‘Navaho’ Pecan

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Additional index words. *Carya illinoensis*, cultivar, variety, breeding

‘Navaho’ is a new pecan [*Carya illinoensis* (Wangenh.) K. Koch] cultivar released 16 Mar. 1994 by the U.S. Dept. of Agriculture (USDA), Agricultural Research Service (ARS), College Station, Texas, and the Texas Agricultural Expt. Station, Texas A&M Univ., College Station. When compared with other protandrous cultivars, ‘Navaho’ has the unique characteristics of high yield, high precocity, rapid tree growth, high percentage of kernel in relation to nut weight, and excellent shelling characteristics. Nut maturity is too late to allow culture in extreme northern pecan production areas in the United States, and scab [*Cladosporium caryigenum* (Ell. et Lang.) Gottwald] resistance is poor, making ‘Navaho’ unacceptable for the humid environments of the southeastern United States. ‘Navaho’ likely will perform well in the arid areas of the western United States (west of central Texas).

Origin

‘Navaho’, tested as USDA selection 74-1-11, is a progeny from a 1974 cross between USDA selection 48-13-311 (‘Moore’ x ‘Schley’) and ‘Wichita’ made by E.J. Brown and G.D. Madden at the W.R. Poage Pecan Field Station, USDA-ARS, Brownwood, Texas (Fig. 1). The seed was planted in a greenhouse, and the seedling tree was transplanted to the breeding nursery in 1978. Based on preliminary performance, extensive testing started in 1986.

Description

Yield data taken early during the evaluations indicate that the precocity and yield potential of ‘Navaho’ are good (Table 1). In a test orchard in Burleson County, Texas, grafted trees produced nuts during the 4th leaf (1989). In 1989, yields were not significantly different from the other cultivars tested due to extreme tree-to-tree variability. Over the entire life of

the test, ‘Navaho’ produced much more than the two standard cultivars (‘Desirable’ and ‘Stuart’).

Nuts are large enough to be marketed in the in-shell trade, or they can be shelled to produce attractive kernel halves (Fig. 2, Table 2). Nut size averaged 137 nuts/kg, significantly smaller than the standard cultivars. ‘Navaho’ nuts have a high percentage of kernel, averaging 61% over the 5-year test. Nut shape is ovate elliptic, with an acuminate apex and an obtuse base. Nuts are characterized by dark stripes at the apex and freckling at the base similar to ‘Wichita’; however, ‘Navaho’ nuts exhibit less apex curvature than ‘Wichita’. Kernels have deep and relatively narrow dorsal grooves that diverge from the apex, where the dorsal ridge is narrow, to the base of the kernel, where the dorsal ridge is broad. Kernels have a prominent basal cleft; their shape and color are similar to those of ‘Wichita’ and

Fig. 1. Pedigree of ‘Navaho’ pecan, including the year each cultivar was named and U.S. Dept. of Agriculture, Agricultural Research Service, experimental number (in parentheses), where appropriate. F = female parent, and M = male parent.

Fig. 2. Nuts and kernel halves of ‘Navaho’ pecan.

Table 1. Yield of nuts (kilograms per tree) across years for ‘Navaho’ and standard pecan cultivars.²

Cultivar	1989	1990	1991	1992	1993	Mean	Total
Navaho	0.81 a ³	1.80 a	10.51	3.78 ab	19.11 a	7.43 a	36.01
Pawnee	0.22 a	0.58 a	1.71 b	2.51 b	19.38 a	5.15 ab	24.40
Desirable	0.26 a	0.93 a	2.81 b	6.09 a	7.73 b	3.56 bc	17.82
Stuart	0.01 a	0.20 a	0.14 b	0.87 b	4.26 b	1.26 c	5.48

Received for publication 27 May 1994. Accepted for publications 14 Sept. 1994. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

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²Each number is the mean of four (‘Stuart’), five (‘Navaho’), or six (‘Desirable’ and ‘Pawnee’) trees each year. Clones were grafted to established rootstocks in Apr. 1986.

³Least square mean separation within columns by paired *t* test at *P* ≤ 0.05.

were darker than standard cultivars in this test (Table 2). 'Navaho' has not shown the problem of shell split at shell hardening that characterizes 'Wichita' when grown in some humid environments.

'Navaho' is a vigorous cultivar, producing a large, strong tree with excellent limb attachment. As indicated by trunk cross-sectional area, trees are significantly larger than other standard cultivars (Table 3). Nuts are typically well distributed throughout the canopy, with the average inflorescence having ≈ 2.7 nuts (Table 4). During the course of these observations, 'Pawnee' consistently produced clusters with more fruit than 'Desirable' or 'Stuart'.

The blooming habit of 'Navaho' is protandrous, with an early to midseason shedding pattern similar to 'Cheyenne' and 'Caddo' (data not shown) and 2 to 5 days earlier than 'Desirable' and 'Pawnee' in initial pollen release (Fig. 3). Pollen typically is produced in abundance. Pistil receptivity is mid- to late season and occurs over a longer period than in some cultivars. Receptivity begins ≈ 7 and 3 days before that of 'Desirable' and 'Pawnee'. 'Navaho' likely will be a good pollenizer for and be well pollinated by 'Wichita', 'Choctaw', 'Sioux', 'Apache', 'Tejas', and several other protogynous cultivars.

Table 2. 'Navaho' nut quality compared to standard pecan cultivars.^z

Cultivar	Nuts/kg	% Kernel	Kernel color ^y
Navaho	137 a ^x	60.9 a	3.6 a
Pawnee	115 b	59.6 a	3.3 b
Desirable	111 b	55.2 b	2.8 c
Stuart	116 b	49.6 c	3.2 b

^xEach value is a 5-year average. Clones were grafted to established rootstocks in Apr. 1986.

^yKernel color rated from 1 (light) to 10 (dark).

^zLeast square mean separation within columns by paired *t* test at $P \leq 0.05$.

Table 3. Trunk cross-sectional area (square decimeter per tree) across years for 'Navaho' and standard pecan cultivars.^z

Cultivar	1989	1990	1991	1992	1993
Navaho	1.15 a ^y	2.17 a	2.92 a	3.83 a	4.54 a
Pawnee	0.62 ab	1.20 b	1.72 b	2.49 b	3.04 b
Desirable	0.38 b	0.78 b	1.18 c	1.72 c	2.13 c
Stuart	0.39 b	0.78 b	1.09 c	1.61 c	2.22 c

^yEach number is the mean of four ('Stuart'), five ('Navaho'), or six ('Desirable' and 'Pawnee') trees each year. Clones were grafted to established rootstocks in Apr. 1986.

^zLeast square mean separation within columns by paired *t* test at $P \leq 0.05$.

Table 4. 'Navaho' fruiting characteristics compared to standard pecan cultivars.^z

Cultivar	Terminals with flower clusters (%)	No. nuts/cluster
Navaho	41.1 a ^y	2.73 b
Pawnee	34.8 a	3.60 a
Desirable	36.6 a	2.28 c
Stuart	20.8 b	1.76 d

^yEach value is a 5-year average. Clones were grafted to established rootstocks in Apr. 1986.

^zLeast square mean separation within columns by paired *t* test at $P \leq 0.05$.

According to the scab susceptibility rating system of Hunter and Roberts (1978), 'Navaho' has poor scab resistance. However, the disease has been controlled on leaves and nuts by a light fungicide spray program in a severe scab environment (Tables 5 and 6). 'Navaho' is less susceptible to nut scab than 'Wichita', about equal to 'Pawnee', and inferior to 'Desirable' and 'Stuart'. 'Navaho' is also susceptible to vein spot (*Gnomonia nerviseda* Cole); it is recommended specifically for areas where disease pressure is minimal.

Preliminary data suggests that 'Navaho' has some resistance to yellow aphids, similar to 'Pawnee' and better than 'Stuart' or 'Desirable'.

Availability

Graftwood was supplied to nurseries and state universities and experiment stations in 1994. Scionwood and budded trees should be available from nurseries in early 1995. The USDA does not have trees for distribution.

Literature Cited

Hunter, R.E. and D.D. Roberts. 1978. A disease grading system for pecan scab. *Pecan Quarterly* 12(3):3-6.

Fig. 3. Flowering patterns of four pecan cultivars by Julian date at College Station, Texas, in 1992 and 1993. Patterns are the mean of observations made on four to six trees of each cultivar in each year. Pollen shed = ; pistil receptivity = .

Table 5. Leaf scab ratings^z of 'Navaho' pecan compared to standard pecan cultivars.

Cultivar	1989	1990	1991	1992	1993	Mean
Navaho	1.10 a ^y	1.58 a	2.50 ab	3.60 a	2.60 a	2.28 a
Pawnee	1.00 a	1.43 a	2.05 bc	2.33 b	2.00 b	1.76 bc
Desirable	1.00 a	1.45 a	2.90 a	2.50 b	2.67 a	2.10 a
Stuart	1.50 a	1.28 a	1.58 c	2.00 b	1.00 c	1.47 c

^yLeaf scab rated from 1 (no scab lesions) to 5 (severe scab), based on the worst single leaflet (see Hunter and Roberts, 1978).

^zLeast square mean separation within columns by paired *t* test at $P \leq 0.05$.

Table 6. Nut scab ratings^z of 'Navaho' pecan compared to standard pecan cultivars.

Cultivar	1989	1990	1991	1992	1993	Mean
Navaho	1.30 a	1.16 a	2.56 ab	2.40 b	4.20 a	2.32 a
Pawnee	1.32 a	1.16 a	2.96 a	3.17 a	4.33 a	2.67 a
Desirable	1.00 a	1.18 a	2.10 bc	2.17 b	2.50 b	1.85 b
Stuart	1.50 a	1.00 a	1.00 c	1.25 c	1.00 c	1.12 c

^yNut scab rated from 1 (no scab lesions) to 5 (severe scab), based on the worst single nut (see Hunter and Roberts, 1978).

^zLeast square mean separation within columns by paired *t* test at $P \leq 0.05$.