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Pecan Cultivars for North Florida[1]

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Summary

The performance of 26 cultivars of pecan (*Carya illinoensis* [Wangeh.] K. Koch) was evaluated at the UF/IFAS North Florida Research and Education Center (UF/IFAS NFREC) in Monticello for 11 years. Yield (percentage of full crop), resistance to leaf and nut diseases (mainly pecan scab), and resistance to limb breakage were estimated on 2–10 trees of each cultivar. The 10-year average yield was 33% of a full crop across all cultivars; only 'Curtis' and 'Moreland' averaged more than 50% of a full crop. Resistance to leaf diseases varied greatly among cultivars and was highest for 'Moreland', 'Curtis', and 'Elliott'. Based upon yield, nut size, percentage kernel, and resistance to leaf and nut diseases, the recommended cultivars from this trial for North Florida are 'Elliott', 'Excel', and 'Sumner'. 'Cape Fear', 'Curtis', 'Desirable', 'Kiowa', 'Melrose', 'Moreland', and 'Stuart' are conditionally recommended.

New information concerning cultivar performance in Georgia and Alabama has become available over the last 10 years. Some new and rediscovered pecan cultivars have shown good yields, nut quality, and scab resistance, but most have not been adequately tested in Florida. Concomitantly, many older cultivars that were once resistant to pecan scab, such as 'Cape Fear' and 'Stuart', now require an intensive spray program to consistently produce a good crop. In Georgia, the recommended cultivars are 'Elliott' (excellent scab resistance); 'Sumner' (good scab resistance); 'Caddo', 'Forkett', 'Kanza', and 'Oconee' (average scab resistance); and 'Pawnee' and 'Desirable' (poor scab resistance). In Alabama, the recommended cultivars are 'Excel', 'Gafford', 'Headquarters', and 'Lakota' (excellent scab resistance); 'McMillan' and 'Baby B' (good scab resistance); and 'Apalachee', 'Caddo', and 'Giftpack' (average scab resistance). Many other cultivars are conditionally recommended in Georgia and Alabama.



Figure 1. Immature pecan nut.
Credit: Peter Andersen, UF/IFAS

Introduction

The southeastern United States (particularly Georgia) is the major pecan-producing region in the United States and in the world. High humidity and high summer rainfall have limited the range of acceptable cultivars for the southeastern United States because of the difficulty in controlling pecan scab (*Cladosporium caryigenum* Ell. et Lang.). The introduction of new high-yielding, scab-susceptible cultivars, such as 'Wichita' or 'Western Schley', has given the southwestern United States a competitive advantage over the southeastern United States. Recently, a pecan breeding program has been developed in Georgia, and new scab-resistant cultivars are being tested. Impediments to the culture of pecans in the southeastern United States include lack of new high-yielding cultivars that are scab resistant; lack of tree size control and suitable dwarfing rootstocks; lack of consistent yield because of alternate bearing; and competition from other nut crops (walnuts, almonds, pistachios) that have been more successfully marketed (Andersen 1996). Recently, there has been a resurgence of interest in growing pecans as a result of increased demand from China and other Asian countries.

In the southeastern pecan belt, disease susceptibility has become the paramount concern. Pecan scab is the disease of major importance, and it infects both leaves and nuts. Other diseases of economic importance include downy

spot, powdery mildew, zonate leaf spot, pecan vein spot, and pecan anthracnose. Insect pests include aphids, pecan weevils, nut case bearers, hickory shuckworms, walnut caterpillar, and fall webworm (Harris, 2014). Aphids have been a major insect pest of pecan; however, recently (since 1993) imported species of ladybug and other natural enemies have provided some control of aphid populations, although chemical control of black pecan aphids has often been required.

Pecan breeding and pecan cultivar testing is a long-term investment. Pecan trees are not precocious, and it requires at least 5–10 years after a cross is made until the resultant hybrid can be evaluated (Madden 1968). In addition, the resistance of a given pecan cultivar to insects and diseases varies and generally declines over time. These facts underscore the need for long-term evaluation of pecan cultivars at various locations throughout the United States. The major criteria in southeastern United States for the pecan breeding program are consistent high yields, early harvest date for gift pack sales, large nut size, high percentage kernel, light-colored kernels high in oil, and resistance to scab and other leaf diseases.

Materials and Methods

At the UF/IFAS NFREC—Monticello, 26 pecan cultivars were evaluated from 1989 to 1999. Trees generally received fungicides (Super Tin®, Orbit®, Tilt®, etc.) once a month or once every 2 months from April through August to help control leaf and nut diseases. Insecticides were generally not applied to most blocks in any year. Supplemental irrigation was generally not provided. Data were collected on 2–10 trees of each cultivar. The trees were at least 12 years old in 1989.

Yields were estimated as the percentage of maximum yields obtainable for a given tree size. The resistance to pecan scab and other diseases on leaves, pecan scab on nuts, and limb breakage was estimated on a scale of 0–10 with 10 being the highest resistance. Nut weight, percentage kernel (kernel weight/total nut weight), and percentage pops (nuts that were not filled) were evaluated on 100 nuts from each tree in 1989.

A data set was also utilized from the University of Georgia and Auburn University. These data largely consisted of cultivars that had not been adequately tested in Florida. Indeed, many of them had not been adequately tested in their respective states. Twenty-five of the most promising cultivars were established at the UF/IFAS NFREC—Quincy in 2011, and they are under evaluation.

Results and Discussion

A pattern of alternate bearing occurred for pecan trees at the NFREC—Monticello (Table 1). On average, at least 50% of a crop was produced in 1989, 1991, 1993, 1996, and 1999, whereas a maximum of only 16% of a full crop was produced in 1990, 1992, 1994, and 1995. Yields during 1997 and 1998 varied greatly with cultivar. Synchronous alternate bearing is believed to be the result of environmental and physiological conditions. For this 11-year period, an average of about 33% of a full crop was produced (i.e., a full crop would equate to about 1500–2000 pounds per acre). Thus, average yield for all cultivars combined was 600 pounds per acre over this 11-year period; however, marketable yield was less than this because of losses caused by nut diseases and insufficient kernel filling.

Only a small percentage of pecan cultivars are adapted to North Florida. Yield, nut quality, disease resistance, and a tendency to resist limb breakage are important criteria by which to determine the suitability of pecan cultivars to a given location. Only 'Curtis' and 'Moreland' produced an average of at least 50% of a full crop over the 11-year period. 'Cape Fear', 'Chickasaw', 'Curtis', 'GraBohls', 'GraZona', 'Kiowa', 'Melrose', 'Moreland', and 'Owens' produced at least 40% of a crop. The best overall yield was produced in 1993; however, because of oversupply, the price offered to the grower was unsatisfactory. Virtually all cultivars displayed a tendency to bear heavy and light crops in alternate years; 'Owens' was the cultivar with the least alternate bearing tendency, but 'Owens' still had a tendency to produce unfilled nuts. During 1994, a year of extremely heavy rainfall, only 'Elliott' produced a good crop (i.e., 75%). The following year, only 'Curtis' produced at least 50% of a crop, whereas in 1996 most pecan cultivars produced at least 50% of a crop.

Many pecan cultivars are not recommended for North Florida because of limitations, such as a low percentage kernel or poor resistance to scab and other leaf diseases. Nut weight varied from about 45–90 nuts per pound (5.0–10.9 g), respectively (Table 2). Percentage kernel, which is a good indicator of nut quality, was at least 50% for all cultivars except 'Griffin' and 'Stuart'. Percentage kernel calculations did not include unfilled nuts (pops). Percentage pops in 1989 was very high (> 30%) for 'Desirable', 'GraBohls', 'GraZona', 'Griffin', 'Jackson', 'Moreland', and 'Stuart'.

Poor resistance to leaf diseases (Table 3) contributed to low yields, low percentage kernel, and a high frequency of pops. Leaf diseases include downy spot, powdery mildew, zonate leaf spot, pecan vein spot, and pecan anthracnose. Resistance to leaf and nut diseases varied from year to year mainly as a function of the humidity and precipitation during the growing season. Note that all pecan cultivars with an Indian name ('Cherokee', 'Cheyenne', 'Chickasaw', 'Kiowa', 'Mohawk', 'Tejas', and 'Wichita') had an average leaf disease rating of less than 7. Other cultivars with poor disease resistance include 'Desirable', 'GraBohls', 'GraZona', 'Griffin', 'Mahan', and 'Mahan Stuart'. The cultivars with the highest overall yield ('Curtis' and 'Moreland') also had the highest level of resistance to leaf

diseases (Table 3). These data do not support the contention of Wolstenholme and Malstrom (1980) when evaluating a United States pecan breeding program that breeding for scab resistance should be rated as a lower priority than yield potential.

A fungicide spray program is generally required for successful pecan production in the southeastern United States. Only pecan cultivars with a disease resistance rating of higher than 7 should be considered for North Florida. 'Cheyenne', 'Mahan Stuart', 'Tejas', and 'Wichita' had the lowest level of resistance. Indian-named cultivars and the "Gra" series of cultivars generally had inadequate disease resistance.

Nut disease resistance also varied greatly among cultivars (Table 4). 'Curtis', 'Elliott', and 'Moreland' had the greatest resistance to scab. Nuts of 'Jackson', 'Kernodle', 'Melrose', and 'Sumner' were also highly disease resistant. Cultivars with a nut disease rating of less than 5 are not likely to produce marketable nuts. For example, only 9 of 26 cultivars were likely to produce marketable nuts during 1999. In general, the Indian-named cultivars had the least resistance to nut diseases. Cultivars such as 'Desirable' often require 15 fungicide applications per year to control scab in southern Georgia (Wells and Conner 2015).

The strength of wood varied greatly among cultivars (Table 5). 'Cape Fear', 'Curtis', 'Elliott', 'GraTex', 'Griffin', 'Jackson', 'Moreland', 'Owens', and 'Tejas' had the highest resistance to limb breakage. However, it must be remembered that limb breakage is both a function of inherent wood strength and crop load. For example, 'Tejas' does not fill nuts in North Florida even with a good fungicide program. Thus, 'Tejas' wood does not have to contend with the weight of a heavy crop of nuts, and its wood strength is no better than most of the other cultivars.

Table 6 was compiled based upon data, observations, and discussions with research and Extension personnel and growers. Six major parameters were chosen as important variables: pollination type (Type I protandrous = pollen shedding occurs prior to stigma receptivity; Type II protogynous = stigma receptivity occurs prior to pollen shedding); yield; nut size; percentage kernel; resistance to scab and other leaf diseases (downy spot, zonate leaf spot, brown spot, leaf spot, liver spot, powdery mildew, etc.); and precocity (the length of time required before a crop can be produced = length of juvenility). Numerical yield and nut size ratings vary from 1 (lowest) to 4 (highest). Tree size was taken into account in establishing yield ratings. Percentage kernel and nut size were determined. Resistance to scab and resistance to leaf disease are rated from poor to excellent, and precocity is indicated in years.

'Moreland' and 'Sumner' are cultivars recommended for North Florida because of above-average yield, nut size, and disease resistance. Although nut size of 'Elliott' is small, it is recommended because of excellent disease resistance. 'Curtis' is conditionally recommended because it has produced consistently high yields and is disease resistant; however, nut size is small and kernels are speckled in appearance. 'Desirable' and 'Kiowa' are conditionally recommended because they produce high-quality nuts, but they require an intensive disease control program. 'Stuart' is conditionally recommended because of poor precocity and low percentage kernel, but older trees are worthy of retention. 'Melrose' offers some potential (moderate to high yield, disease resistant), but more information is needed. None of the remaining cultivars released from the USDA Breeding Program in Brownwood, Texas (denoted by Indian names), except 'Kiowa' are recommended for North Florida. Cultivars selected in the arid west are all susceptible to scab and other leaf diseases. 'GraBohls', 'GraCross', 'GraTex', and 'GraZona' do not appear in Table 6 and are not recommended.

Sherman et al. (1982) recommended 'Cape Fear', 'Choctaw', 'Curtis', 'Elliott', 'Kiowa', and 'Moreland' for trial in North Central Florida. Crocker (1988) recommended 'Cape Fear', 'Curtis', 'Desirable', 'Elliott', 'Stuart', and 'Sumner' for commercial plantings in Georgia. While 'Cape Fear,' 'Curtis', and 'Elliott' are recommended in the present study and in the two previous studies, 'Moreland' has not been adequately tested throughout the southeastern United States; however, under Florida conditions (i.e., high humidity and high disease pressures), it has performed well. However, in a new pecan orchard at the UF/IFAS NFREC—Quincy the scab resistance of 'Moreland' and 'Curtis' has been rated average.

The pattern of stigma receptivity and pollen shedding when selecting a pecan cultivar is important (Table 6). For pollination to occur, pollen must be shed at a time when the stigmas are receptive. Since there is often little overlap in stigma receptivity and pollen shedding within a given cultivar, cultivars with complementary pollination characteristics should be planted together. Protandrous (pollination Type I) cultivars produce viable pollen before their stigmas are receptive. Protogynous (pollination Type II) cultivars produce receptive stigmas before their pollen is viable. The degree of overlap of viable pollen and receptive stigmas is cultivar and, to a lesser extent, region dependent.

Cultivars for North Florida

Recommended Cultivars

'Elliott': The wood of 'Elliott' trees is strong. It is protogynous but not precocious. It is a moderate producer. Nut size is small, typically 5.5 g (82 nuts per pound) with a 54% kernel. Kernel color is bright, and quality and flavor are excellent. Resistance to scab and leaf diseases is good.



Figure 2. A morphological depiction of the Elliott pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Excel': 'Excel' is the best relatively new cultivar tested at the UF/IFAS NFREC—Quincy. The nut size is large with a thick shell. Kernel filling is large and is golden in color. Resistance to pecan scab is excellent. It is protogynous. It ripens early- to mid-season. It has performed well at the UF/IFAS NFREC—Quincy, but limited information exists for older trees.

'Sumner': 'Sumner' is a largely overlooked pecan cultivar. It is a moderately strong tree and is moderately precocious. Nuts are large (9.5 g, 48 nuts per pound), and percentage kernel is about 54%. Overall nut quality is good, although kernels can be somewhat dark. It has a high resistance to scab and other leaf diseases. It is susceptible to black pecan aphids.



Figure 3. A morphological depiction of the Sumner pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

Conditionally Recommended Cultivars

'Cape Fear': 'Cape Fear' trees are protandrous and precocious. It has been a high producer at the UF/IFAS NFREC—Monticello. Nut weight is typically 7.5–8.2 g (58 nuts per pound) with a 55% kernel. Kernel color is bright and quality is excellent. Resistance to scab has declined from good to average, and resistance to other leaf diseases is fair. It is susceptible to bacterial leaf scorch.

'Curtis': 'Curtis' is a strong tree. It is protogynous but not precocious. It has been one of the most consistent producers in North Florida, although nut size is small (5.0 g, 90 nuts per pound). Percentage kernel is about 53%, and kernels are somewhat dark in color with dark brown speckles. Flavor is good. It is somewhat resistant to scab and other leaf diseases; however, because of small nut size, a dark kernel, and late maturity, it is not highly recommended.



Figure 4. A morphological depiction of the Curtis pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Desirable': 'Desirable' trees have been planted extensively in the Southeast, often as a pollenizer to 'Stuart'. 'Desirable' wood is weak. It is protandrous and is moderately precocious. Nut size is typically large (9.5 g, 48 nuts per pound) with a 53% kernel. Kernel color is light and quality is good. Consumer acceptance is very high. However, resistance to scab and leaf diseases is poor. A strict spray schedule and good weather are prerequisites for successful culture in Florida. 'Desirable' has not performed as well in Florida compared to Georgia.



Figure 5. A morphological depiction of the Desirable pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Kiowa': 'Kiowa' trees are slow growing and the wood is brittle, like many of the cultivars with Indian names. It is protogynous and precocious. Yields have not been high. The nut is slightly larger (10 g, 45 nuts per pound) and kernels are darker than 'Desirable'. Percentage kernel is about 55% and quality is good. Susceptibility to scab and other leaf diseases is average and a fungicide spray program is required. A strict spray schedule and good weather are prerequisites for successful culture in Florida.

'Melrose': 'Melrose' has been a consistent producer of high yields. It is protogynous but not precocious. The nut is medium in size (7.5 g, 60 nuts per pound) and is somewhat pointed. Kernel color is medium dark. It has good resistance to scab and other leaf diseases. It is only recommended on a trial basis in North Florida since little data are currently available.



Figure 6. A morphological depiction of the Melrose pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Moreland': 'Moreland' is a strong tree that has produced consistently high yields in North Florida. It is protogynous and moderately precocious. Nut size is about 8.2 g (55 nuts per pound). The nut is similar to 'Schley' in appearance. Percentage kernel is 55%. Color is somewhat bright and quality is high. Its tolerance to scab and other leaf diseases appears to be declining.

'Stuart': 'Stuart' is the best-known pecan cultivar. Trees are moderately strong and do not require as much training or pruning as other cultivars. It is protogynous but not precocious. Nuts are large (8.7 g, 52 nuts per pound) and attractive. Percentage kernel, however, is usually low (often 45%). Kernel color is average, and quality is poor to average. It was formerly regarded as tolerant to scab and other leaf diseases but is now rated as average in both categories. 'Stuart' retains a high status among pecan cultivars, largely because of tradition. Because of the long period of time before it bears nuts (10–12 years), it is not recommended for new plantings; however, if it occurs in existing mature orchards, it is a tree worthy of retention.



Figure 7. A morphological depiction of the Stuart pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

Recommended Cultivars for Georgia and Alabama (Table 7)

For more information, see *Review of Scab-Resistant Cultivars/Pecan Breeding at CAES/UGA* (2010), Wells and Conner (2015), and Goff (2009). The cultivars below may be suitable for Florida as well, unless otherwise noted.

'Adams 5': A single scab lesion has not been observed on 'Adams 5' (Goff 2009). Fungicide sprays need not be applied. In Alabama, it is recommended for homeowners but not for commercial growers because of marginal nut size. Nut quality is good. More data are needed.

'Amling': 'Amling' is recommended for Georgia and Alabama for homeowners or low-input pecan production, but not for commercial growers. Scab resistance is excellent and kernel quality is good. Harvest season is early. Its main limitation is that it may not produce sufficiently high yields for commercial production. 'Amling' is currently under evaluation at the UF/IFAS NFREC—Quincy.

'Apalachee': 'Apalachee' has produced consistently high yields of good-quality nuts in several southeastern states. Harvest season is early. Major limitations include small nut size, moderate scab resistance, and a tendency to exhibit moderate alternate bearing. It is probably not one of the better cultivars in North Florida. 'Apalachee' is recommended for Alabama.

'Baby B': 'Baby B' has redeeming features of early harvest, consistently high yields, and good insect and disease resistance. It is recommended for Alabama. Nut size is average and resembles a large 'Elliott'. More data are needed.

'Byrd': 'Byrd' is conditionally recommended for Georgia and Alabama. It produces high yields of large nuts with a very high percentage kernel. Crop thinning is often required to obtain consistently high nut quality. Harvest season is very early. It has average resistance to scab and other leaf diseases, and a full-season fungicide spray program is required.

'Caddo': 'Caddo' is recommended for Georgia and Alabama. It produces consistently high yields of average-sized, high-quality nuts. Harvest season is early. It is susceptible to fungal leaf scorch and black pecan aphids. 'Caddo' is currently under evaluation at the UF/IFAS NFREC—Quincy.



Figure 8. A morphological depiction of the Caddo pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Cape Fear': This cultivar has performed particularly well as a young tree producing a high yield of well-filled nuts. It is conditionally recommended for Georgia in certain situations. However, in many cases, nut quality has declined for mature trees and alternate bearing has occurred. It is also very susceptible to bacterial leaf scorch caused by *Xylella fastidiosa*. Resistance to pecan scab, although once considered good, is now probably average in most locations. 'Cape Fear' is under evaluation at the UF/IFAS NFREC—Quincy.



Figure 9. A morphological depiction of the Cape Fear pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Creek': 'Creek' is conditionally recommended for Georgia and Alabama. It produces high yields of large nuts, but nut quality and percentage kernel is, at best, average. Crops of 'Creek' may require thinning during the "on" year of alternate bearing. Irrigation, fertilization, and a good spray program for insects and diseases are required. 'Creek' is under evaluation at the UF/IFAS NFREC—Quincy.

'Desirable': This cultivar is still highly regarded despite poor resistance to pecan scab and other leaf diseases. It is recommended for Georgia and conditionally recommended in Alabama. It produces high yields of large nuts with a bright kernel. A rigorous fungicide spray program is required. It is not recommended for homeowners. It is has been very susceptible to scab at the UF/IFAS NFREC—Quincy.

'Elliott': 'Elliott' is recommended for Georgia and conditionally recommended for Alabama. It has been the standard for resistance to scab and other leaf diseases for decades. It produces good yields of high-quality nuts, although nut size is small. Alternate bearing can be a problem. 'Elliott' is under evaluation and appears that it may be losing some of its resistance to pecan scab.

'Excel': 'Excel' is recommended for Alabama and conditionally recommended for Georgia. It has the advantages of early- to mid-harvest season, large nut size, and excellent scab resistance. Kernels are bright and percentage kernel is very high. Yields of young trees are high, although alternate bearing may be a problem for older trees. 'Excel' has performed very well at the UF/IFAS NFREC—Quincy.

'Forkert': 'Forkert' is recommended for Georgia and conditionally recommended for Alabama. It produces a long nut with a thin shell. Percentage kernel is high. Disadvantages include dark kernel color, retention of packing material in the sutures, and poor to average scab resistance. It requires a good pecan scab control program. 'Forkert' is under evaluation at the UF/IFAS NFREC—Quincy.



Figure 10. A morphological depiction of the Forkert pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Gafford': 'Gafford' is recommended for Alabama because of its excellent resistance to pecan scab and foliage pests. It produces a medium-sized nut with a bright kernel. Limitations include alternate bearing and a tendency to require crop thinning. More data are warranted.

'Giftpack': 'Giftpack' is recommended for Alabama because of high nut quality and an early harvest date. Yields are consistently high. Nut size is medium, percentage kernel is high, and kernel color is bright. It is only moderately resistant to pecan scab. As the name reflects, it should sell in the early season gift pack market. More data are required.

'Headquarters': 'Headquarters' is thought to be a seedling of 'Elliott' with excellent resistance to pecan scab. It is recommended for Alabama. 'Headquarters' nuts resemble 'Elliott' but are considerably larger. Kernel quality may not be as good as 'Elliott'. Yields are consistently high in Alabama with no pesticide sprays. More data are warranted.

'Kanza': 'Kanza' is adapted to northern Alabama and Georgia and would likely not be a good cultivar for Florida. It has excellent scab resistance and cold hardiness. Nut size and kernel quality are average.

'Kiowa': 'Kiowa' is conditionally recommended for Georgia but not for Alabama. Nut size resembles that of 'Desirable', although 'Kiowa' nuts are a little darker. Percentage kernel is higher for 'Kiowa' than 'Desirable'. Similarly, resistance to pecan scab is probably higher for 'Kiowa' than 'Desirable'. 'Kiowa' is a precocious cultivar and as such is subject to alternate bearing. 'Kiowa' has been very susceptible to pecan scab at the UF/IFAS NFREC—Quincy.



Figure 11. A morphological depiction of the Kiowa pecan nut.
Credit: Muhammad A. Shahid, UF/IFAS

'Lakota': 'Lakota' is recommended for Alabama and conditionally recommended for Georgia because of early harvest, good nut quality, and excellent resistance to pecan scab. Nut size is average and, in some years, crop thinning may be required. The performance of old trees is not known. Thus far, 'Lakota' has performed well at the UF/IFAS NFREC—Quincy.

'Mandan': 'Mandan' is conditionally recommended for Georgia and Alabama. It has an early harvest about a week after 'Pawnee'. 'Mandan' produces a medium-large nut with a high percentage kernel. There is some controversy concerning kernel quality. Resistance to scab may be average to good, but this cultivar has not been adequately tested. More data are needed.

'McMillan': 'McMillan' is conditionally recommended for Georgia and recommended for Alabama. It produces high consistent yields. Nut size is moderately large, but kernel color is not bright. It has good resistance to pecan scab. More data are required.

'Oconee': 'Oconee' is recommended for Georgia but not for Alabama. Scab resistance is only mediocre. It is also very susceptible to black aphids. Attributes include early harvest date, large nut size, and attractive kernels with a high percentage kernel. 'Oconee' has been very susceptible to scab at the UF/IFAS NFREC—Quincy.

'Pawnee': 'Pawnee' is recommended for Georgia. It is not recommended for Alabama because of poor resistance to pecan scab. Harvest date is extremely early and trees must be shaken and harvested to limit animal depredation. It produces a large nut with a high percentage kernel. Kernels with dark veins and/or dark spots have been reported. 'Pawnee' has been somewhat susceptible to scab at the UF/IFAS NFREC—Quincy.

'Sumner': 'Sumner' is one of the few cultivars recommended for both Georgia and Alabama. It produces a large nut with good kernel quality. Yields are consistently high and resistance to pecan scab is good. Disadvantages of 'Sumner' are a late harvest date and black aphid susceptibility. 'Sumner' is under evaluation at the UF/IFAS NFREC—Quincy.

'Surprize': 'Surprize' is recommended for trial only in southern Alabama. It produces a large nut with average percentage kernel. It is recommended, in part, because it has sustained minimal hurricane damage. Kernel filling is questionable and harvest season is late. More data are required.

'Syrup Mill': 'Syrup Mill' is conditionally recommended for Alabama. It produces an average-sized nut with a low percentage kernel. Yields are reported to be high and scab resistance is average to good. More data are required.

'Zinner': 'Zinner' is recommended for trial for Georgia. It produces a medium-large nut with excellent color. Yield on young trees has been good, and resistance to scab has been very good. More data are needed.

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Table 1. Yield estimates (percentage of full crop) for cultivars at the UF/IFAS NFREC–Monticello (1989–1999).

Cultivar	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Average
'Cape Fear'	67	0	79	13	84	5	2	94	12	48	72	43
'Cherokee'	25	0	90	3	55	0	0	68	0	0	30	25
'Cheyenne'	-	0	33	70	45	5	10	0	0	0	13	19
'Chickasaw'	67	0	73	17	83	0	0	80	0	0	35	33
'Curtis'	80	0	70	22	80	0	60	90	48	30	78	52
'Desirable'	39	0	57	22	68	0	2	48	31	23	30	29
'Elliott'	30	0	63	8	45	75	0	43	25	23	85	36
'GraBohls'	88	0	85	0	90	0	0	47	95	40	88	48
'GraCross'	77	0	60	20	73	23	0	63	63	13	70	42
'GraTex	43	0	34	0	59	33	0	52	30	10	68	30
'GraZona'	80	0	80	17	97	0	3	93	50	80	10	46
'GraKing'	70	0	53	0	63	13	20	80	68	10	58	40
'Griffin'	35	0	38	0	33	30	23	8	58	0	50	25
'Jackson'	25	0	15	14	40	10	8	42	37	12	46	22
'Kernodle'	53	0	63	0	70	7	23	27	57	3	50	32
'Kiowa'	48	0	68	5	83	33	13	65	25	8	35	38
'Mahan'	-	0	0	0	95	0	0	45	0	0	20	16
'Mahan Stuart'	-	0	23	18	48	15	0	0	0	0	28	14
'Melrose'	63	0	97	0	80	17	13	63	53	37	90	46
'Mohawk'	-	0	43	15	58	16	6	28	14	0	18	18
'Moreland'	85	0	85	45	80	0	20	95	65	15	70	52
'Owens'	53	0	63	70	57	43	0	70	37	60	60	47
'Stuart'	36	0	46	20	35	7	13	75	60	12	40	32
'Sumner'	33	0	63	22	79	5	0	71	32	51	60	39
'Tejas'	30	0	50	3	20	0	0	0	0	0	35	14
'Wichita'	40	0	54	30	70	2	2	30	20	12	43	28
Average	51	0	56	16	63	15	11	52	33	19	50	33

Table 2. Cultivar performance at the UF/IFAS NFREC–Monticello (1989).

Cultivar	Nuts/lb	% kernel	% pops
'Cape Fear'	63	57	20
'Cherokee'	96	58	25
'Cheyenne'	-	-	-
'Chickasaw'	77	58	0
'Curtis'	97	53	18
'Desirable'	66	53	45
'Elliott'	83	53	9
'GraBohls'	72	54	72

Cultivar	Nuts/lb	% kernel	% pops
'GraCross'	53	54	5
'GraTex'	57	57	25
'GraZona'	52	50	45
'GraKing'	46	65	20
'Griffin'	74	46	39
'Jackson'	42	57	45
'Kernodle'	45	51	13
'Kiowa'	66	50	21
'Mahan'	-	-	-
'Mahan Stuart'	-	-	-
'Melrose'	54	63	30
'Mohawk'	-	-	-
'Moreland'	61	56	40
'Owens'	52	51	17
'Stuart'	66	44	54
'Sumner'	49	52	21
'Tejas'	142	61	18
'Wichita'	95	53	18

Table 3. Resistance of pecan cultivars to leaf diseases at the UF/IFAS NFREC–Monticello (1989–1999).

Cultivar	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Average
'Cape Fear'	3.3	5.1	8	9	9.8	6	7.6	9.4	8.8	8.6	8.8	7.6
'Cherokee'	4	4.8	6.3	6.3	9	1.3	6.8	6.8	3.2	1.8	6.5	5.2
'Cheyenne'	-	3.3	6	5.3	7	1	4	5.5	2	0	4.8	4
'Chickasaw'	3.3	2	8.7	7.3	9.7	5	7.7	8	5.7	3	8	6.7
'Curtis'	5.3	7.8	9.3	8	10	8.3	8.8	9	8.3	8.8	9.3	8.4
'Desirable'	3.7	4.6	5.8	7.5	9.3	3.1	5.3	7.4	7.6	5.6	7	6.2
'Elliott'	2	3.8	9.3	7	10	8.8	8	9	7.8	9.5	9.3	7.8
'GraBohls'	6	6.5	3.5	5.5	7.5	1.3	5.3	7.5	8.5	8	6.8	6
'GraCross'	4.7	7.7	8.3	7.3	9	6.7	8	8.7	8.7	7.7	8	7.7
'GraTex'	4.7	6.3	5.6	5	9	6.7	6.4	6.8	7.4	7.2	8	6.6
'GraZona'	2	5.7	5.3	4.3	7.7	2.7	7	7	6	8	7.3	5.9
'GraKing'	4.8	5.3	7.3	3.8	8	6.3	7.5	7.5	8	6.5	8.8	6.7
'Griffin'	2.5	2.5	3.8	6.5	8.8	7.8	7.5	7.8	7.8	8	7.3	6.4
'Jackson'	6.5	7	7.5	6	9.4	8.7	7.4	7.4	7.3	7.8	8	7.6
'Kernodle'	4	6	8.7	6.8	9	5	5.7	6.7	6.7	7	7.3	6.7
'Kiowa'	3.5	5.3	5.5	6.5	9.7	6.3	7	5.8	6.3	8.5	6.8	6.4
'Mahan'	-	6	4	6.5	9.5	4.5	7	6.5	8	6	8	6.7
'Mahan Stuart'	1.8	1.8	7	6.5	7.3	1	5	6.3	2.3	4	6.8	4.5

Cultivar	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Average
'Melrose'	5	7.3	8.3	5.3	8.3	7.7	8.3	7.3	6	7.7	9	7.2
'Mohawk'	-	3	6	7.3	9	5.4	6	5.8	2.6	2.2	7	5.6
'Moreland'	6.5	7	9.5	8	10	8.5	9	8.5	7.5	9	8	8.4
'Owens'	5.3	5.3	7.7	8	8.7	5.7	8.3	9.5	8.7	8.5	8	7.6
'Stuart'	3.6	5.3	7.3	6.8	8.8	5.1	6.5	7.5	8.2	5.2	7	6.5
'Sumner'	5.4	7	8.7	6.8	10	6.5	9.6	7.7	8.6	9.1	8.3	7.9
'Tejas'	1.3	4.3	4.3	4.7	8	1	5	6.3	2.7	0	6.5	3.9
'Wichita'	2.4	5	3.8	4.3	8.8	2.7	4.8	6	5	4.2	6.7	4.9
Average	4.4	5.4	7.1	6.5	8.9	5.4	6.9	7.3	6.8	6.2	7.6	6.7

Note: On a scale of 0–10, where 0 = *low* and 10 = *high.*

Table 4. Resistance of pecan cultivars to nut diseases at the UF/IFAS NFREC–Monticello (1991–1999).

Cultivar	1991	1992	1993	1994	1995	1996	1997	1998	1999	Average
'Cape Fear'	6.6	9	9.8	2.5	9	9	7	4.2	6	7.1
'Cherokee'	2	4	4.5	-	-	3.5	-	-	1	3
'Cheyenne'	4	5.7	7	1	2	-	-	-	1	3.5
'Chickasaw'	7	7	9.3	-	4	-	-	-	1.5	5.8
'Curtis'	9.5	7.8	10	-	8.3	9.5	5.3	9	8	8.5
'Desirable'	3.5	5.8	8.8	-	4	6.6	5.4	7.7	3.6	5.7
'Elliott'	9.3	8	10	9.5	-	9	8	9	9.5	9.1
'GraBohls'	3.5	-	6.3	-	-	7.3	6	6	3.3	5.7
'GraCross'	5.3	7.5	9	2.7	-	9	8.3	6	4.3	6.5
'GraTex'	5.6	-	9.4	7.6	-	7.8	6.3	7.5	7	7.2
'GraZona'	2.3	2.5	7.3	-	2	5.7	4.7	4.7	2	4.5
'GraKing'	7	-	7.3	3	7.5	9	8.5	6	6	6.8
'Griffin'	5.5	-	9	2.8	7.3	8.5	7.3	8	3.8	6.5
'Jackson'	8.5	6.4	9.8	6.7	5.3	8.3	8.3	-	7.8	7.6
'Kernodle'	6.3	-	9.7	7	4	7.7	6.3	6	3.3	6.3
'Kiowa'	3.5	4	9.7	1	4.3	2.3	2	5.5	1.5	3.8
'Mahan'	-	-	7.5	-	-	3.5	-	-	-	5.5
'Mahan Stuart'	5.5	6	8.3	1	-	-	-	-	4.7	5.1
'Melrose'	7	-	9.3	8	6.7	8	5	8	7.3	7.5
'Mohawk'	3.8	6	8.2	2	2	7	5	4	4.5	4.8
'Moreland'	9.5	8	10	-	7.5	8	8	9	8	8.5
'Owens'	7.3	8	8.3	4.7	3	8.5	7.7	7.5	3	6.5
'Stuart'	4.4	5.8	9.7	1.6	5	5.7	5	4	2	4.7
'Sumner'	4.4	5.8	9.7	1.6	-	8.7	5.7	8.3	7	6.4
'Tejas'	1.7	2	9	-	-	-	-	-	0	3.2
'Wichita'	2.2	0.7	6.2	1	3	-	2.3	5.3	0	2.6

Cultivar	1991	1992	1993	1994	1995	1996	1997	1998	1999	Average
Average	5.4	5	8.4	3.6	5.1	7.3	6.1	6.3	4.2	5.7

Note: On a scale of 0–10, where 0 = *low* and 10 = *high.*

Table 5. Resistance of pecan cultivars to limb breakage at the NFREC–Monticello (1993–1999).

Cultivar	1993	1994	1995	1996	1997	1998	1999	Average
'Cape Fear'	9.4	10	8.2	9.8	9.2	9.5	8.2	9.2
'Cherokee'	8	7.3	5.8	7.3	7.5	6.5	6	6.9
'Cheyenne'	9.8	10	4.3	9.8	8.3	9	7.5	8.4
'Chickasaw'	6.7	3.3	4.5	6.3	8.3	7.3	6	6
'Curtis'	9.5	8.3	8.8	9.5	7.3	9	8.3	8.6
'Desirable'	7.8	5.9	6.2	8.6	8.3	8	7.5	7.3
'Elliott'	10	9.5	9	9.3	9.8	9.3	8	9.2
'GraBohls'	7.5	7.8	5.5	8.5	9	8	7.8	7.8
'GraCross'	9.7	8.7	7.3	8.3	9	9	8.7	8.7
'GraTex'	9.9	9	7.7	9.3	9.3	9.2	7	8.8
'GraZona'	8	7.3	8	8.3	8.7	9	8.8	8.4
'GraKing'	9.3	8	6.8	8.3	7.8	7.5	7.8	7.9
'Griffin'	10	9	7.3	9.5	9.8	9.3	9.5	9.3
'Jackson'	9.6	9.3	7.8	9	9.3	8.4	9	8.6
'Kernodle'	8.7	7	8	10	7.7	9.7	9.3	8.6
'Kiowa'	6.3	8.8	6.8	8.8	9.3	8.8	8.3	8.3
'Mahan'	9.5	7.5	7.5	8	8.5	9	7	8.2
'Mahan Stuart'	9.3	6	8	9.3	8	9	7.8	8.2
'Melrose'	7.7	9.3	8	6	8.7	9.3	8.7	8.2
'Mohawk'	9.8	6.8	7.6	8.6	8.6	9	6.3	7.8
'Moreland'	9	9.5	10	9	8.5	8.5	8.5	9
'Owens'	10	9	8.3	9.5	8.7	9	9	9.1
'Stuart'	9.7	7.8	8.2	9.8	9.8	10	9	9.3
'Sumner'	9.7	7	9.6	9.1	8.9	9.3	8.6	8.8
'Tejas'	10	9.3	7.3	9	9	9	8.3	8.8
'Wichita'	7.7	6.8	5.2	9	8.7	8.8	8.5	7.9
Average	9	8.1	7.8	8.8	9	8.4	7.8	8.4

Note: On a scale of 0–10, where 0 = *extreme breakage* and 10 = *no breakage.*

Table 6. Pollination type, yield, nut weight, % kernel, resistance to scab and leaf diseases, precocity, and recommendation status of 36 pecan cultivars.

Cultivar	Pollination type[w]	Yield[x]	Nuts/lb	% kernel	Resistance to scab	Resistance to leaf diseases	Precocity[y]	Recommendation status[z]
'Barton'	II	4	57	54	Good	Good	6–8	NR
'Caddo'	I	3+	70	55	Average+	Average	6–8	NR
'Candy'	II	3	68	45	Good	Good	4–6	NR
'Cape Fear'	I	3+	54	54	Average	Average	4–6	CR
'Cheyenne'	I	3	53	55	Average-	Average	3–5	NR
'Chickasaw'	II	3	66	54	Poor	Average	3–5	NR
'Cherokee'	I	3	67	57	Poor	Average	4–6	NR
'Choctaw'	II	3	47	56	Average	Average	8–10	NR
'Curtis'	II	3-	85	54	Average+	Good	10–12	CR
'Davis'	I	3	53	49	Good	Good	8–10	NR
'Delmas'	II	3+	49	46	Poor	Average	8–10	NR
'Desirable'	I	3	47	52	Poor	Poor	10–12	CR
'Elliott'	II	3	74	53	Excellent	Good-	10–12	R
'Farley'	II	2	60	53	Good	Average	10–12	NR
'Forkert'	II	3	47	62	Average-	Average	10–12	NR
'Gloria Grande'	II	3-	44	48	Good	Good	8–10	NR
'Griffin'	?	2	66	47	Poor	Poor	8–10	NR
'Harris Super'	II	2	50	53	Poor	Average	8–10	NR
'Jackson'	?	3	50	52	Average+	Average	8–10	NR
'Kernodle'	II	3-	55	53	Average	Average	8–10	NR
'Kiowa'	II	3-	48	58	Average-	Average	6–8	CR
'Melrose'	II	3+	54	55	Good	Average	8–10	CR
'Moneymaker'	II	4	66	47	Average	Average	6–8	NR
'Moore'	I	3+	89	47	Poor	Average	6–8	NR
'Moreland'	II	3+	60	56	Good	Good	8–10	R
'Owens'	I	2+	50	53	Good	Average	8–10	NR
'Schley'	II	3	65	58	Average-	Average	10–12	NR
'Shawnee'	II	3-	57	56	Poor+	Average	8–10	NR
'Pawnee'	I	3	49	57	Average-	Average	6–8	NR
'Shoshoni'	II	3	50	54	Average	Average	4–6	NR
'Stuart'	II	3-	52	47	Average	Average	10–12	CR
'Success'	I	2	51	52	Average	Poor	6–8	NR

Cultivar	Pollination type[w]	Yield[x]	Nuts/lb	% kernel	Resistance to scab	Resistance to leaf diseases	Precocity[y]	Recommendation status[z]
'Sumner'	II	3	48	54	Good	Good	6–8	R
'Tejas'	II	1–4-	67	54	Poor	Poor	3–5	NR
'Van Deman'	II	2	60	42	Average-	Average	10–12	NR
'Wichita'	II	1–4-	47	60	Poor	Poor	6–8	NR

[w] Pollination status: Type I = *protandrous*; Type II = *protogynous.*

[x] Yield rating: 1 = *low*, 2 = *average*, 3 = *good*, and 4 = *excellent*.

[y] Precocity (in years to reach bearing age).

[z] Recommendation status: R = *recommended*, CR = *conditionally recommended*, NR = *not recommended.*

Table 7. Pecan cultivars recommended by the University of Georgia (UGA) and/or Auburn University (AU)[w].

Cultivar	Pollination type[x]	Yield[y]	Nuts/lb	% kernel	Resistance to scab	Harvest date	Recommendation status[z]	
							UGA	AU
'Adams 5'	?	2	81	53	Excellent	7 Oct.	?	CR
'Amling'	I	2	60	53	Excellent	11 Oct.	TR	CR
'Apalachee'	I	4	80	57	Average	7 Oct.	?	R
'Baby B'	II	3	67	50	Good	28 Sept.	?	R
'Byrd'	I	3	46	62	Average	25 Sept.	TR	CR
'Caddo'	I	4	70	54	Average	7 Oct.	R	R
'Cape Fear'	I	3	55	51	Average	19 Oct.	CR	NR
'Creek'	I	3	54	50	Average	8 Oct.	CR	CR
'Desirable'	I	4	47	52	Poor	16 Oct.	R	CR
'Elliott'	II	2+	76	51	Good	12 Oct.	R	CR
'Excel'	II	3	45	49	Excellent	7 Oct.	TR	R
'Forkert'	II	3+	53	57	Average	19 Oct.	R	CR
'Gafford'	I	4	53	50	Excellent	18 Oct.	?	R
'Giftpack'	II	4	61	56	Average	10 Oct.	?	R
'Headquarters'	II	3	53	57	Excellent	17 Oct.	?	R
'Kanza'	II	2	65	52	Excellent	28 Sept.	R	CR
'Kiowa'	II	4	48	58	Average	16 Oct.	CR	NR
'Lakota'	II	4	74	57	Excellent	3 Oct.	TR	R
'Mandan'	I	2	50	57	Average	1 Oct.	TR	CR
'McMillan'	II	4	56	51	Good	22 Oct.	TR	R
'Oconee'	I	?	48	54	Average	12 Oct.	R	NR
'Pawnee'	I	3	49	57	Poor	1 Oct.	R	NR

Cultivar	Pollination type[x]	Yield[y]	Nuts/lb	% kernel	Resistance to scab	Harvest date	Recommendation status[z]	
							UGA	AU
'Stuart'	II	3	55	46	Average	15 Oct.	CR	?
'Sumner'	II	3+	50	52	Good	29 Oct.	R	CR
'Surprize'	I	3+	49	49	Average	1 Nov.	?	CR
'Syrup Mill'	I	4	65	47	Average+	20 Oct.	?	CR
'Zinner'	II	3	48	56	Good+	13 Oct	TR	?

[w] Adapted from Wells and Conner (2012) and Goff (2009).

[x] Pollination status: Type I = *protandrous*; Type II = *protogynous.*

[y] Yield rating: 1 = *low*, 2 = *average*, 3 = *good*, and 4 = *excellent*.

[z] Recommendation status: R = *recommended*, TR = recommended for trial, CR = *conditionally recommended*, NR = *not recommended*.

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