Table S1: Fresh fruit and shell fruit weight analysis of variance

Indicator		time (developmental stage) × cultivar	time (developmental stage)	cultivar
Fresh fruit Weight	Sum of squares	32.6	707.6	68.81
	degree of freedom	6	6	1
	mean square	5.434	117.9	68.81
	F (DFn, DFd)	F (2.586, 10.34) = 156.2	F (2.586, 10.34) = 3391	F (1, 4) = 1830
	P	*P*<0.0001	*P*<0.0001	*P*<0.0001
Shell fruit Weight	Sum of squares	16.64	437.4	43.9
	degree of freedom	6	6	1
	mean square	2.773	72.9	43.9
	F (DFn, DFd)	F (2.134, 8.534) = 43.96	F (2.134, 8.534) = 1156	F (1, 4) = 456.4
	P	*P*<0.0001	*P*<0.0001	*P*<0.0001

Table S2: Morphological indicators analysis of variance

Indicator		time (developmental stage) × cultivar	time (developmental stage)	cultivar
Longitudinal diameter of fruits with green exocarp	sum of squares	35.43	442.2	73.47
	degree of freedom	6	6	1
	mean square	5.906	73.69	73.47
	F (DFn, DFd)	F (2.870, 11.48) = 130.0	F (2.870, 11.48) = 1623	F (1, 4) = 2277
	P	*P*<0.0001	*P*<0.0001	*P*<0.0001

	sum of squares	62.87	566.2	62.32
	degree of freedom	6	6	1
Transverse diameter of fruits with green exocarp	mean square	10.48	94.36	62.32
	F (DFn, DFd)	F (2.838, 11.35) = 342.8	F (2.838, 11.35) = 3087	F (1, 4) = 3235
	P	*P*<0.0001	*P*<0.0001	*P*<0.0001
	sum of squares	29.62	520.7	65.93
	degree of freedom	6	6	1
	mean square	4.937	86.79	65.93
Longitudinal diameter of shell fruit	F (DFn, DFd)	F (1.406, 5.625) = 21.52	F (1.406, 5.625) = 378.3	F (1, 4) = 1020
	P	*P*=0.0031	*P*<0.0001	*P*<0.0001
	sum of squares	23.77	769.1	52.19
	degree of freedom	6	6	1
	mean square	3.962	128.2	52.19
Transverse diameter of shell fruit	F (DFn, DFd)	F (1.544, 6.178) = 17.47	F (1.544, 6.178) = 565.1	F (1, 4) = 590.9
	P	*P*=0.0036	*P*<0.0001	*P*<0.0001
	sum of squares	0.01247	0.1842	0.0004667
	degree of freedom	6	6	1
	mean square	0.002078	0.0307	0.0004667
Fruit Shape Index of Fruits with Green exocarp	F (DFn, DFd)	F (2.361, 9.444) = 27.13	F (2.361, 9.444) = 400.8	F (1, 4) = 6.323
	P	*P*<0.0001	*P*<0.0001	*P*=0.0657

Fruit shape index of shell fruit	sum of squares	0.08397	0.2249	0.01412
	degree of freedom	6	6	1
	mean square	0.01399	0.03748	0.01412
	F (DFn, DFd)	F (2.022, 8.089) = 363.6	F (2.022, 8.089) = 973.7	F (1, 4) = 137.9
	P	*P*<0.0001	P<0.0001	*P*=0.0003

Table S3: ‘A4 ’vs ‘OC’ analysis of developmental significance (Significant differences are denoted as * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; **** $p < 0.0001$and “ns” denotes not significant)

Growth period, DAF	Fresh fruit welght	Shell fruit welght	Longitudinal diameter of fruits with green exocarp	Transverse diameter of fruits with green exocarp	Longitudinal diameter of shell fruit	Transverse diameter of shell fruit	Fruit Shape Index of Fruits with Green exocarp	Fruit shape index of shell fruit
	p							
50	ns	***	****	****	*	*	***	*
65	ns	*	*	***	ns	ns	**	**
80	ns	*	***	**	**	ns	ns	***
95	ns	***	***	****	***	**	ns	ns
110	ns	***	****	***	**	**	ns	ns
125	ns	**	**	**	****	****	*	ns
140	**	*	**	***	***	**	*	ns

Table S4: Fatty acid content analysis of variance

Fatty acid content		time (developmental stage) × cultivar	time (developmental stage)	cultivar
SFA	sum of squares	3746	1629	113.7
	degree of freedom	6	6	1
	mean square	624.3	271.5	113.7
	F (DFn, DFd)	F (2.745, 10.98) = 16.46	F (2.745, 10.98) = 7.156	F (1, 4) = 7.573
	P	*P*=0.0003	*P*=0.0069	*P*=0.0513
MUFA	sum of squares	38468	99740	3608
	degree of freedom	6	6	1
	mean square	6411	16623	3608
	F (DFn, DFd)	F (1.827, 7.309) = 23.99	F (1.827, 7.309) = 62.20	F (1, 4) = 15.60
	P	*P*=0.0007	*P*<0.0001	*P*=0.0168
PUFA	sum of squares	1009	968.4	25.94
	degree of freedom	6	6	1
	mean square	168.1	161.4	25.94
	F (DFn, DFd)	F (2.352, 9.409) = 24.83	F (2.352, 9.409) = 23.84	F (1, 4) = 16.41
	P	*P*=0.0001	*P*=0.0002	*P*=0.0155
Total fatty acid content	sum of squares	77776	131190	2970
	degree of freedom	6	6	1
	mean square	12963	21865	2970
	F (DFn, DFd)	F (1.825, 7.301) = 27.47	F (1.825, 7.301) = 46.33	F (1, 4) = 8.458
	P	*P*=0.0005	*P*<0.0001	*P*=0.0438

Table S5: Hexadecanoic acid, cis-Vaccenic acid, Palmitoleic acid and Oleic acid content analysis of variance

Fatty acid content		time (developmental stage) × cultivar	time (developmental stage)	cultivar
Hexadecanoic acid content	sum of squares	2707951499	887715242	6335153
	degree of freedom	6	6	1
	mean square	451325250	147952540	6335153
	F (DFn, DFd)	F (2.574, 10.30) = 28.34	F (2.574, 10.30) = 9.292	F (1, 4) = 0.2401
	P	P<0.0001	*P*=0.0035	*P*=0.6498
cis-Vaccenic acid content	sum of squares	1669938574	13055912065	12731793
	degree of freedom	6	6	1
	mean square	278323096	2175985344	12731793
	F (DFn, DFd)	F (3.014, 12.06) = 16.32	F (3.014, 12.06) = 127.6	F (1, 4) = 0.6910
	P	P=0.0002	P<0.0001	P=0.4526
Palmitoleic acid content	sum of squares	10271062470	15236293704	2414894020
	degree of freedom	6	6	1
	mean square	1711843745	2539382284	2414894020
	F (DFn, DFd)	F (1.717, 6.867) = 28.24	F (1.717, 6.867) = 41.89	F (1, 4) = 36.32
	P	P=0.0006	P=0.0002	P=0.0038
Oleic acid content	sum of squares	77776	14288741348	8304909
	degree of freedom	6	6	1
	mean square	12963	2381456891	8304909
	F (DFn, DFd)	F (1.825, 7.301) = 27.47	F (2.006, 8.024) = 62.30	F (1, 4) = 0.2121
	P	P=0.0005	P<0.0001	P=0.6690

Table S6: ‘A4 ’vs ‘OC’ analysis of developmental significance (Significant differences are denoted as * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; **** $p < 0.0001$and “ns” denotes not significant)

Growth period, DAF	Hexadecanoic acid	Palmitoleic acid	Oleic acid	cis-Vaccenic acid
	p			
50	**	****	ns	ns
65	ns	*	ns	ns
80	ns	**	ns	ns
95	*	*	*	**
110	*	ns	ns	ns
125	***	ns	ns	*
140	**	**	ns	ns

Table S7: Changes in fatty acids during the development of ‘A4’ macadamias. (mean ± standard deviation)

	50 DAF	65 DAF	80 DAF	95 DAF	110 DAF	125 DAF	140 DAF
SFA （ng/g)							
Decanoic acid	18.15±7.88	52.33±0.76	16.13±5.85	84.51±13.55	41.42±3.21	132.46±10.66	62.2±14.62
Dodecanoic acid	1882.37±346.11	1378±299.04	665.65±136.43	1072.26±89.34	674.28±120.23	794.81±154.21	920.11±135.42
Tridecanoic acid	38.53±6.02	37.56±0.98	14.52±7.64	28.21±0.87	10.11±0	10.11±0	10.11±0
Tetradecanoic acid	1053.06±635.32	1533.66±575.2	1767.79±874.64	2554.09±1286.72	2413.54±868.34	1766.63±773.21	561.7±7.7
Pentadecanoic acid	287.15±17.55	281.29±42.69	62.2±3.81	76.57±3.82	68.65±9.81	111.89±2.46	83.66±2.25
Hexadecanoic acid	27239.34±1666.27	38016.93±3829.34	29632.27±2756.05	33073.51±2598.22	33571.25±6994.81	59159.37±2637.42	47903.89±3285.79
Heptadecanoic acid	78.17±7.85	96.24±20.19	48.39±5.93	55.79±4.32	35.35±5.01	71.7±6.01	14.02±5.93
Octadecanoic acid	20519.26±4500.54	16963.41±2577.26	12885.69±1513.75	15717.23±1997.38	18217.89±2804.6	21684.13±3775.47	16364.3±2624.62
Arachidic acid	324.14±70.32	332.96±58.15	2558.43±683.25	1971.36±655.44	3477.15±1147.61	1964.59±516.97	3349.15±552.08
Heneicosanoic acid	28.14±1.93	4.04±0	117.35±20.75	41.67±20.55	115.08±40.45	84.53±17.63	50.54±18.89
Docosanoic acid	229.47±57.43	214.14±51.84	649.33±213.48	468.51±132.08	823.52±166.07	527.65±47.2	818.31±151.41

Tricosanoic acid	87.42±22.59	41.76±11.31	119.68±22.66	44.05±11.04	115.79±26.58	124.12±13.7	86.11±42.53
Tetracosanoic acid	697.04±77.9	393.52±46.51	522.72±166.56	442.34±102.15	452.39±64.51	364.85±62.14	677.29±300.4
MUFA (ng/g)							
Myristoleic acid	31.64±7.54	137.1±9.86	5.63±0	82.4±7.16	73.85±9.8	33.17±1.75	35.6±8.44
Myristelaidic acid	19.7±9.58	30.21±12.25	10.12±0	33.92±2.42	10.12±0	33.22±6.12	29.22±2.02
cis-10-Pentadecenoic acid	23.14±5.81	135.66±13.59	16.77±3.29	23.57±1.88	7.75±3.18	13±0.53	21.55±6.49
trans-10-Pentadecenoic acid	22.2±0.35	34.11±8.52	9.07±3.49	22.09±0.9	16.95±2.92	31.23±2.45	11.92±4.75
Palmitoleic acid	4887.37±1340.84	36457.41±2736.66	22323.12±8539.58	48109.21±6362.22	33069.71±1935.17	41191.26±11467.5	52821.87±168.96
Palmitelaidic acid	641.63±308.85	929.86±464.42	530.26±122.51	724.95±28.44	859.95±168.51	618.14±263.6	215.18±145.32
cis-10-Heptadecenoic acid	183.91±10.35	492.7±14.3	169.65±10.78	209.64±10.73	291.62±9.55	274.76±29.72	176.15±7.1
trans-10-Heptadecenoic acid	10±1.15	3.58±0	20.53±1.77	14.22±3.46	48.8±6.24	31.18±2.11	8.13±0.98
Oleic acid	8682.56±2780.08	17513.56±2779.12	41464.2±7340.16	40320.48±6830.4	59989.11±3018.71	67677.25±12971.46	55877.56±6384.44

cis-Vaccenic acid	8532.04±2438.1	17316.7±2934.1	41123.58±6858.76	35712.02±1863.3	59386.27±2548.99	60331.15±5783.48	56121.06±5933.71
Elaidic acid	124.14±20.94	197.26±20.98	1461.97±338.01	1266.21±113.52	2355.52±1065.23	3366.87±760.64	682.83±58.74
trans-Vaccenic acid	122.37±17.47	236.22±42.36	1553.81±341.99	1051.21±394.46	2427.74±1042.3	3235.55±691.08	973.12±369.91
trans-10-Nonadecenoic acid	2.79±0	3.71±1.61	14.81±3.25	25.99±7.65	12.96±2.05	24.86±5.01	73.49±25.75
cis-11-Eicosenoic acid	434.28±84.2	516.93±168.53	3278.02±1099.11	2470.91±502.66	2875.88±720.39	2230.82±351.06	2298.77±374.88
trans-11-Eicosenoic acid	8.27±0	8.27±0	163.52±27.16	164.87±3.35	425.99±103.52	371.39±136.11	199.85±36.83
Erucic acid	396.68±141.75	515.2±59.36	919.9±207.51	591.66±125.6	884.79±382.1	637.37±194.77	928.24±239.9
Nervonic acid	270.2±60.62	331.47±135.46	32.71±4.47	29.08±13.06	22.66±8.02	10.72±2.64	38.09±12.29
Petroselinic acid	24.09±11.39	35.1±11.5	114.38±50.68	99.69±9.23	222.32±59.66	249.28±84.31	55.73±2.03
PUFA (ng/g)							
Linoleic acid	7463.37±1886.32	4808.99±1532.32	7262.72±2605.29	10442.94±899.43	7391.2±1612.07	14331.39±4162.02	17934.77±1622.29
Linoelaidic acid	33.67±0	33.67±0	662.84±297.78	638.71±125.26	1267.8±163.02	1560.25±448.9	139.59±16.15

gamma-Linolenic acid	13.5±0	120.28±5.53	418.62±18.57	13.5±0	495.92±180.41	820.79±225.28	659.58±238.33
alpha-Linolenic acid	3313.63±88.92	719.21±201.45	1996.96±74.09	3088.37±87.52	2776.68±634.8	3171.5±1203.26	3640.55±243.49
cis-11,14-Eicosadienoic acid	69.39±4.5	122.83±0.23	96.18±12.89	118.46±11.73	104.46±20.33	85.47±35.58	33.6±12.66
cis-11,14,17-Eicosatrienoic acid	27.21±5.36	34.87±16.59	24.19±10.76	23.41±6.06	27.32±16.7	9.76±1.31	5.74±1.85
Arachidonic acid	48.93±2.3	21.97±2.31	37.53±17.59	32.65±20.84	60.21±23.2	50.61±14.96	8.89±1.91
cis-13,16-Docosadienoic acid	56.37±18.9	38.85±26.2	24.45±12.81	19.69±9.26	22.94±12.79	10.15±0	34.36±11.2
cis-5,8,11,14,17-Eicosapentaenoic acid	5.33±0.3	2.25±1.88	1.16±0	1.16±0	1.8±0.64	6.44±1.02	1.16±0

cis-4,7,10,13,16,19-Docosahexaenoic acid	4.23±0	4.23±0	57.45±30.15	93.07±20.91	222.74±114.4	78.23±37.79	24.96±8.48

Table S8: Changes in fatty acids during the development of 'OC' macadamias. (mean ± standard deviation)

	50 DAF	65 DAF	80 DAF	95 DAF	110 DAF	125 DAF	140 DAF
SFA (ng/g)							
Decanoic acid	25.95±0.79	10.28±0	111.25±14.32	42.75±0.84	55.05±12.58	39.95±13.38	16.71±6.43
Dodecanoic acid	1828.95±20.94	1008.95±112.8	912.17±17.35	2870.64±85.37	1038.18±74.13	775.92±32.78	1360.79±393.6
Tridecanoic acid	48.14±5.61	40.74±8.92	22.51±0.72	21.08±0.85	10.11±0	10.11±0	21.14±0.4
Tetradecanoic acid	2671.92±1477.93	2876.7±386.41	2041.88±932.11	2402.96±1010.07	1430.18±100.69	1579.02±277.63	1273.47±694.09
Pentadecanoic acid	361.02±32.79	177.79±43.72	106.05±12.77	133.01±52.43	82.82±6.13	91.94±17.82	139.33±22.28
Hexadecanoic acid	39602.33±1942.48	32798.23±8002.69	30916.84±1671.37	48851.54±5315.54	33907.67±552.38	28443.09±2451.64	33695.7±3499.23

Heptadecanoic acid	148.27±20.61	188.46±10.12	82.35±12.04	40.71±2.52	103.3±10.73	138.74±19.42	140.28±9.89
Octadecanoic acid	19829.22±1872.58	16521.2±4322.29	12354.13±3036.08	22087.35±4070.52	14838.52±3241.46	15351.32±3379.97	14897.97±3228.06
Arachidic acid	202.04±27.96	347.1±47.69	2305.59±296.96	3388.61±725.96	1861.86±62.15	1307.23±60.64	3312.7±458.77
Heneicosanoic acid	5.39±2.33	8.33±7.43	116.56±47.69	155.71±12.47	152.82±48.22	98.27±10.04	64.29±15.84
Docosanoic acid	125.71±11.86	160.92±30.85	647.65±90.95	816.88±142.85	465.11±46.26	347.77±32.27	618.47±58.32
Tricosanoic acid	38.22±9.6	31.53±8.27	85.52±13.05	184.62±18.36	178.11±18.4	139.04±61.35	87.72±5.45
Tetracosanoic acid	514.44±99.67	363.45±90.07	535.4±51.14	698.98±153.57	337.91±40.49	323.12±19.92	593.05±81.88
MUFA (ng/g)							
Myristoleic acid	164.93±6.09	228.79±41.07	150.04±3.82	125.33±17.35	59.27±8.55	32.17±9.09	45.56±4.16
Myristelaidic acid	47.79±5.83	50.03±8.75	34.01±2.43	10.12±0	28.26±4.48	26.11±1.57	25.03±2.11
cis-10-Pentadecenoic acid	140.01±4.1	208.97±15.99	41.89±3.91	53.57±3.4	13.34±3.89	13.19±4.3	22.67±0.29

trans-10-Pentadecenoic acid	24.47±0.06	27.65±2.01	18.36±3.56	18.8±5.93	17.26±5.59	12.86±4.03	20.11±7.76
Palmitoleic acid	30540.36±1780.45	51156.8±6285.73	60055.92±7919.16	119374.77±21492.37	36154.05±5198.03	18446.44±2281.63	29289.52±1690.42
Palmitelaidic acid	1041.14±813.83	1288.74±434.41	659.53±324.17	274.31±8.35	553.47±82.79	429.82±52.75	231.9±46.66
cis-10-Heptadecenoic acid	476.47±0.24	489.46±52.27	252.7±63.47	382.68±13.79	479.7±12.56	344.9±27.12	469.43±38.22
trans-10-Heptadecenoic acid	3.58±0	9.88±1.04	33.59±2.75	19.39±6.95	49.53±14.42	29.6±3.67	57.85±7.77
Oleic acid	14533.93±3298.24	14046.43±3451.6	48221.54±2533.13	68702.23±9692.72	57453.08±4922.78	45808.04±7168.57	48984.92±2023.5
cis-Vaccenic acid	12664.18±43.6	14011.09±3340.25	48555.91±3532.49	62474.99±4428.15	56126.45±3439.85	44960.45±6590.44	47437.87±1667.71
Elaidic acid	129.29±15.02	290.09±46.53	1969.06±316.08	1631.37±491.84	3105.84±467.07	1395.53±57.98	1269.86±131.22
trans-Vaccenic acid	104.78±9.81	165.76±24.86	2138.32±317.75	1557.12±450.9	3181.03±472.92	1409.98±9.82	1095.8±23.86

trans-10-Nonadecenoic acid	2.79±0	4.21±2.47	2.79±0	241.46±51.97	61.09±8.67	47.46±4.29	78.46±8.32
cis-11-Eicosenoic acid	582.09±88.83	692.56±69.5	4115.79±893.11	5781.84±1255.26	2552.06±316.85	1291.22±127.8	1642.2±335.21
trans-11-Eicosenoic acid	8.27±0	8.27±0	245.32±43.77	281.06±13.61	307.72±38.21	153.37±43.46	153.43±27.74
Erucic acid	648.26±31.61	517.28±101.17	1558.45±149.7	3326.88±916.15	1786.17±261.07	857.1±35.64	661.35±125.84
Nervonic acid	673.5±29.51	304.65±38.82	61.23±9.84	72.94±5.92	29.48±4.91	17.06±10.69	11.51±6.71
Petroselinic acid	43.02±18.1	50.05±4.02	143.34±61.5	52.41±1.41	201.85±39.76	93.47±44.89	99.75±10.19
PUFA (ng/g)							
Linoleic acid	4378.96±126.88	10247.36±1707.7	8555.34±1124.55	26302.43±4277.07	9493.12±1323.91	10821.84±1220.98	8356.42±692.03
Linoelaidic acid	33.67±0	33.67±0	1160.6±248.9	537.83±230.18	1523.34±156.37	1199.47±21.27	669.04±47.57
gamma-Linolenic acid	13.5±0	3797.8±3521.72	292.05±14.18	571.97±30.63	770.13±29.81	672.07±223.72	247.42±76.02
alpha-Linolenic acid	814.63±321.97	1439.6±387.22	3153.14±255.6	5767.54±681.39	2484.53±304.16	1219.25±53.67	920.51±128.78

cis-11,14-Eicosadienoic acid	90.1±33.62	65.69±12.16	149.69±56.34	105.01±30.22	105.95±7.87	42.49±18.31	45.31±4.36
cis-11,14,17-Eicosatrienoic acid	60.36±19.94	50.11±15.84	50.61±16.98	32.5±13.77	27.91±5.6	9.6±2.06	9.09±4.55
Arachidonic acid	1.71±0.57	26.87±12.12	64.36±28.25	20.78±4.11	75.84±10.39	120.38±14.55	59.81±32.18
cis-13,16-Docosadienoic acid	63.35±11.53	38.84±7.13	107.58±27.59	182.5±43.18	194.37±56.51	73.57±6.36	39.45±6.64
cis-5,8,11,14,17-Eicosapentaenoic acid	1.16±0	1.16±0	4.48±1.36	8.13±1.43	9.45±1.06	5.23±1.13	1.96±0.79
cis-4,7,10,13,16,19-Docosahexaenoic acid	7.28±2.65	39.75±2.63	102.45±65.29	107.3±70.15	113.68±18.86	141.21±17.97	54.16±30.56

Figure S1: Fatty acid XIC chart





