PECAN CULTIVARS FOR LANDSCAPE AND HOME PLANTINGS IN THE SOUTHEASTERN U.S.

by William D. Goff, Ronnie McDaniel[1] and Emmett Carden[2]

Abstract. Several pecan cultivars for home and landscape plantings in the southeastern United States were identified in an evaluation of 23 cultivars and selections growing in southwest Alabama. Cultivars that appear to combine pest tolerance with good production and at least moderate quality, and thus are promising for landscape and home plantings, include Elliott, Sumner, Jackson, Melrose, and Jubilee.

Résumé. Plusieurs cultivars prometteurs de caryers pacaniers pour la plantation autour des maisons et en *aménagements paysagers pour le Sud-est des États-Unis* étaient identifiés au cours d'une évaluation de 23 cultivars et sélections croissant dans le Sud-ouest de l'Alabama. Les cultivars qui semblent combiner une tolérance aux insects et aux maladies avec une bonne production avec le moins de qualités modérés sont, par conséquent, prometteurs pour la plantation en aménagements paysagers et autours des maisons et sont les suivants: Elliott, Sumner, Jackson, Melrose, Jubilee.

Pecan *(Carya illinoensis)* trees are commonly planted in landscape plantings and in small home orchards in the southern United States with the dual goals of aesthetic appeal and production of nuts. Cultivars for such plantings are often selected based on name recognition (Stuart), nut size and thinness of shells (Mahan), early bearing (Shoshoni) or availability of trees due to popularity in commercial orchards (Desirable).

Performance of many cultivars selected is often poor in unsprayed landscape trees. Fungal diseases, particularly pecan scab *(Cladosporium caryigenum),* and other pests often are severely injurious when the cultivars are susceptible and the trees are unsprayed. Cultivars are often selected that produce poor quality pecans on older trees. This inferior quality frequently results when precocious cultivars, which bear nut crops early in the life of the tree, are selected. Early bearing is desirable when trees are young, and the leaf-to-nut ratio is high enough to maintain quality. In older trees, the leaf-to-nut ratio declines, and the precocious cultivars tend to overbear, alternately bear, and produce poor quality nuts (13). Also, cultivars are selected which are poorly adapted to an area, resulting in poor performance of a cultivar which may do well elsewhere (19).

Much can be done to improve performance of pecan trees in landscape plantings by careful selection of cultivars. The purpose of this paper is to report initial results of a pecan cultivar trial in southwest Alabama, to review applicable information on pecan cultivars for home plantings from other locations in the Southeast, and to offer suggestions on cultivars that show promise in the southeastern United States.

Materials and Methods

A pecan cultivar trial was planted in February, 1983, at the Alabama Agricultural Experiment Station's Gulf Coast Substation near Fairhope in southwest Alabama. The Station is near the Gulf of Mexico and Mobile Bay in a warm, humid climate, averaging over 60 inches of rainfall annually and a growing season of 270 days.

The cultural management of the planting has been in accordance with standard commercial pecan recommendations, including spraying (4, 8). Since trees were sprayed, this initial report will indicate primarily the early yields, nut quality, budbreak and harvest dates of the cultivars, but will not evaluate pest tolerance, except as it may be reflected indirectly in yield and quality. Pest tolerance will be reviewed in the discussion and will be evaluated on these trees in a later report. General management included leaf and soil sampling annually in July, fertilizing in early-mid March according to recommendations based on sample results, pruning and training, and spraying with fungicides (3 sprays at 2-week intervals beginning at budbreak, followed by 4-7 additional sprays

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(depending on disease pressure) at 3 week intervals. Insect and mites were monitored according to Extension guidelines (8) and sprays applied as needed. Trees were irrigated as needed with drip irrigation. A weed-free strip in the tree row was maintained with herbicides, and grass in middles was kept closely mowed. Tree spacing was 40 ft. X 40 ft. (27 trees per acre). The planting was divided into two sections. The "main block" was in a randomized complete block design, with four 5-tree replications per cultivar. Fourteen cultivars (20 trees per cultivar) were being evaluated in the main test. In addition to the main block, an "observation block" had 9 additional cultivars planted in a completely randomized design with 3 single-tree replications per cultivar.

Information collected annually since the trees began bearing has been yield of nuts per tree, size and quality of nuts (percent #1, #2, #3, and reject kernels, total % edible kernel) (2). The harvest date was recorded when an estimated 50% of nuts could be readily shaken from the tree.

In 1988, budbreak data (date most active buds reached inner scale split stage) (5) and in 1989 relative order of budbreak and early spring growth was estimated by recording growth state (5) and length of new growth on April 17.

Results

Yield. A few cultivars were bearing nuts by 1986, their fourth growing season following planting, although none averaged as high as 1 lb of nuts per tree (Tables 1 and 2). Through age seven, Shoshoni produced the highest cumulative yield (37.1 lb), mostly from the 32 lb/tree produced in 1989. Additional cultivars with cumulative yields of over 10 lb/tree through the seventh season were Schley/Harris, Cape Fear, Kiowa, USDA 61-6-67, Jubilee, Davis, and Pioneer. Cultivars with less than 3 pounds per tree through the seventh season were USDA 56-6-148, Stuart, and Maramec (Table 1).

Nut Quality and Size. Kernel quality is the primary consideration in determining value of pecans (2). Overall percentage kernel is important, and the grades of the kernels also dramatically affect price and quality. Seven cultivars, Forkert, Cape Fear, Kiowa, Jackson, Cheyenne, Melrose, and Elliott, had a percentage kernel of over 52% (Tables 3 and 4). The highest kernel grade is number one, which represents bright, thick kernels. Cultivars having over 40% number one kernels were Forkert, Cheyenne, Jackson, Elliott, and USDA 56-6-148. Less than 45% edible kernel, (relatively poor quality), was found with Stuart, Davis, Shoshoni, Owens, Candy, and Gloria Grande. The heaviest pecans, with inshell weight of over 9 g, were Jackson, USDA

Table 1. Mean yields per tree in years 4-7 of pecan cultivars or selections in the main block at the Gulf Coast Substation.

Cultivar or selection	Year 86 (Age of tree 4)	87 (5)	88 (6)	89 (7)	Cumulative yield/tree for years 4 through 7
	pounds/tree[z]				
Cape Fear	.13	2.6	2.5	17.3	22.6 a[y]
Kiowa	.95	3.4	2.4	13.9	20.7 ab
USDA 61-6-67	.10	1.8	1.1	16.5	19.5 ab
Cheyenne	.20	2.3	1.4	12.3	16.3 b
Davis	.03	.4	1.7	9.0	11.1 c
USDA 53-9-1	.20	1.3	1.7	6.7	9.9 c
Choctaw	.15	1.5	1.2	5.1	8.0 cd
Melrose	.08	.7	.6	6.5	7.9 cd
Jackson	.00	.1	.3	3.4	3.8 de
Forkert	.03	.4	.3	2.8	3.6 de
Sumner	.00	.1	.3	3.0	3.5 de
Elliott	.00	.1	.1	3.1	3.4 de
Stuart	.00	.1	.1	2.1	2.3 de
Maramec	.00	.1	.3	1.6	2.0 e

[z]Table entries represent means for 20 trees of each selection.
[y]Mean separation in columns by Duncan's Multiple Range Test, 5% level.

Table 2. Mean yields per tree in years 4-7 of pecan cultivars or selections in the observation block at the Gulf Coast Substation.

Cultivar or selection	Year 86 (Age of tree 4)	87 (5)	88 (6)	89 (7)	Cumulative yield/tree for years 4 through 7
	pounds/tree[z]				
Shoshoni	.0	2.4	2.7	32.0	37.1a[y]
Schley/harris	.0	2.2	3.1	23.1	28.4 ab
Jubilee	.0	.2	.7	15.9	16.8 bc
Pioneer	.1	.5	2.3	8.8	11.7 c
Surprize	.0	.0	.8	7.6	8.4 c
Gloria Grande	.0	.1	1.1	5.6	6.9 c
Owens	.0	.1	.4	6.9	5.1 c
Candy	.1	1.3	.4	2.9	4.7 c
USDA 56-6-148	.0	.6	.6	1.6	2.8 c

[z]Table entries represent means for 3 single-tree replications of each selection.
[y]Mean separation in columns by Duncan's Multiple Range Test, 5% level.

56-6-148, Forkert, Kiowa, Choctaw, Maramec, and Gloria Grande. Candy and Elliott produced the lightest nuts, less than 6 g average weight.

Budbreak and Harvest Dates. Early budbreak results in greater susceptibility to spring freezes, and cultivars with early budbreak should thus be avoided when planting in frost-prone sites. In 1988, budbreak occurred (Table 5) on April 1 or earlier, relatively early for pecans at this location, on Elliott, Candy, Cape Fear, Davis, Shoshoni, and USDA 61-6-67. Relatively late budbreak, after April 12, occurred on Jubilee, Forkert, Surprize, Sumner, Maramec, and Stuart.

Harvest date influences value, since early season prices usually are highest (9). Cultivars with late harvest dates not only bring a lower price, but are at greater risk of early fall freeze damaging the nuts prior to shucksplit, especially when these cultivars are grown in colder climates. Cultivars with late harvest dates (Table 7), Nov. 1 or later, were Surprize, Pioneer, Gloria Grande, and 53-9-1. Very early harvest dates, before October 1, were recorded for Candy and Shoshoni.

Table 3. Kernel grades and nut weight of pecan cultivars or selections in the main block at the Gulf Coast Substration.

	Kernel grade[z]					
Cultivar	*#1*	*#2*	*#3*	*Reject*	*Edible kernel*	*Nut wt.*
	%					g
Forkert	44.9	10.9	1.1	3.4	56.9	9.57
Cape Fear	39.4	15.0	.5	.6	55.0	7.91
Kiowa	31.5	19.5	3.9	2.0	54.9	9.45
Jackson	40.9	13.4	.7	2.0	54.9	11.03
Cheyenne	42.9	11.2	.5	.6	54.7	6.25
Melrose	26.4	20.2	6.6	1.1	53.3	6.51
Elliott	41.8	9.3	.9	.3	52.0	5.72
Sumner	34.5	15.6	1.7	.8	51.8	7.69
Chocktaw	31.0	16.5	3.4	4.1	50.9	9.45
Maramec	36.3	11.2	1.2	5.8	48.7	9.45
53-9-1	21.3	25.1	1.4	4.0	47.8	8.94
61-6-67	27.7	16.8	1.3	3.8	45.8	8.10
Stuart	19.6	22.8	.4	2.4	42.8	8.52
Davis	23.5	14.3	3.5	3.5	41.4	8.79

[z]Table entries represent means for 20 trees of each selection, averaged over two years, 1988 and 1989, when trees were in their 6th and 7th leaf after planting.

Table 4. Kernel grades and nut weight of pecan cultivars or selections in the observational block at the Gulf Coast Substation.

	Kernel grade[z]					
Cultivar	*#1*	*#2*	*#3*	*Reject*	*Edible kernel*	*Nut wt.*
			%			g
56-6-148	40.9	4.9	6.1	0.0	51.9	9.6
Schley/Harris	37.0	13.9	.9	2.4	51.9	8.8
Pioneer	6.4	0.0	42.7	0.0	49.0	8.4
Surprize	29.2	8.1	11.0	0.8	48.3	8.6
Jubilee	31.8	12.3	2.9	3.3	46.9	8.2
Shoshoni	20.6	17.8	3.3	9.2	41.8	7.5
Owens	21.1	15.3	5.0	2.3	41.5	8.4
Candy	25.0	9.6	4.5	1.8	39.1	5.3
Gloria Grande	12.5	18.8	7.7	2.6	39.0	9.2

[z]Table entries represent means for 3 single-tree replications of each selection, averaged over two years, 1988 and 1989, when trees were in their 6th and 7th leaf after planting.

Discussion

The ability to produce high yields and high quality in well-managed and sprayed experimental plantings is required before pecan cultivars are recommended for home and commercial planting. However, this ability is not sufficient evidence that a cultivar will perform well when planted in a landscape planting with no spray program and minimal care. Numerous other sources are available which evaluate tolerance to scab and other pests (1, 3, 6, 7, 10, 15), very important criteria for trees in

Table 5. Budbreak of pecan cultivars at the Gulf Coast Substation.

	Relative order of budbreak[z]			
Cultivar	*1988*	*1989*	*Both years considered*	*1988 Budbreak date*
Elliott	1	1	1	Mar. 25
Candy	3	2	2	Apr. 1
Cape Fear	2	6	3	Mar. 28
Davis	4	5	4	Apr. 1
Shoshoni	5	4	5	1
Kiowa	7	3	6	2
Melrose	9	7	7	5
61-6-67	6	13	8	1
53-9-1	11	10	9	5
Gloria Grande	13	8	10	9
Cheyenne	8	14	11	5
Jackson	14	11	12	9
Pioneer	16	9	13	9
Owens	10	16	14	5
Choctaw	12	15	15	7
Schley/Harris	17	12	16	9
56-6-148	18	17	17	9
Jubilee	20	18	18	13
Forkert	19	20	19	13
Surprize	21	21	20	13
Sumner	23	19	21	16
Maramec	22	22	22	16
Stuart	24	23	23	17

[z]Budbreak date was a visual estimate of the day most buds near branch terminals reached the inner scale split stage of development.

landscape plantings in the humid South. Also, researchers (12) have evaluated foliage retention or condition of foliage in late season—indirect measures of tolerance to aphids and other foliage pests. Review of this information, results obtained in this study, and lists of cultivars recommended for home plantings in the Southeast (15) suggest the following cultivars as promising in small plantings with minimal or no sprays. Data reported for the cultivars are from this study, where applicable, and from sources cited above.

Promising Pecan Cultivars for Home and Landscape Plantings

Davis. This cultivar was introduced in 1921 and is a prolific producer of mediocre quality pecans (16). Kernels may be dark and not well developed. Its good scab resistance and productivity with minimal care, plus its usefulness as a pollinator, are the reasons it is suggested for home and small plantings.

Pollination type I; harvest Oct. 13; 52 nuts/lb.; 41% kernel; first yield of 1 lb. or more in year 6; good scab resistance; SE states recommending for home plantings: Alabama, Mississippi.

Elliott. This very scab-resistant cultivar is favored for home and commercial planting. The small, teardrop shaped nuts have high quality kernels. Elliott is also a favorite rootstock cultivar. Older trees tend to alternately bear. Very early budbreak makes it prone to late frost injury.

Pollination type II; harvest Oct. 7; 79 nuts/lb; 52% kernel; First yield of 1 lb. or more in year 7; very good scab resistance; SE states recommending for home planting: Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina.

Jackson. This cultivar was popular in the 1920s because it produces a very large nut with a high percent kernel. It has moderate scab resistance. Grower reports indicate that older trees do not consistently produce good yields.

Pollination type II; harvest Oct. 27; 41 nuts/lb.; 55% kernel; First yield of 1 lb. or more in year 7; good scab resistance; SE states recommending for home planting: Alabama, Louisiana, Mississippi.

Jubilee. On limited observations of older trees in South Alabama, this cultivar has produced good yields of large, thin-shelled nuts and has had excellent scab resistance. The tree grows vigorously. Kernel quality is moderate, and occasionally the long kernels do not develop completely all the way to the end. The large size, thin shells, and early harvest make it a good nut for inshell trade. It has not been grown long enough in test plantings for adequate evaluation, but appears from observations in grower's orchards to have promise, especially for home plantings and for plantings receiving minimal sprays. Some late-season nut diseases have been observed on unsprayed trees.

Pollination type II; harvest Oct. 10; 55/lb.; 47%

Table 6. Harvest dates in 1986-89 for pecan cultivars or selections in the main block at the Gulf Coast Substation.

	Harvest date[z]			*Avg. date*
Cultivar	*1986*	*1987*	*1988*	*1986-89*
61-6-67	Oct 15	Oct 1	Oct 6	Sep 30 Oct 5 a[y]
Elliott	6	13	6	Oct 1 7 a
Choctaw	16	10	2	15 11 b
Kiowa	14	9	7	20 12 bc
Davis	15	10	9	17 13 bc
Cheyenne	20	15	5	16 14 bc
Maramec	NA[x]	9	1	Nov 6 16 c
Cape Fear	22	16	6	Oct 19 16 c
Forkert	31	16	15	Nov 7 25 d
Stuart	NA	NA	15	6 26 d
Sumner	NA	27	12	6 26 d
Jackson	NA	29	15	6 27 d
Melrose	Nov 8	Nov 1	13	8 30 e
53-9-1	9	16	14	16 Nov 5 f

[z]Harvest date is the estimated date that 50% of the nuts can be shaken from the tree.
[y]Mean separation in columns by Duncan's Multiple Range Test, 5% level.
[x]NA - Data not available.

Table 7. Harvest dates in 1988-89 for pecan cultivars or selections in the observation block at the Gulf Coast Substation.

	Harvest date[z]		*Avg. date*
Cultivar	*1988*	*1989*	*88-89*
Candy	Sep 29	Sep 22	Sep 26 a[y]
Shoshoni	25	Oct 4	29 a
Schley/Harris	26	10	Oct 4 ab
Jubilee	Oct 8	11	10 ab
Owens	8	19	13 b
56-6-148	8	Nov 16	28 c
Surprize	18	16	Nov 1 c
Pioneer	10	15	3 c
Gloria Grande	10	16	3 c

[z]Harvest date is the estimated date that 50% of the nuts can be shaken from the tree.
[y]Mean separation in columns by Duncan's Multiple Range Test, 5% level.

kernel; First yield of 1 lb. or more in year 7; very good scab resistance; SE states recommending for home planting: Alabama (trial).

Melrose. Released by the Louisiana Agricultural Experiment Station in 1979 (20), this cultivar produces a good quality pecan of adequate size. In addition to excellent scab resistance, it is reported to be more tolerant of zinc deficiency than are many other cultivars, and to retain foliage well.

Pollination type II; harvest Oct. 30; 69/lb; 53% kernel; First yield of 1 lb. or more in year 7; Very good scab resistance; SE states recommending for home planting: Alabama, Louisiana, Mississippi.

Moreland. We have not yet tested this cultivar in Alabama, but reports from Louisiana and Florida have been very favorable, resulting in its recent release (11). Moreland produces nuts of excellent quality and yields well. It has good to moderate scab resistance. It has not been found to have bunch or tumor and it has very little vein spot, liver spot, brown spot, or blotch diseases of leaves. It has no recorded shuck disease or severe black aphid damage. Leaf retention without sprays is quite good. It was officially released by the Louisiana Agricultural Experiment Station in 1989 but has been observed in test plantings for more than 40 years in Louisiana and Florida.

Pollination type II; harvest Oct. 15; 50 nuts/lb.; 56% kernel; First yield of 1 lb. or more in year 4; good scab resistance; SE states recommending for home planting: Alabama, Florida.

Owens. This cultivar has large, mediocre quality nuts and moderate production. The nuts are thick-shelled. The tree is scab resistant and has done well in Arkansas and Mississippi. It protandrous (Type 1) pollination habit and pest tolerance make it useful as a pollinator for home plantings, even though quality has been relatively poor.

Pollination type I; harvest Oct. 13; 54 nuts/lb.; 42% kernel; first yield of 1 lb. or more in year 7; Good scab resistance; SE states recommending for home planting: Alabama, Arkansas, Louisiana, Mississippi.

Sumner. This seedling cultivar from south Georgia has good nut size, precocity, and kernel percentage (17, 18). Scab resistance is good; harvest is late.

Pollination type II; harvest Oct. 24; 55/lb.; 53% kernel; First yield of 1 lb. or more in year 7; Good scab resistance; SE states recommending for home planting: Alabama, Florida, Georgia, Louisiana, South Carolina.

Surprize. The Surprize cultivar produces large nuts of moderate quality. The large nuts should be well-suited to inshell trade, even though the shell color is dark and grayish. Harvest is mid-season. This cultivar has moderate-good scab resistance. According to records maintained by Bill Underwood, a nurseryman and grower of this cultivar from Foley, Alabama, the trees have been consistently productive when given good care. Trees are strong and have withstood hurricanes well compared to other cultivars nearby. Kernels have bright color.

Pollination type I; harvest Oct. 17; 45/lb; 49% kernel; First yield of 1 lb. or more in year 7; Good-moderate scab resistance; States recommending for home planting: Alabama (trial).

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INJECTION SITE WOUNDING WHEN USING PLANT GROWTH REGULATORS[1]

by John A. Bieller

Abstract. Based on results of field examinations of over 800 trees injected with plant growth regulators, this utility has decided not to include plant growth regulators in our line clearance tool kit. Although the chemistry appears to be generally effective at growth regulation, delivery system side effects show damage to the tree which outweighs derived benefits from use of these materials.

Résumé. Basé sur des résultats d'examens sur le terrain de plus de 800 arbres injectés avec des régulateurs de croissance, cette entreprise de service public a décide de ne pas inclure de régulateurs de croissance dans notre équipement de dégagement des réseaux électriques. Bien que la chimie semble être généralement efficace dans la régulation de la croissance, les effets sur la source du système de distribution montrent des dommages à l'arbre qui pèsent plus que les bénéfices dérivés de l'utilisation de ces matériels.

Studies in recent years by chemical companies and utilities have shown that plant growth regulators (PGR) should be considered as a possible means to reducing the cost of right-of-way maintenance. While cost and product effectiveness have been demonstrated, little study on how the trunk injection method of chemical delivery may be of greater detriment to the health of the tree than derived cost: benefit has been offered. Field studies show that acceptance of the trunk injection method of chemical delivery may be in direct conflict with studies of recent years demonstrating wound compartmentalization of trees.

Materials and Methods

Plant growth regulators used by Union Electric in field studies were: paclobutrazol (Clipper®), uniconazol (Prunit®), and flurprimidol (Cutless®). Arborchem 3-point injectors were used for all injections.

Based on the species and size of tree involved, a specified number of holes were drilled in the tree to accomodate the injector nozzles or probes. This is somewhat similar to the Mauget system ex-

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