Shell Thickness Classifications for 46 Pecan Cultivars Grown in the Southeastern United States

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Shell thickness in pecan [*Carya illinoensis* (Wangenh.) C. Koch] is an important consideration because consumers often prefer thin-shelled nuts that are easy to crack. The term “papershell,” which is not precisely defined but is used in advertising to describe thin-shelled cultivars like ‘Schley’, appeals to this consumer preference. In commercial harvesting, thin-shelled nuts more easily are unintentionally cracked by mechanical harvesting and handling equipment than thicker-shelled nuts (Reid and Heaton, 1977). Shell thickness also may affect preference of pests, particularly birds, for pecan cultivars.

Kays and Payne (1982) measured shell thickness of 14 pecan cultivars and two unnamed selections. Forbus et al. (1983) examined shell thickness of 21 pecan genotypes and found shell thickness to be an important physical property influencing shelling efficiency. Our report expands the available information quantifying shell thickness of common pecan cultivars, groups cultivars into shell thickness categories, and offers suggestions on measuring shell thickness.

Pecans from 46 cultivars were sampled over several years from various orchards and experimental plantings in Alabama and Georgia. We drew a random sample of 10 nuts for each cultivar and cut each pecan longitudinally in the plane of the middle septum. Six measurements were made in that plane, or slightly distant from it if there were obvious irregularities near the juncture of the middle septum and shell. The measurements were at 25%, 50%, and 75% of the distance along the shell circumference from the base of the nut to the apex and were made using a microscope and ocular scale. Means of these

six measurements were calculated as a composite measure of shell thickness. We then further examined the data statistically by cluster analysis using average linking (Johnson and Wicheren, 1982) to determine if measuring could be simplified by selecting fewer locations. The locations with least variation and that best represented overall shell thickness were those sites 25% of the distance along the shell circumference from the base to the apex (Fig. 1). We suggest that shell thickness measurements be made at these locations. Simply clip the lower 25% of the nut off with a York Nut Sheller (Texan Nut Sheller, San Angelo, Texas) and then measure with calipers. If there are obvious thickness abnormalities at the middle septum, as we commonly observed, measure slightly away from it at a location appearing to represent prevailing shell thickness.

The range in shell thickness ranged from 0.39 mm for ‘Hastings’ to 1.26 mm for ‘Rome’ (Table 1). This range was divided into three equally spaced divisions, resulting in the three groupings (Table 1). We suggest the terms “thin,” “moderate,” and “thick” be used to better define shell thickness, and that use of the term “papershell” be reserved for cultivars in the “thin” category, i.e., those with shell thickness < 0.68 mm.

Fig. 1. Location of measurements selected to be representative of average shell thickness. Measurements are near the plane of the middle septum and are 25% of the distance along the shell circumference from the base to the apex.

Table 1. Mean shell thickness of 46 pecan cultivars and suggested shell thickness classifications.

Rank (1 = thickest)	Cultivar	Shell thickness ² (mm)	Range (mm)
Thick (>0.97 mm) ¹			
1	Rome	1.26 ± 0.14	1.03–1.54
2	Surprise	1.04 ± 0.17	0.79–1.24
3	Gloria Grande	1.01 ± 0.10	0.83–1.17
4	Success	1.00 ± 0.13	0.79–1.15
5	Jackson	0.99 ± 0.11	0.82–1.17
6	Moneymaker	0.98 ± 0.22	0.54–1.38
Moderate (0.68 to 0.97 mm)			
7	Jubilee	0.92 ± 0.11	0.79–1.13
8	Pabst	0.89 ± 0.11	0.72–1.09
9	Van Daman	0.87 ± 0.12	0.68–1.06
10	Pioneer	0.85 ± 0.16	0.64–1.03
11	Desirable	0.84 ± 0.11	0.67–1.03
12	Elliott	0.83 ± 0.13	0.67–1.03
13	Nelson	0.83 ± 0.16	0.60–1.09
14	Candy	0.83 ± 0.07	0.74–0.95
15	Choctaw	0.79 ± 0.27	0.51–1.39
16	Kiowa	0.79 ± 0.09	0.64–0.94
17	Davis	0.77 ± 0.10	0.64–0.97
18	Brooks	0.77 ± 0.15	0.50–1.10
19	Stuart	0.77 ± 0.18	0.54–1.01
20	Owens	0.76 ± 0.10	0.53–0.88
21	Maramec	0.75 ± 0.13	0.64–1.04
22	Delmas	0.74 ± 0.11	0.59–0.90
23	Cape Fear	0.72 ± 0.14	0.47–0.87
24	Mobile	0.70 ± 0.14	0.54–0.90
25	Frotscher	0.69 ± 0.15	0.47–0.91
26	Melrose	0.69 ± 0.17	0.46–0.96
27	Shawnee	0.69 ± 0.08	0.56–0.81
28	Farley	0.68 ± 0.18	0.49–1.10
29	Forkert	0.68 ± 0.06	0.62–0.77
Thin or “papershell” (<0.68 mm)			
30	Shoshoni	0.66 ± 0.17	0.49–0.97
31	Mohawk	0.65 ± 0.13	0.38–0.86
32	Chickasaw	0.64 ± 0.12	0.37–0.79
33	Moore	0.63 ± 0.14	0.47–0.90
34	Sumner	0.62 ± 0.08	0.49–0.71
35	Pawnee	0.62 ± 0.09	0.46–0.82
36	Zink	0.62 ± 0.11	0.51–0.87
37	Curtis	0.62 ± 0.10	0.40–0.73
38	Teche	0.61 ± 0.11	0.40–0.74
39	Mahan	0.61 ± 0.10	0.49–0.73
40	Moreland	0.60 ± 0.16	0.32–0.77
41	Woodard	0.58 ± 0.19	0.38–1.00
42	Wichita	0.57 ± 0.11	0.29–0.72
43	Schley	0.54 ± 0.11	0.37–0.77
44	Barton	0.43 ± 0.07	0.33–0.56
45	Cheyenne	0.42 ± 0.06	0.35–0.51
46	Hastings	0.39 ± 0.03	0.35–0.46

¹Mean shell thickness at two locations per nut on 10 nuts of each cultivar ± SD. Measurements were made near the plane of the middle septum, 25% of the distance from the base to the apex.
²Shell thickness classification was determined by dividing the range from thickest to thinnest into three equal divisions of 0.29 mm each.

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