce edible fruits or seeds but none is of as much interest or value as the above mentioned species.

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DECIDUOUS FRUIT SPECIES AS LANDSCAPE ITEMS IN NORTH FLORIDA'S HOMEOWNER PLANTINGS

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Abstract. **Many deciduous fruit species are excellent landscape plants in north Florida while others are limited due to climatic adaptability. Information on propagation, dimensions, adaptability, varieties, and uses are discussed for the homeowner. Commercial crops such as peaches, nectarines, pecans, grapes, and blueberries are included as well as less common deciduous fruit species.**

The landscape value of many deciduous fruit species has long been realized in north Florida. The pecan as a shade tree and the muscadine grape trained to an arbor are found often in landscapes from the Gainesville area north and west to Pensacola. Other major fruit species as well as many less common fruits can be successfully grown if attention is given to adapted varieties, soil requirements and pest control.

The list of species discussed here attempts to present information useful for a landscape plan in north Florida incorporating fruit and nut crops. Each fruit type is followed by its scientific name and family to which it belongs. For each fruit type, landscape use, unique requirements of certain species and ultimate dimensions and/or proper growing dimensions are given.

Brief descriptions of species have certain words that occur frequently and are abbreviated. Terms used for the mode of propagation for each species are: S Ct, shoot cuttings; R Ct, root cuttings; Gft, grafts (including budding); Of S, off shoots; L, layering; A L, air layering; Sd, seed. Seed can be used for all fruits listed but is not recommended since seedlings vary and are not true to type. Ultimate dimensions and/or proper growing dimensions are given in meters (m) and in feet (ft) in parentheses. Height precedes diameter or "spread". Cvs. is used for cultivated varieties. Information on fruit and fruit quality are excluded except where relevant. Using the standards outlined, the following fruits are valuable for inclusion in north Florida's landscape plantings:

APPLE (Malus domestica Borkh; Rosaceae). Moderate size trees used for free-standing shade trees or of considerable smaller size used as specimen plants. Tree size is dependent upon the dwarfing character of the rootstock. Most apple varieties are not well adapted to north Florida because of their high chilling requirement.[1] Cvs. 'Anna', 'Ein Shemer', and 'Dorsett Golden' are the only apples presently recommended for planting in the dooryard with the latter a good pollinator for the more popular 'Anna'. Gft. Attains dimensions of 4.5 by 3.75 m (15 by 12 ft) unless pruned or size controlled by rootstock.

BUNCH GRAPE (Vitis spp. L.; Vitaceae). Due to climate and lack of disease resistance, there are few bunch grape varieties adaptable to north Florida. Cvs. 'Lake Emerald', 'Blue Lake', 'Stover', 'Liberty', and 'Roucaneuf' can be trained to grape arbors or trellised for the landscape area. For commercial production, no other fruit has such demanding pruning requirement; however, home production requires a much less exacting program. Gft, S Ct. Restrained to an arbor of desired dimensions while trellis dimensions are 1.5 m by 3 m (5 ft by 10 ft arms).

CHINESE CHESTNUT (Castanea mollissima Bl.; Fagaceae). Grows rapidly into a well-shaped shade tree pro-

[1]See E. H. Rowland, "Low-chilling apples for Florida" pp. 224-225 and Liebeman et al. pp. 226-228.

ducing nuts at an early age. Blight resistant cultivars such as 'Nanking', 'Kuling', and 'Meiling' are the most suitable for north Florida. Trees thrive on most types of soil but should be planted in pairs for cross-pollination. The spiny burs or husks of chestnuts can be a problem in the dooryard. Gft. Dimensions 9 by 7.5 m (30 by 25 ft).

CRABAPPLE (Malus angustifolia Michx.; Rosaceae). This small tree when pruned and shaped can be an attractive and useful addition to any landscape. This species grows wild along riverbanks and woodland margins preferring a moist, humus soil. The crabapple bears attractive one-inch fragrant pink flowers in the spring. Preserves can be made from the small yellow-green fruit which ripens in September. Sd., Gft. Dimensions 2.5 by 2.5 m (8 by 8 ft).

ERECT BLACKBERRY (Rubus argutus Link.; Rosaceae). Blackberries can be grown in north Florida and the erect type can be used in the home landscape to establish an attractive hedgerow. However, without proper training and pruning the blackberry can become a weed when uncontrolled. The 'Brazos' cultivar has large, attractive fruit and will serve as a rewarding dooryard plant. S Ct, R Ct, Of S, L. Pruned to dimensions of 1.25 m by 1 m (4 ft by 3 ft).

FIG (Ficus carica L.; Moraceae). While this fruit species attains a small tree size in more southern locations, late spring freezes usually limit the fig to a bush form in north Florida. Cvs. 'Celeste', 'Brown Turkey', 'Magnolia', and 'Green Ischia' are adaptable to a wide variety of soils but rootknot nematode can cause severe damage on deep sandy soils. This native of Asia Minor can be incorporated into the landscape by planting near buildings or used as free standing specimens. S Ct, Gft, A L. Attains dimensions of 2.5 by 2.5 m (8 by 8 ft).

FLORIDA CHINKAPIN (Castanea floridana Ashe; Fagaceae). This junior member of the Chestnut family is a small, shrub-like tree which can be used as a screen or border plant in the dooryard. This species begins bearing small delicious nuts at an early age. Sd. Gft. Dimensions of 3.75 by 3.75 m (12 by 12 ft).

JAPANESE PLUM (Prunus salincina Lindl.; Rosaceae). Plum trees are either low-spreading or upright in growth depending upon variety and can be used as free standing specimens in the home landscape. Most Japanese plums have a high winter chilling requirement and only cultivars like 'Kelsey' and 'Mariposa' are adapted to north Florida. Plums, like other *Prunus* species, must have proper fertilization and pest control to insure good fruit quality. Gft. Restricted to dimensions of 2 m by 2.5 m (7 ft by 8 ft).

MAYHAW (Crataegus opaca Hook. and Arn.; Rosaceae). The mayhaw or riverflat hawthorne makes a small tree with thorny branches. Since this species grows wild along riverbeds and swamps in Florida, it would be of use in landscapes of similar nature where other fruits would not survive due to "wet feet". The orange fruit makes an excellent aromatic jelly. Sd. Attains dimensions of 2.5 by 2.5 m (8 by 8 ft).

MUSCADINE GRAPE (Vitis rotundifolia Michx.; Vitaceae). Muscadines are native to the Southeastern United States and will grow on many types of soil. They can serve as a beautiful dooryard arbor or can be trellised for easier care. Fruit from these vigorous vines ranges from bronze to pink to black in color. Whether sweet, eaten fresh and preserved or slightly sour, as used in wines, their flavor is unique and unlike any of the more common table grapes. When selecting cultivars, plant either self-fertile types or interplant pistillate and self-fertile types. L, S Ct. Vines attain very large size but usually are restrained to an arbor of desired dimensions or on a trellis 1.5 m by 6 m (5 ft by 20 ft fruiting arms).

NATIVE PLUM (Prunus angustifolia Marsh; Rosaceae). Though often allowed to grow uncontrolled as thickets in the wild, the American or native plum with training makes a small tree or it can be used as a hedge. Hybrids with the Japanese plum such as 'Excelsior' are also adapted to north Florida. Fruit are usually small to medium with a tough skin but makes excellent jams and jellies. The native plum, like the Japanese plum, requires special attention to make it a productive landscape item. Sd. Gft. Restricted to dimensions of 2 by 1.5 m (6 by 5 ft).

NECTARINE (Prunus persica (L.) Batsch; Rosaceae). This smooth-skinned peach is believed to have derived its name from "nectar", the drink of the Gods, to which this fruit was compared because of its superb flavor. The nectarine can be used in the landscape as a free-standing specimen but only cultivars adapted to mild winters should be planted. Not only is the nectarine susceptible to the many pests affecting other *Prunus* species, but is more susceptible to the plum curculio insect and the brown rot disease. Therefore, this species requires a thorough spray program. Gft. Pruned to dimensions of 2 m by 3 m (7 ft by 10 ft).

ORIENTAL PERSIMMON (Diospyros kaki L.; Ebenaceae). This small tree has large, glossy, dark green leaves and highly colored fruit that make it a beautiful dooryard tree. Some cultivars must become soft before the fruit loses its astringency while others are non-astringent and can be eaten while still firm and crisp. Persimmons can be grown on a wide range of soils with little or no pest control and pruning. Gft. Dimensions 3 by 2.5 m (10 by 8 ft).

PEACH (Prunus persica (L.) Batsch.; Rosaceae). Considered the queen of temperate-zone fruit, the peach is also highly ornamental in bloom and suitable for the dooryard as free-standing specimens. Peach cultivars have a winter chilling requirement and Florida's mild winters restrict the number of cultivars available. Only those cultivars with a requirement of 450 to 700 chill hours should be planted in north Florida. Peaches are susceptible to a multitude of pests, including disease, nematodes, and insects. Thus, a regular pest control program must be followed to insure good quality fruit. Gft. Pruned to dimensions of 2 m by 3 m (7 ft by 10 ft).

PEAR (Pyrus communis L. X Pyrus pyrifolia (Burm.) Nak. Hybrids; Rosaceae). These hybrid pears are usually long-lived and make medium size shade trees in the dooryard. While most European varieties *(P. communis)* have high chilling requirements and lack disease resistance, several of these hybrids are adapted to north Florida and are tolerant of fireblight. Gft. Dimensions 4.5 by 3.75 m (15 by 12 ft).

PECAN (Carya illinoensis (Wang.) K. Koch; Juglandaceae). The pecan is one of the most important shade trees grown in north Florida. The huge size attained by many older pecan trees makes it especially valuable in dooryard plantings. Pecan cultivars are generally divided into two groups, those exhibiting resistance to the scab fungus and those that are susceptible. Only scab resistant cultivars such as 'Stuart', 'Desirable', 'Elliott', 'Curtis', and 'Moreland' should be planted in the dooryard. Gft. Height 18.75 m (60 ft), spread 12 m (40 ft). Although many dooryard trees bear nuts in alternate years, the aesthetic value of the pecan justifies its planting.

POMEGRANATE (Punica granatum L.; Punicaceae). The pomegranate is not grown on a commercial scale in Florida, but it is planted as an ornamental. This small shrubby tree can be used as an accent plant in the home landscape with its long shiny leaves and showy orange flowers. The roundish, yellow red fruit has a leathery skin and seedy pulp but can be eaten fresh or used in decorative

table arrangements at Thanksgiving time. S Ct. Dimensions of 2 m by 1.25 m (6 ft by 4 ft).

RABBITEYE BLUEBERRIES (Vaccinium ashei Reade; Vacciniaceae). This vigorous and tall growing shrub makes an excellent hedge when pruned. The waxy, dark green leaves and bright blue to black fruit are very attractive. When kept small, rabbiteye blueberries can be used as a low hedge around the home and as a border or screen plant when unpruned. The blueberry is not without its problems however. Its requirement for acid soils (pH 4.5-5.2), shallow root system, and sensitivity to fertilizers necessitate extra care but the plants are generally long lived. S Ct, Of S. Restricted to dimensions of 2 m by 1 m (6 ft by 3 ft).

TRAILING BLACKBERRY (Rubus trivialis Michx.; Rosaceae). This type of blackberry requires a trellis to allow easier access to fruit and ease of cultivation but are widely adapted and thrive on virtually all soils. Recommended cultivars include 'Oklawaha' and 'Flordagrand' which should be planted together for cross-pollination. S Ct, R Ct, Of S, L. Dimensions 1.5 by 1.5 m (5 by 5 ft).

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STATISTICAL HYPOTHESIS TESTING: AN ACADEMIC EXERCISE IN FUTILITY

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Additional index words. curve fitting, simultaneous interval estimation, selection and ranking procedures.

Abstract. **Statistical hypothesis testing is futile because with enough replications, the null hypothesis will** always **be rejected. More meaningful alternatives to hypothesis testing will be presented.**

If m_1 and m_2 are the unknown true means of 2 treatments, the null hypothesis (denoted by H_0) is that $(m_1 - m_2) = 0$. If H_0 is rejected, it does not mean the difference is big. It only means that the difference is nonzero, which may be very small. If H_0 is accepted, it does not mean that there is no difference, only that the experiment was not large enough. With enough replications, the t-test for comparing 2 treatment means will *always* be highly significant.

Testing the equality of 2 true treatment means is ridiculous. They will always be different, at least beyond the hundredth decimal place. A more sensible hypothesis to test is that $(m_1 - m_2) = d$, a specified minimum difference of practical importance. In a sufficiently large experiment, rejection (or acceptance) of *this* hypothesis implies that the difference *is* large and important (or small and not important). Unfortunately, this generalized t-test cannot be extended to 3 or more treatments. We now discuss several more meaningful alternatives to testing the hypothesis of equal treatment means.

Curve Fitting

If the treatments are levels of a quantitative variable (e.g., temp, time, concn, etc.), the proper statistical technique (e.g., temp, time, conc, etc.), the proper statistical technique is curve fitting or regression analysis (6). We should examine whether the data may be fitted by a straight line (with zero or nonzero slope), a curve that rises and falls, a curve that rises to a maximum and remains constant thereafter, or a curve that approaches but never quite reaches some maximum value (1).

Simultaneous Interval Estimation

The 95% CL (confidence limits) for $(m_1 - m_2)$ are $(\bar{x}_1 - \bar{x}_2) \pm t(.05,n)\sqrt{2s^2/r}$. If the lower limit L is negative and the upper limit U is positive, the null hypothesis H_0 that $(m_1 - m_2) = 0$ will be accepted; if L and U are both negative or both positive, H_0 will be rejected. Interval estimation of $(m_1 - m_2)$ gives an estimate of the difference, beside the information provided by hypothesis testing. Estimation of L and U is the real purpose of the experiment, and not testing the equality of m_1 and m_2. A wide interval (L,U) does not give precise information about $(m_1 - m_2)$. We can calculate the number of replications r such that the confidence interval will be no wider than some preassigned value.

If we use the previous formula to calculate CL for each pair from 3 (or more) means, the probability is individually 95% that $(m_1 - m_2)$, $(m_1 - m_3)$ and $(m_2 - m_3)$ will lie within their respective CL's, but is less than 95% that all 3 differences will *simultaneously* fall between their CL's. A similar multiple comparisons problem arises in testing 3 or more means (2). Tukey's HSD (honestly significant difference) procedure for multiple comparisons of k means is directly applicable to the construction of simultaneous CL's for $k(k-1)/2$ possible pairs of means. The probability is 95% that for *all* pairs (i, j), the difference $(m_i - m_j)$ will lie within $(\bar{x}_i - \bar{x}_j) \pm$ HSD, where HSD = $q(.05; k, n)s/\sqrt{r}$. Values of q(.05; k, n) and q(.01; k, n) are given in (3).

Using the example from Duncan's classic paper, with $k = 7$ means, $r = 6$ replications, $s = 8.92$ with $n = 30$ degrees of freedom, the HSD = $4.46(8.92)/\sqrt{6} = 16.2$. The sample means were $\bar{x}_1 = 71.3$, $\bar{x}_2 = 71.2$, $\bar{x}_3 = 67.6$, $\bar{x}_4 = 61.5$, $\bar{x}_5 = 61.0$, $\bar{x}_6 = 58.1$ and $\bar{x}_7 = 49.6$. The 95% simultaneous CL's for all $7(6)/2 = 21$ pairs of means are of the following form:

$(m_1 - m_7)$: $(71.3 - 49.6) \pm 16.2 = 21.7 \pm 16.2 = (5.5, 37.9)$
$(m_2 - m_6)$: $(71.2 - 58.1) \pm 16.2 = (-3.1, 29.3)$

Note that L will be negative and U will be positive if 2 sample means differ in absolute magnitude by less than the HSD. Other simultaneous estimation procedures are available (7).

Selection and Ranking Procedures

Instead of comparing the k treatments, the objective in some experiments is to (a) pick the best treatment; (b)