

Table S1.1. Pasteurized almond skin flavonoid and phenolic acid content.

Flavonoid or phenolic acid	Content of Treated Almonds (µg/g almond skin)			
	Raw	PF0	S1	S2
CA	201.4 ± 119.2	204.7 ± 74.6	185.3 ± 103.6	171.3 ± 118.1
EP	120.8 ± 41.4	98.8 ± 30.3	102.9 ± 39.3	92.1 ± 44.5
PCA	19.5 ± 3.2	31.1 ± 1.4	18.0 ± 2.5	16.8 ± 1.4
pHBA	4.9 ± 0.2	5.9 ± 0.8	4.1 ± 0.2	3.9 ± 0.5
Q3R	12.0 ± 3.9	9.3 ± 3.1	11.4 ± 4.6	10.4 ± 2.6
N7Glu	72.2 ± 26.6	59.0 ± 21.2	65.6 ± 23.6	62.7 ± 32.5
Q3Gal	12.7 ± 4.6	10.6 ± 2.8	11.2 ± 4.5	11.1 ± 5.1
K3Gal	13.3 ± 9.1	13.4 ± 7.5	14.6 ± 9.4	13.3 ± 10.9
K3R	243.5 ± 127.5	197.6 ± 128.4	193.5 ± 157.1	221.6 ± 136.5
diOHK	77.4 ± 19.8	58.9 ± 14.2	68.9 ± 8.9	63.9 ± 21.4
Iso3R	720.7 ± 124.8	615.4 ± 144.0	574.7 ± 194.0	659.8 ± 113.5
K3Glu	32.4 ± 11.1	27.6 ± 8.2	31.7 ± 14.0	41.8 ± 20.2
Iso3Glu	142.0 ± 109.5	131.2 ± 93.3	131.2 ± 114.2	123.8 ± 128.5
E	4.9 ± 0.6	3.8 ± 0.1	4.3 ± 0.5	4.4 ± 0.8
Q	1.4 ± 0.5	4.9 ± 1.3	191.6 ± 324.9	2.4 ± 1.4
N	120.4 ± 12.9	89.2 ± 13.3	102.2 ± 6.0	84.3 ± 38.8
K	3.1 ± 1.6	5.7 ± 1.2	3.5 ± 1.9	3.0 ± 2.1
Iso	6.6 ± 5.6	16.9 ± 11.4	10.2 ± 11.4	7.7 ± 8.8
Sum	1809.1 ± 117.2	1583.8 ± 109.6	1724.9 ± 56.5	1594.3 ± 244.7

Data is mean ± SD, n = 3 of Butte, Carmel, and Nonpareil cultivars. Abbreviations: CA-catechin, EC-epicatechin, DiOHK-dihydroxykaempferol, E- eriodictyol, Iso- isorhamnetin, Iso3Glu-isorhamnetin-3-O-glucoside, Iso3R-isorhamnetin-3-O-rutinoside, K- kaempferol, K3Gal- kaempferol-3-O-galactoside, K3Glu- kaempferol-3-O-glucoside, K3R-kaempferol-3-O-rutinoside, N-naringenin, N7Glu-naringenin-7-O-glucoside, PCA- procatechuic acid, pHBA- p-hydroxybenzoic acid, Q- quercetin, Q3Gal- quercetin-3-O-galactoside, Q3R- quercetin-3-O-rutinoside.

Table S1.2. Pasteurized almond flavonoid and phenolic acid content.

Flavonoid or phenolic acid	Content of Treated Almonds (µg/100 g almonds)			
	Raw	PF0	S1	S2
CA	879.9 ± 520.8	894.7 ± 326.2	809.9 ± 452.9	748.8 ± 516.0
EP	528.1 ± 180.9	431.7 ± 132.4	449.7 ± 171.7	402.6 ± 194.3
PCA	85.1 ± 14.2	135.8 ± 6.0	78.9 ± 10.8	73.6 ± 5.9
pHBA	21.3 ± 0.7	25.9 ± 3.6	18.0 ± 1.0	17.1 ± 2.2
Q3R	52.5 ± 17.1	40.6 ± 13.5	49.7 ± 20.0	45.3 ± 11.5
N7Glu	315.6 ± 116.1	257.6 ± 92.7	286.8 ± 103.0	274.0 ± 142.1
Q3Gal	55.4 ± 20.0	46.3 ± 12.2	48.9 ± 19.9	48.4 ± 22.5
K3Gal	58.2 ± 39.9	58.7 ± 32.6	63.7 ± 41.0	57.9 ± 47.5
K3R	1064.0 ± 557.3	863.4 ± 561.1	845.6 ± 686.3	968.3 ± 596.6
diOHK	338.1 ± 86.6	257.5 ± 62.0	301.0 ± 38.8	279.2 ± 93.6
Iso3R	3149.4 ± 545.6	2689.3 ± 629.4	2511.4 ± 848.0	2883.2 ± 495.8
K3Glu	141.6 ± 48.6	120.4 ± 35.6	138.7 ± 61.1	182.8 ± 88.2
Iso3Glu	620.4 ± 478.4	573.1 ± 407.8	573.5 ± 499.2	541.0 ± 561.7
E	21.2 ± 2.6	16.7 ± 0.6	18.7 ± 2.1	19.2 ± 3.4
Q	6.0 ± 2.4	21.2 ± 5.8	837.1 ± 1419.7	10.3 ± 5.9
N	526.2 ± 56.4	389.6 ± 58.3	446.7 ± 26.1	368.5 ± 169.5
K	13.8 ± 7.0	24.8 ± 5.4	15.2 ± 8.1	13.2 ± 9.3
Iso	28.9 ± 24.4	73.9 ± 50.0	44.6 ± 50.0	33.7 ± 38.5
Sum	7905.6 ± 512.3	6921.4 ± 478.9	7538.0 ± 247.0	6967.1 ± 1069.5

Data is mean ± SD, n = 3 of Butte, Carmel, and Nonpareil cultivars. Abbreviations as in Table S1.1.

Table S2.1. Raw and roasted almond skin flavonoid and phenolic acid content.

Flavonoid or phenolic acid	Content of Treated Almonds ($\mu\text{g/g}$ skin)			
	Raw		Roasted	
CA	181.0 \pm 94.7		196.7 \pm 72.5	
EP	101.9 \pm 35.5		96.1 \pm 32.5	
PCA	18.9 \pm 2.4		30.4 \pm 6.3	
pHBA	4.5 \pm 0.5		6.2 \pm 1.0	
Q3R	9.8 \pm 3.6		9.5 \pm 2.9	
N7Glu	51.4 \pm 23.5		54.0 \pm 20.1	
Q3Gal	9.8 \pm 4.0		10.2 \pm 3.7	
K3Gal	10.0 \pm 6.5		12.6 \pm 6.0	
K3R	210.5 \pm 109.1		195.7 \pm 109.0	
diOHK	59.7 \pm 21.7		57.9 \pm 18.0	
Iso3R	641.1 \pm 125.0		601.9 \pm 113.9	
K3Glu	26.0 \pm 10.9		27.5 \pm 9.3	
Iso3Glu	124.1 \pm 97.5		126.7 \pm 91.6	
E	3.7 \pm 1.4		3.6 \pm 1.1	
Q	1.3 \pm 0.7		4.0 \pm 2.0	
N	93.1 \pm 24.3		85.4 \pm 12.9	
K	2.8 \pm 1.8		5.0 \pm 2.2	
Iso	7.1 \pm 7.2		14.2 \pm 11.2	
<i>Sum</i>	1556.8 \pm 182.6		1537.4 \pm 145.9	

Data is mean \pm SD, n = 12 of Butte, Carmel, and Nonpareil cultivars. Abbreviations as in Table S1.1.

Table S2.2. Raw and roasted almond skin flavonoid and phenolic acid content.

Flavonoid or phenolic acid	Content of Treated Almonds ($\mu\text{g}/100$ g almonds)			
	Raw		Roasted	
CA	714.9 \pm 374.2		785.0 \pm 289.1	
EP	402.6 \pm 140.0		383.3 \pm 129.6	
PCA	74.8 \pm 9.6		121.3 \pm 25.2	
pHBA	17.9 \pm 1.9		24.6 \pm 4.2	
Q3R	38.8 \pm 14.3		37.8 \pm 11.5	
N7Glu	202.9 \pm 93.0		215.3 \pm 80.4	
Q3Gal	38.7 \pm 15.8		40.6 \pm 14.8	
K3Gal	39.7 \pm 25.8		50.1 \pm 24.0	
K3R	831.6 \pm 431.1		781.0 \pm 434.7	
diOHK	235.8 \pm 85.9		231.1 \pm 71.7	
Iso3R	2532.4 \pm 493.6		2401.6 \pm 454.4	
K3Glu	102.7 \pm 43.0		109.8 \pm 37.3	
Iso3Glu	490.4 \pm 385.3		505.6 \pm 365.5	
E	14.8 \pm 5.7		14.5 \pm 4.2	
Q	4.9 \pm 2.9		15.8 \pm 7.9	
N	367.7 \pm 96.2		340.6 \pm 51.3	
K	10.9 \pm 7.0		19.8 \pm 8.7	
Iso	27.9 \pm 28.6		56.7 \pm 44.8	
<i>Sum</i>	6149.3 \pm 721.1		6134.4 \pm 582.1	

Data is mean \pm SD, n = 12 of Butte, Carmel, and Nonpareil cultivars. Abbreviations as in Table S1.1.

Table S3.1. Almond skin flavonoid and phenolic acid content during storage at 4 °C.

Flavonoid or phenolic acid	Content at Time Point (µg/g almond skin)							
	0 mo		3 mo		9 mo		15 mo	
CA	184.3 ± 97.9	198.2 ± 130.4	236.8 ± 143.1	277.6 ± 157.3				
EP	68.6 ± 32.5	67.7 ± 39.8	69.6 ± 35.2	88.2 ± 50.1				
PCA	44.6 ± 15.3	28.1 ± 9.9	15.0 ± 4.9	24.9 ± 9.0				
pHBA	4.0 ± 0.9	4.0 ± 1.2	48.6 ± 17.5	75.2 ± 25.0				
Q3R	8.1 ± 3.5	8.8 ± 4.2	5.6 ± 2.5	8.5 ± 3.1				
N7Glu	35.8 ± 20.4	41.5 ± 24.8	45.8 ± 27.8	58.9 ± 33.3				
Q3Gal	6.4 ± 4.7	10.0 ± 5.8	11.3 ± 9.1	16.0 ± 10.8				
K3Gal	7.2 ± 6.3	7.7 ± 6.2	6.4 ± 4.8	8.8 ± 7.6				
K3R	196.2 ± 154.5	193.9 ± 136.1	280.6 ± 208.6	295.0 ± 217.6				
diOHK	49.9 ± 26.6	41.4 ± 19.6	110.7 ± 52.7	116.6 ± 52.3				
Iso3R	638.6 ± 201.1	658.2 ± 189.6	1183.6 ± 341.7	1273.8 ± 364.7				
K3Glu	23.2 ± 11.8	26.5 ± 14.9	22.4 ± 12.6	29.1 ± 15.7				
Iso3Glu	139.0 ± 141.9	158.2 ± 150.7	219.9 ± 233.9	315.1 ± 324.7				
E	2.7 ± 1.1	3.1 ± 1.3	3.9 ± 1.6	4.9 ± 1.8				
Q	3.1 ± 0.9	3.0 ± 1.2	4.2 ± 1.7	2.2 ± 0.8				
N	83.4 ± 41.3	105.2 ± 45.9	50.8 ± 22.8	36.3 ± 14.8				
K	2.4 ± 2.0	3.2 ± 3.1	3.7 ± 3.8	4.8 ± 4.5				
Iso	10.9 ± 18.7	12.5 ± 18.8	2.3 ± 5.1	8.1 ± 13.9				
Sum	1508.5 ± 410.7	1571.4 ± 448.7	2321.0 ± 618.2	2643.9 ± 659.2				

Data is mean ± SD, n = 13 of 7 almond cultivars. Abbreviations as in Table S1.1.

Table S3.2. Almond skin flavonoid and phenolic acid content during storage at 23 °C.

Flavonoid or phenolic acid	Content at Time Point (µg/g almond skin)							
	0 mo		3 mo		9 mo		15 mo	
CA	184.3 ± 97.9	220.4 ± 126.2	220.5 ± 112.9	338.3 ± 189.9				
EP	68.6 ± 32.5	88.9 ± 47.4	64.6 ± 34.5	103.2 ± 48.8				
PCA	44.6 ± 15.3	44.4 ± 11.1	28.0 ± 4.0	50.4 ± 8.9				
pHBA	4.0 ± 0.9	4.2 ± 0.9	91.8 ± 23.6	169.8 ± 25.3				
Q3R	8.1 ± 3.5	8.0 ± 3.1	5.7 ± 2.3	12.3 ± 10.8				
N7Glu	35.8 ± 20.4	41.8 ± 25.3	48.6 ± 29.1	65.7 ± 36.4				
Q3Gal	6.4 ± 4.7	8.8 ± 6.6	11.7 ± 10.1	19.4 ± 15.5				
K3Gal	7.2 ± 6.3	8.0 ± 7.2	6.2 ± 5.3	10.7 ± 7.0				
K3R	196.2 ± 154.5	185.0 ± 139.2	261.9 ± 186.7	316.8 ± 223.6				
diOHK	49.9 ± 26.6	41.9 ± 22.1	112.1 ± 50.2	123.8 ± 57.1				
Iso3R	638.6 ± 201.1	598.6 ± 185.1	1138.0 ± 325.7	1360.6 ± 407.0				
K3Glu	23.2 ± 11.8	24.0 ± 14.1	22.7 ± 12.0	52.1 ± 47.6				
Iso3Glu	139.0 ± 141.9	164.0 ± 169.0	219.3 ± 235.5	325.0 ± 376.1				
E	2.7 ± 1.1	2.6 ± 1.1	4.2 ± 1.7	5.2 ± 2.0				
Q	3.1 ± 0.9	2.5 ± 0.6	3.9 ± 1.7	2.4 ± 0.9				
N	83.4 ± 41.3	90.1 ± 41.4	46.0 ± 19.3	39.7 ± 16.8				
K	2.4 ± 2.0	2.4 ± 2.4	4.4 ± 4.6	5.2 ± 4.6				
Iso	10.9 ± 18.7	9.0 ± 13.7	3.4 ± 8.5	9.3 ± 15.6				
Sum	1508.5 ± 410.7	1544.6 ± 459.3	2292.9 ± 601.0	3009.9 ± 825.7				

Data is mean ± SD, n = 13 of 7 almond cultivars. Abbreviations as in Table S1.1.

Table S4. Almond flavonoid and phenolic acid content of equivalently stored harvest years.

Flavonoid or phenolic acid	Content by Year ($\mu\text{g}/100\text{ g almonds}$)				P-value
	2006 (15 mo)		2007 (15 mo)		
CA	891.8 \pm	866.8	1318.8 \pm	736.2	0.1885
EP	487.5 \pm	122.0	403.5 \pm	197.1	0.2035
PCA	58.9 \pm	9.6	195.4 \pm	33.1	3.14E-13
pHBA	15.6 \pm	2.2	659.6 \pm	105.8	2.14E-17
Q3R	66.8 \pm	24.1	47.9 \pm	42.6	0.1752
N7Glu	220.7 \pm	135.9	261.1 \pm	162.6	0.4988
Q3Gal	54.5 \pm	40.5	75.3 \pm	57.7	0.2961
K3Gal	39.0 \pm	21.5	42.4 \pm	29.9	0.7458
K3R	670.9 \pm	469.1	1214.4 \pm	836.7	0.0522
diOHK	287.2 \pm	87.1	491.5 \pm	263.5	0.0139
Iso3R	2698.7 \pm	727.5	5264.1 \pm	1511.2	1.14E-05
K3Glu	124.1 \pm	53.4	204.3 \pm	187.5	0.1510
Iso3Glu	686.5 \pm	576.4	1280.8 \pm	1464.1	0.1859
E	17.5 \pm	7.8	20.2 \pm	8.4	0.3911
Q	19.2 \pm	6.8	9.5 \pm	3.6	0.0001
N	436.0 \pm	142.3	155.6 \pm	69.1	1.31E-06
K	15.8 \pm	17.9	20.4 \pm	17.8	0.5245
Iso	65.5 \pm	105.6	35.8 \pm	57.9	0.3829
<i>Sum</i>	6856.2 \pm	1926.8	11700.4 \pm	3246.3	0.0001

Data is mean \pm SD, n = 13 of 7 almond cultivars, significance by paired t-test. Abbreviations as in Table S1.1.