

# Pecan Variety Study on the Safford Agricultural Center 1997-1998

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## **Abstract**

*In 1986 a replicated study of eight varieties of pecans were planted on the Safford Agricultural Center at an elevation of 2954 feet above sea level. The objective of the study was to determine which varieties would produce best under the saline conditions found in the Safford valley. This paper contains yield, kernel percentages and other nut characteristics found in the study during the 1997 and 1998 harvest seasons. Cheyenne and WO-3 were the highest yielding varieties in 1997 and 1998, respectively. The respective yields were 1894 and 2286 pounds per acre.*

## **Introduction**

Pecans are a small crop in southeastern Arizona being grown on approximately 4500 acres with about 1000 of those acres in Graham county. Using an average yield of 2000 pounds per acre, a nut turnout of 55% and the 1997 price of \$1.25 per pound, they produce \$1.375,000 of income for the county, which is equivalent to more than 6% of the income from all crops in the county in 1997. In addition to the pecans being grown commercially, many trees are grown in an urban setting for the pleasure of the homeowner. With this income potential and the urban interest, more emphasis ought to be placed in this crop.

## **Materials and Methods**

In 1986 eight varieties of pecans varying from the Burkett that has been grown in the valley for many years to currently recommended varieties, such as: Western, Wichita, Barton, and Mohawk and the newer varieties such as: Cheyenne, Sullivan and WO-3. These varieties were planted in four replications in a Pima clay loam variant with a soluble salt content around 2000 parts per million. The transplants were placed with 25 feet between trees in a row and 25 feet between rows in a diamond grid. Area per tree was calculated at 0.014 acres. Nitrogen fertilizer was applied each spring and surface flood irrigation was applied approximately monthly during the summer season. Soil sulfur was applied twice and gypsum was applied once over the years to reduce the affects of sodium. As the trees reached nut bearing age irrigations were increased somewhat, but management levels would still not be considered aggressive. In 1998 ten irrigations were applied with a total of approximately 4 acre feet of water and 110 pounds of nitrogen and 60 pounds of P<sub>2</sub>O<sub>5</sub> were applied. In December the trees were mechanically shaken and the nuts picked up from each tree by hand. Nuts were run through a huller and the percent tight nuts were determined, the good nuts were weighed and per acre yields were calculated. Twenty nuts were taken from each tree to determine nuts weight and they were measured for size. These nuts were then shelled to determine kernel percentages and the kernels were inspected for quality.

## **Results and Discussion**

1997 was the first year that yields were taken from the plots. Yields, kernel percentages and fill information are contained in Table 1. Since planting a few trees have died and a couple of others are still small and not bearing significant fruit for evaluation. Because of this, only 3 replicates were evaluated in the study. Individuality of the trees

affected the yields much more than the characteristics of the fruit as demonstrated by the Coefficient of Variability (CV(%)). Cheyenne produced the best in-shell yield with WO-3 following closely behind and producing a higher kernel yield. Kernel percentages are a bit lower than would be anticipated and this is probably due to less than optimal cultural practices. Yields varied greatly by variety, with Burkett, an old time favorite in the area, yielding the lowest. The last column in Table 1 is a visual estimate of how well the kernel filled to the end of shell.

Table 2 gives characteristics of the nut. The number of nuts per pound are higher than would be found in a commercial orchard, again due to inadequate inputs. The Sullivan variety was the largest nut in that it had the least number of nuts per pound and was also the longest nut. The nuts were not cylindrical so two widths are given, >width 1' was the greater of the two dimensions. The last column gives the length to width ratio where >width 1' was used in the calculation. Burkett was the shortest, widest nut, true to its normal characteristics. Kernel quality was not assessed in 1997.

In 1998 the management was intensified to supply water and fertilizer more consistently to increase the yield potential. Table 3 contains information on yield from the study. Even though it was considered to be the off year for most alternate bearing varieties, WO-3, Mohawk and Burkett varieties produced higher yields than in 1997. The average yield in the study, however, was lower in 1998 and the variability between trees of the same variety was high. Kernel percentages were much higher than the previous year for all varieties except Mohawk. Percent length of kernel fill was visually estimated as the nuts were cracked and was also calculated by comparing the length of the kernel to the length of the nut shell. The calculated values are inherently smaller than the visual values, since the kernel cannot be as long as the shell and the visual values are compared to the potential length of the kernel. So, caution must be exercised in comparing the values.

Table 4 provides values on the characteristics of the nuts by variety. In general the nut size in 1998 was greater than the previous year, but significant differences were seen between years and between varieties. Western and Wichita had much larger nuts and Sullivan had much smaller nuts in 1998. The Mohawk variety was wider in 1998 which lowered its length to width ratio. The Sullivan nuts were much shorter in 1998 than seen the year before, but the length to width ratios remained constant. The last column shows the percent nuts with tight hulls. Wichita and Mohawk had the largest percent tight nuts with Barton and Cheyenne following close behind. Had these nuts filled, they would have made significant increase to yield.

Ratings were made on nut characteristics of the 1998 harvest. This information is found in Table 5. Fill ratings in the first column are an estimate of how well the kernel filled the thickness of the nut. Figure 1 shows a cross section of three nuts. Our rating for the nuts would be 10, 8 and 6 respectively for kernels a, b, and c. More unfilled space in the middle of the kernel would rate a lower value. The next column indicates the propensity of a nut to retain internal shell fragments in the dorsal grooves of the kernel. A rating of 1.0 indicated that 10% of the kernels observed contained a small shell fragment. The size uniformity column ratings were from 0 to 10, with a 10 meaning that all kernel lengths were the same. Larger variance in lengths of kernels rated lower. The appearance ratings also were from 0 to 10. They took into consideration how appealing the kernels appeared. Plumpness, smoothness, shininess and uniformity of color of kernel were all factors that were considered. Color of kernel is more or less self-explanatory, the brown color could be considered golden brown.

The last column in Table 5 was the diameter of the tree trunks measured below any forks and generally a couple of feet above the ground. This measurement is related to tree size and the ability to produce fruit. In future years of the study there may be a correlation between this type of measurement and yield.

## Acknowledgments

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**Table 1. Yield components of pecan variety trial harvested 1997 at the Safford Agricultural Center.**

Variety	In-shell Yield (lbs/ac)	Kernel Percent	Kernel Yield (lbs/ac)	Estimated % Length of kernel fill
Cheyenne	1894.1 a	49.6 ab	958.0 a	100 a
WO-3	1820.2 a	53.2 a	966.8 a	98 a
Western Schley	1654.8 ab	50.5 ab	840.4 ab	95 ab
Mohawk	1650.0 ab	50.1 ab	828.4 ab	100 a
Barton	1569.1 ab	47.1 b	739.0 ab	98 a
Wichita	1307.2 ab	51.0 ab	661.2 ab	100 a
Sullivan	1003.2 b	49.9 ab	481.2 b	900 b
Burkett	965.4 b	50.9 ab	491.2 b	100 a
Average	1483.0	50.3	754.8	97.7
LSD(05)	796.4	5.9	422.9	6.0
CV(%)	37.3	8.2	39.4	4.4

**Table 2. Nut weights and dimensions of pecan variety trial harvested 1997 at the Safford Agricultural Center.**

Variety	Nuts per pound	Nut Shell Dimensions			Length to Width Ratio
		Length (in)	Width 1 (in)	Width 2 (in)	
Cheyenne	75.6 abc	1.43 c	0.93 abc	0.80 abc	1.53 c
WO-3	79.6 bcd	1.51 bc	0.88 cde	0.79 bc	1.71 b
Western Schley	98.6 d	1.44 b	0.81 e	0.73 c	1.77 ab
Mohawk	88.9 cd	1.57 c	0.90 bcd	0.78 bc	1.75 b
Barton	90.07 cd	1.43 c	0.94 abc	0.81 ab	1.52 c
Wichita	94.5 d	1.46 c	0.84 de	0.77 bc	1.73 b
Sullivan	65.7 a	1.86 a	0.99 a	0.87 a	1.88 a
Burkett	72.0 ab	1.22 d	0.97 ab	0.84 ab	1.27 d
Average	81.3	1.49	0.91	0.80	1.65
LSD(05)	15.7	0.10	0.07	0.08	0.12
CV(%)	13.5	4.8	5.7	6.5	4.9

**Table 3. Yield components of pecan variety trial harvested 1998 at the Safford Agricultural Center.**

Variety	In-shell Yield (lbs/ac)	Kernel Percent	Kernel Yield (lbs/ac)	% Length of Kernel fill	
				Vis. Est.	Calculation
WO-3	2285.7 a	58.0 ab	1334.5 a	99.0 a	82.2 a
Mohawk	2029.1 a	44.6 c	836.8 b	50.0 c	76.3 ab
Burkett	1000.0 b	51.4 b	514.2 c	95.0 ab	77.9 ab
Western Schley	642.8 bc	58.8 a	383.9 cd	100.0 a	82.0 a
Cheyenne	452.4 bc	58.8 a	269.1 cd	98.3 ab	74.4 b
Wichita	267.9 c	58.0 ab	156.1 d	100.0 a	81.1 ab
Barton	178.6 c	51.8 b	96.6 d	85.0 b	82.0 a
Sullivan	142.9 c	56.4 ab	81.0 d	93.3 ab	81.5 a
Average	874.9	54.7	459.0	90.1	79.7
LSD(05)	571.9	6.6	310.3	13.4	7.0
CV(%)	45.5	8.4	47.0	10.3	6.1

**Table 4. Nut weights and dimensions of pecan variety trial harvested 1998 at the Safford Agricultural Center.**

Variety	Nuts per pound	Nut Shell Dimensions			Length to Width Ratio	Percent Tights
		Length (in)	Width 1 (in)	Width 2 (in)		
WO-3	67.2 ab	1.44 ab	0.83 e	0.75 bcd	1.75 ab	1.5 a
Mohawk	81.7 d	1.57 a	0.96 ab	0.81 ab	1.64 bcd	18.3 a
Burkett	76.9 cd	1.19 c	0.98 a	0.85 a	1.22 e	6.0 a
Western Schley	74.1 bcd	1.43 ab	0.83 de	0.72 d	1.72 abc	6.4 a
Cheyenne	63.9 a	1.38 b	0.93 bc	0.80 abc	1.49 d	11.1 a
Wichita	69.3 abc	1.42 b	0.83 de	0.74 cd	1.70 abc	18.8 a
Barton	76.2 bcd	1.39 b	0.88 cd	0.77 bcd	1.57 cd	13.3 a
Sullivan	80.6 d	1.49 ab	0.81 e	0.70 d	1.86 a	8.3 a
Average	73.3	1.41	0.88	0.77	1.62	10.5
LSD(05)	9.8	0.14	0.05	0.07	0.17	18.3
CV(%)	9.3	6.8	4.2	6.0	7.4	121.5

**Table 5. Nut meat characteristics by pecan variety at the Safford Agricultural Center, trial harvested 1998.**

Variety	Fill Rating	Shell fragment retention	Size uniformity Rating	Appearance Rating	Kernel Color	Trunk Diameter (in)
WO-3	8.8 a	1.0 abc	8.7 ab	9.0 a	med brown	7.3 a
Mohawk	4.7 c	1.8 a	6.3 d	5.3 b	dark brown	5.9 cd
Burkett	5.0 c	0.0 c	9.0 a	8.7 a	med brown	7.0 ab
Western Schley	8.7 a	1.3 ab	8.5 ab	8.3 a	med brown	6.2 bc
Cheyenne	9.0 a	0.0 c	8.3 ab	8.7 a	light brown	6.7 abc
Wichita	9.0 a	0.3 bc	8.0 bc	8.5 a	med brown	4.9 d
Barton	7.0 b	0.3 bc	7.3 c	7.7 a	m/drk brown	7.3 a
Sullivan	8.8 a	0.0 c	8.0 bc	8.0 a	cream	5.9 c
Average	7.6	0.59	8.02	8.02	--	6.4
LSD(05)	1.3	1.1	0.88	1.35	--	0.97
CV(%)	12.0	129.7	7.6	11.7	--	10.5



**Figure 1. Kernel cross-sections demonstrating kernel fill ratings of 10, 8 and 6, respectively.**