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The 'Surprize' Pecan

WILLIAM D. GOFF, L. ED TUNNELL, AND RONNIE MCDANIEL[2]

Abstract

'Surprize' is a pecan [*Carya illinoensis* (Wangenh.) C. Koch] cultivar, originating as a seedling in Baldwin County, Alabama, which produced consistent high yields of large nuts of moderate kernel percentage with bright attractive kernels. Trees of 'Surprize' have good to moderate scab (*Cladosporium caryigenum* (Ell. and Lang.) Gottwald) resistance and retain foliage well in late season. Flowering habit is protandrous and nut maturity is mid-to-late season. Trees are reported to be strong and have withstood hurricane damage better than other cultivars in the area. Under conditions of heavy disease incidence with six to seven fungicide applications, 'Surprize' was significantly better ($p < .05$) than 'Desirable' in leaf and nut scab ratings. 'Surprise' has performed well in limited observations in the humid conditions of south Alabama, and further testing in the southeastern United States is warranted.

Introduction

'Surprize' originated in Baldwin County, AL, from a seedling on which 'Pioneer,' another local cultivar, was grafted by Louis V. Underwood in 1963. The 'Pioneer' scion died, but the seedling rootstock grew, producing the original 'Surprize' tree. The first crop of six pounds was produced on the parent tree in 1968, five years after planting. At that time it was obvious that the large nuts on the tree were not from 'Pioneer,' a surprise providing the cultivar name 'Surprize' (spelled with a "z"). From 1968 to 1972, 46 additional trees were propagated from the original tree in the Underwood orchard. The cultivar is currently propagated and sold by Dellwood Nursery in Foley, AL.

Parentage of the seed that produced the original tree, still growing in the orchard, is not known. However, appearance of the nuts (large, obovate shape, adhering shuck attachments at base) suggests the possibility that 'Success,' a common cultivar in southwest Alabama, is a parent. Unlike 'Success,' however, 'Surprize' has not been a severe alternate bearer. Rather, it has been a particularly consistent producer of good yields, even following considerable hurricane damage which greatly reduced production on other cultivars. Consistent nut filling and absence of shuck disease (9) of 'Surprize' also distinguish it from 'Success.'

According to Bill Underwood, partner in Dellwood Nursery, 'Surprize,' when given good care, is a consistent producer of nuts of large size and bright attractive kernels. In a statewide competition held annually in Alabama since 1987, 'Surprize' pecans were judged "Largest Pecan" in all three years. The carefully selected entry samples averaged 28.7, 31.4, and 33.3 nuts/lb., respectively, in 1987, 1988, and 1989, which correspond to individual nut weights of 15.8, 14.5, and 13.6 g. Large nuts when combined with large cluster size are sometimes associated with poor kernel development, but the 'Surprize' nuts were well-filled, perhaps due to the relatively small nut cluster size observed with 'Surprize.' Percentage edible kernel, a common indicator of quality, was 50.8, 48.5, and 52.3 percent, respectively, in the three years, and kernels were bright and attractive.

Orchards in the Foley area were severely damaged by Hurricane Fred-

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[2]Respectively, Associate Professor, Department of Horticulture; County Agent-Coordinator, Baldwin County; and Associate Superintendent-Gulf Coast Substation, Alabama Agricultural Experimentation; Auburn University, Alabama 36849.

eric in 1979 and to a lesser extent by Hurricane Elena in 1985. 'Surprize' trees grafted in 1968-1972 were reported by Bill Underwood to show less structural damage and to recover more quickly than other cultivars. Trees were reported to have moderate to good scab (*Cladosporium caryigenum* (Ell. and Lang.) Gottwald) resistance with the disease being easily controlled with a fungicide application program of six sprays per season.

Publicity about 'Surprize' from the nursery resulted in interest among pecan growers and in the need for objective evaluation of the cultivar. Cultivar performance trials, which included 'Surprize,' were established in southwest Alabama in 1983 and provide limited information on very young trees. In cooperation with Bill and Gary Underwood, older tree performance was evaluated at the orchard they help manage in Foley in 1988 and 1989.

Materials and Methods

Underwood orchard. In the Underwood orchard at Foley, 47 'Surprize' trees planted in 1968-1972 were 17-22 years old during the time we did our evaluations in 1988 and 1989. All trees in the orchard were observed and six were randomly selected for detailed evaluation. In addition, six 'Desirable' trees the same age and growing in the same orchard with the same care as 'Surprize' were randomly selected for comparison of nut size, quality and disease resistance.

Original trees in the orchard were planted at a 22.9 m X 22.9 m. spacing, (19 trees per hectare), but young trees were planted in the middles in a quincunx pattern so that there are now 38 trees/hectare. It is assumed that the small size of the young trees (all were less than five years old) and lack of any shading effect at the time of our evaluation provided minimal competition to the large older trees. Detailed evaluation was limited to older trees.

Cultural management has been in accordance with standard recommendations (4, 7). Trees were sprayed six times with fungicides (propiconazol and triphenyltin hydroxide) at standard rates (7) in 1988, and seven times in 1989. Both 1988 and 1989 were years of heavy disease incidence, particularly in 1989 due to heavy spring rains.

Yields of 'Surprize' were recorded at three harvest dates in 1988 and 1989. For both 'Surprize' and 'Desirable,' leaf and nut scab was visually rated according to percentage of nut shucks or leaf surface affected. Foliage condition and retention were rated for each cultivar on 31 Oct. 1989, with a 1-10 scale, where 10 = green healthy foliage with no defoliation, 5 = moderate foliage discoloration and moderate defoliation, and 1 = complete defoliation. A 454 g nut sample was randomly taken during the first harvest from each tree. Average nut weight was determined and nuts and kernels separated into four grades by commercial standards (1). In 1990, pollen shed and stigma receptivity dates were estimated from observations of trees in the orchard, according to described procedures (10).

Gulf Coast Substation. A trial of 24 cultivars, including 'Surprize' was established in February, 1983, at Auburn University's Gulf Coast Substation near Fairhope. The Station, near the Gulf of Mexico and Mobile Bay, averages over 150 cm of annual rainfall and a growing season of 270 days.

The planting has been managed in accordance with standard commercial recommendations (4, 7). Insects and mites were monitored according to Alabama Cooperative Extension Service guidelines (7) and sprays applied as needed. Trees were drip irrigated as needed. A weed-free strip was maintained with herbicides, and grass middles were kept closely mowed. Tree spacing was 12.2 m X 12.2 m (67 trees per hectare). The portion of the experiment in which 'Surprize' trees

are located is a completely randomized design with three single-tree replications per cultivar.

Yield of nuts per tree, nut weight, percent #1, #2, #3 and reject kernels, harvest date, and budbreak date were measured each year. Nut size and quality determinations were based on a random 454 g sample of nuts from each tree (or as many nuts as were available for yields less than one pound). Harvest date was recorded when an estimated 50% of nuts could be mechanically shaken from the trees. In 1988, budbreak date was estimated, by observing when most active buds reached inner scale split stage (6). In 1989 relative order of budbreak and early spring growth were estimated by recording growth stage (6) and length of new growth on April 17.

Results and Discussion

Yield. 'Surprize' trees at the Gulf Coast Substation began bearing in the 6th season, averaging 0.32 kg/tree, followed by a yield of 3.45 kg/tree in the following year (Table 1). Cumulative yield of 'Surprize' through year seven ranked 11th of 23 cultivars in the Gulf Coast test. Performance of all cultivars in the same experiment are reported elsewhere (3). Moderate precocity is indicated, which, as Sparks (11) suggests, is often preferable to greater precocity since high precociousness is associated with overproduction and poor nut quality on older trees. Yields for trees of 'Surprize' age increased dramatically, as results from the Underwood orchard indicate (Table 2). In year 20, yields averaged 53.5 kg/tree, then 61 kg/tree in year 21, a total of 115 kg/tree for the two years..

Yield records provided by Mr. Underwood from the 47 'Surprize' trees in the Underwood orchard indicated consistent production. Adjusted to kg/tree by tree age, yields are 4, 10, 16, 21, 24, 0, 0, 16, 24, 29, 34, 23, 24, 39, 54, and 61 kg/tree for trees of ages 6-21, respectively, In addition to these data we determined 1990 yield to average 53 kg/tree on the six test trees. These are high and very consistent yields for pecan, except for the years of 0, 0, and 16 kg/tree, which were 1979-81, following Hurricane Frederic in 1979 which produced 175 mph winds in the area and damaged pecan trees severely. According to Underwood, 'Surprize' trees sustained less damage and recovered more quickly than 'Cape Fear,' 'Desirable,' and 'Pensacola Cluster' in the same orchard.

Table 1. Yields from young 'Surprize' trees planted in 1983 at the Gulf Coast Substation, Fairhope, AL.

Year	Age of trees	kg/tree	Estimated yield kg/hectare (66.7 trees/hectare)
1986	4	0	0
1987	5	0	0
1988	6	0.3	21
1989	7	3.5	232

Nut weight. The weights of the samples of 'Surprize' entered in the Alabama State Pecan Show of 15.8, 14.5, and 13.6 g/nut, respectively, in 1987, 1988, and 1989 were from carefully chosen nuts and could be considered as extremes to show the capability of the cultivar. Random samples from the trees were evaluated, however, indicated considerably lighter nuts, although they were still relatively large compared to other cultivars. The young trees at the Gulf Coast Substation pro-

Table 2. Yields from 'Surprize' trees planted in the Underwood orchard, Foley, AL.

Year	Age of trees	Kg/tree	Estimated yield Kg/ha[z] (19 trees/ha)
1988	20	54	1024
1989	21	61	1170
1990	22	53	1009

[z]Trees in the Underwood orchard were originally spaced 22.86 m X 22.86 m (19.03 trees/ha) spacing, but younger trees were planted later in the middles, making the current no. of trees/ha = 38.05. Yields reported are from six randomly selected older trees.

Table 3. Nut weights from 'Surprize' trees at two locations.

Nut weight (g)					
Underwood orchard			Gulf Coast Substation		
1988	1989	avg.	1988	1989	avg.
10.1	10.1	10.1	8.3	9.1	8.6

duced nuts with weights averaging 8.3 g/nut in 1988 and 9.1 g/nut in 1989, while those from the Underwood orchard averaged 10.1 g/nut in both years (Table 3).

Nut quality. Kernel grades, based on brightness and thickness of kernels and on absence of kernel defects, reflect nut quality in pecan (1). The percentage of total nut weight comprised of edible kernels is an important quality characteristic and influences nut value. 'Surprize' had an edible kernel percentage averaging 49.7% for the two year evaluation period at the Underwood orchard. At the Gulf Coast Substation 'Surprize' produced nuts with 48.3% edible kernel. Relative to the 23 cultivars in the Gulf Coast test, percentage kernel of 'Surprize' ranked 14th of 23 (3). The percentage of nut weight in the highest kernel grade (#1 kernel) averaged 37% for 'Surprize' at the Underwood orchard and 27% at the Gulf Coast Substation (Table 4). The high percentage of #1 kernel indicates a high degree of kernel brightness, a major component of the grade (1).

Shell color of 'Surprize' is somewhat darker than most pecan cultivars, including 'Desirable.' Background shell color is slightly darker than 'Cape Fear.' However, shell color is generally not an important consideration in pecan grading or value determination (1).

Disease resistance and foliage retention. 'Surprize' developed less nut scab (4% of surface affected) than did 'Desirable' (48%) treated similarly in the Underwood orchard (Table 5). Leaf scab was minimal in two heavy disease incidence years under a moderate fungicide spray program. Ratings of nut and leaf scab in both years and average ratings showed statistically better ($p < .05$) performance by 'Surprize.' We also observed scab development in an adjacent orchard of 'Surprize' not sprayed with fungicide in 1989. In this orchard, scab development on nuts was light to moderate. Based on this observation, a minimal fungicide spray program should control the disease on 'Surprize.' Leaves and nuts were examined carefully and no other disease problems were observed on 'Surprize.'

Leaf retention in late season can have a dramatic influence on a pecan tree's carbohydrate reserves, and keeping leaves on the tree and functioning through around Nov. 1 is important to next year's crop (13). 'Surprize' trees had good leaf retention and bright, healthy leaves when rated in late October (Table 5). In 1989, foliage condition we observed on other trees in nearby orchards was generally very poor in late October and contrasted sharply with the healthy appearance of the 'Surprize' foliage.

Budbreak, pollination, and harvest dates. Early budbreak results in greater susceptibility to spring freeze, thus cultivars with early budbreak should be avoided when planting in frost-prone sites. Budbreak of 'Surprize' at the Gulf Coast Substation has been relatively late, occurring on 13 Apr. 1989, compared to 25 Mar. for the

Table 4. Kernel grades from 'Surprize' trees at two locations.

Kernel grades (%)[z]									
Underwood orchard					Gulf Coast Substation				
#1	#2	#3	Reject	% kernel	#1	#2	#3	Reject	% kernel
37	9	4	1	49.7	29	8	11	1	48.3

[z]All table entries represent means for two years, 1988 and 1989, at each location. Six trees were evaluated at the Underwood orchard and three trees of each at the Gulf Coast Substation.

Table 5. Scab ratings and foliage retention of 'Surprize' trees in the Underwood orchard in Foley, AL, compared with 'Desirable' trees in the same orchard.

Cultivar	Leaf scab rating[z]			Nut scab rating			Foliage[y] retention
	1988	1989	avg.	1988	1989	avg.	
Surprize	0.0 a[x]	0.0 a	0.0 a	1 a	7 a	4 a	7.7 a
Desirable	3.8 b	0.6 b	2.2 b	37 b	59 b	48 b	6.8 a

[z]Scab ratings represent the percentage of leaf or nut surface area visibly affected, on 26 Oct. 1988 or 30 Oct. 1989. Ten compound leaves and 10 nuts were rated on each of six randomly selected trees of each cultivar in the same orchard. All trees were sprayed six times with fungicides in 1988 and seven times in 1989.

[y]Foliage condition and retention was rated on each cultivar on 31 Oct. 1989 on a 1-10 scale, where 10 = green healthy foliage with no defoliation, 5 = moderate foliage discoloration and moderate defoliation, and 1 = completely defoliated.

[x]Mean separation in columns by Duncan's Multiple Range Test, 5% level.

earliest cultivar 'Elliott,' and to 17 Apr. for the latest 'Stuart.' In 1988 and 1989, 'Surprize' was the 20th of 23 cultivars in time of budbreak (3).

Pollen shed dates recorded at the Underwood orchard in 1990 were 24 Apr. to 2 May, and stigma receptivity was estimated from visual observation to be 5 May to 13 May. These dates indicate protandrous flowering habit and complete dichogamy (12), precluding self-pollination. Of pecan cultivars recommended for planting in Alabama (4), 'Surprize' should be a good pollinizer for 'Desirable,' 'Davis,' 'Woodard,' 'Jackson,' and 'Gloria Grande,' and would be pollinized well by 'Stuart,' 'Kiowa,' or 'Sumner' (5).

Harvest date influences value, since early season prices usually are highest (8). The estimated date that 50% of 'Surprize' nuts could be readily shaken from the tree averaged 1 Nov. in two years of observation at the Gulf Coast Substation. This is relatively late, ranking 20th of 23 cultivars (3). At the Underwood orchard, first harvest was on 26 Oct. 1988, and this harvest produced 38% of the total yield from three harvests of the same trees that year. The 1989 first harvest was 26 Oct., and produced 50% of the total nuts harvested. Indications are that relative to other common cultivars, 'Surprize' harvest date is mid-to-late season, about six days later than 'Stuart.'

Preliminary evaluation suggests that 'Surprize' is a promising cultivar which should be tested further. We have added it to our list of cultivars recommended for trial plantings in Alabama.

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