Supplementary Materials: An Early Calcium Loading during Cherry Tree Dormancy Improves Fruit Quality Features at Harvest

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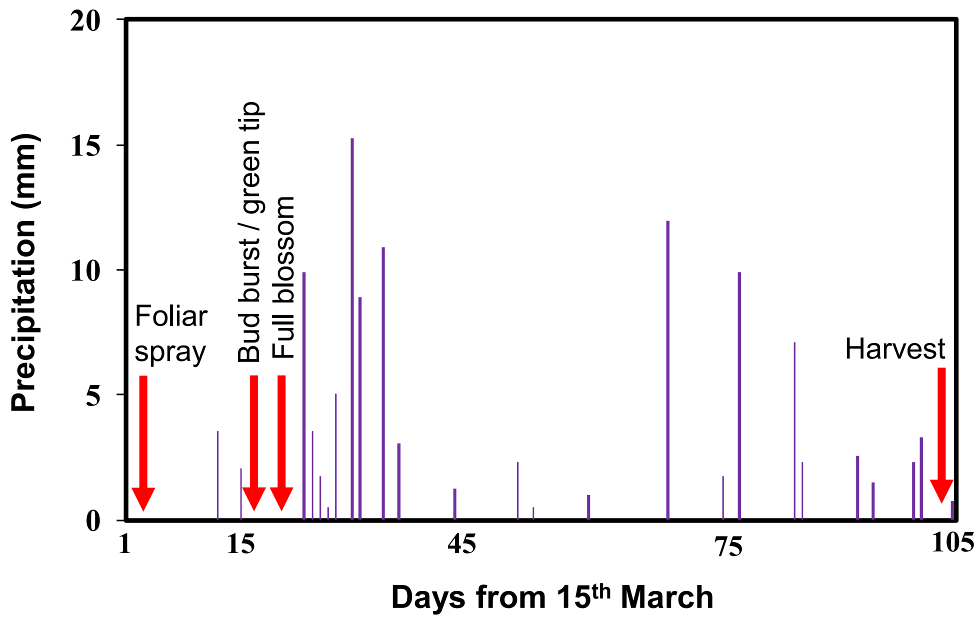

Figure S1. Precipitation graph from 15th March until harvest and timeline of foliar sprays, bud burst, and full blossom.

Table S1. Quantitative results of mineral elements in phloem, flower, and vegetative buds.

	Phloem												
	%, DW	**P**			**K**			**Mg**			**Na**		
		Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value
	Control	0.33	0.06	NS	0.34	0.03	NS	0.17	0.02	NS	0.03	0.005	NS
Molarity of $CaCl_2*2H_2O$	0.25	0.35	0.06		0.4	0.04		0.23	0.02		0.039	0.007	
	0.5	0.31	0.04		0.36	0.03		0.18	0.02		0.03	0.002	
	1	0.34	0.05		0.34	0.04		0.21	0.03		0.034	0.003	
	ppm, DW	**Zn**			**Cu**			**Mn**			**Fe**		
		Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value
	Control	22.96	3.9	NS	100.12	15.93	NS	99.45	9.95	NS	64.25	12.06	NS
Molarity of $CaCl_2*2H_2O$	0.25	28.89	6.55		72.73	20.33		84.94	5.15		64.7	20.46	
	0.5	21.73	5.04		94.97	20.71		86.93	13.35		50.89	8.22	
	1	29.16	7.28		101.56	15.32		87.73	3.42		58.9	16.78	
	Flower buds												
	%, DW	**P**			**K**			**Mg**			**Na**		
		Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value
	Control	0.81b	0.06	*	1.14	0.1	NS	0.3	0.01	NS	0.027	0.001	NS
Molarity of $CaCl_2*2H_2O$	0.25	0.86b	0.05		1.09	0.03		0.29	0.01		0.029	0.002	
	0.5	0.9ab	0.06		1.09	0.06		0.33	0.02		0.033	0.002	
	1	0.99a	0.07		1.19	0.12		0.33	0.02		0.034	0.009	
	ppm, DW	**Zn**			**Cu**			**Mn**			**Fe**		
		Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value
	Control	20.64	0.67	NS	53.28	15.29	NS	14.4	1.66	NS	44.62	11.31	NS
Molarity of $CaCl_2*2H_2O$	0.25	18.78	2.51		32.37	5.92		12.99	0.58		40.62	8.19	
	0.5	19.04	2.48		47.09	18.23		13.1	2.03		37.69	11.45	
	1	20.55	3.38		48.23	3.13		13.59	0.93		37.11	7.3	
	Vegetative buds												
	%, DW	**P**			**K**			**Mg**			**Na**		
		Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value
	Control	0.84	0.03	NS	0.89	0.06	NS	0.33	0.02	NS	0.048	0.007	NS
Molarity of $CaCl_2*2H_2O$	0.25	0.79	0.05		0.88	0.06		0.3	0.01		0.049	0.017	
	0.5	0.8	0.05		0.94	0.08		0.31	0.03		0.055	0.011	
	1	0.83	0.05		0.89	0.12		0.34	0.03		0.037	0.009	
	ppm, DW	**Zn**			**Cu**			**Mn**			**Fe**		
		Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value	Mean	SD	P-value
	Control	18.95	4.22	NS	53.79	17.67	NS	15.6	0.6	NS	48.57	5.44	NS
Molarity of $CaCl_2*2H_2O$	0.25	22.53	0.13		39.4	8.96		15.96	0.58		45.25	10.62	
	0.5	21.48	1.64		56.42	19.67		16.35	1.55		46.31	2.32	
	1	21.31	2.96		38.75	6.34		14.37	0.08		45.01	9.84	

Different letters indicate significant difference based on Duncan's Multiple Range Test; $P \leq 0.05$
NS: No Significance

Table S2. Quantitative results of sweet cherry quality traits.

Ratio flesh fruit^{-1} (%)

Factor		Level	Mean	SD
Treatment (T)		Control	94.88	0.4
	$CaCl_2$* $2H_2O$	0.25M	94.86	0.19
		0.5M	94.92	0.25
		1M	94.92	0.26
Age of spur (AS)	Flower buds	1st	94.91	0.36
		2nd	94.89	0.17
Ripening (R)	Color	Red	94.81	0.29
		Black	94.98	0.25

Factors	P-value		N
T	0.9		12
AS	0.805		24
R	0.026	*	24
T * AS	0.28		6
T * R	0.151		6
AS * R	0.049	*	12
T * AS * R	0.266		3

Penetration force (N)

Factor		Level	Mean	SD
Treatment (T)		Control	13.78	2.04
	$CaCl_2$* $2H_2O$	0.25M	13.78	2.48
		0.5M	13.97	2.21
		1M	14.5	1.78
Age of spur (AS)	Flower buds	1st	14.39	2.24
		2nd	13.66	2.01
Ripening (R)	Color	Red	14.43	2.04
		Black	13.58	2.18

Factors	P-value		N
T	0.205		60
AS	0.003	**	120
R	0.008	**	120
T * AS	0.273		30
T * R	0.531		30
AS * R	0.881		60
T * AS * R	0.673		15

Different letters indicate significant difference based on Duncan's Multiple Range Test P ≤ 0.05

Polyphenols (µg gallic acid g^{-1} FW)

Factor		Level	Mean	SD
Treatment (T)		Control	179.92	34.73
	$CaCl_2$* $2H_2O$	0.25M	179.01	26.05
		0.5M	185.84	23.75
		1M	192.69	29.89
Age of spur (AS)	Flower buds	1st	185.51	32.69
		2nd	183.22	24.29
Ripening (R)	Color	Red	176.56	26.32
		Black	192.17	29.01

Factors	P-value		N
T	0.6		12
AS	0.776		24
R	0.049	*	24
T * AS	0.696		6
T * R	0.272		6
AS * R	0.322		12
T * AS * R	0.134		3

Anthocyanins (µg cyanidin g^{-1} FW)

Factor		Level	Mean	SD
Treatment (T)		Control	26.15	8.44
	$CaCl_2$* $2H_2O$	0.25M	24.79	7.14
		0.5M	23.02	4.64
		1M	27.77	3.93
Age of spur (AS)	Flower buds	1st	25.3	6.75
		2nd	24.01	5.9
Ripening (R)	Color	Red	19.96	2.69
		Black	29.34	5.31

Factors	P-value		N
T	0.313		12
AS	0.269		24
R	<0.001	***	24
T * AS	0.352		6
T * R	0.079		6
AS * R	0.617		12
T * AS * R	0.364		3

Different letters indicate significant difference based on Duncan's Multiple Range Test P ≤ 0.05

Flavonols (µg rutin g^{-1} FW)

Factor		Level	Mean	SD
Treatment (T)		Control	33.68	4.23
	$CaCl_2$* $2H_2O$	0.25M	34.97	8.99
		0.5M	37.5	14.33
		1M	33.52	9.44
Age of spur (AS)	Flower buds	1st	33.52	10.81
		2nd	36.32	8.51
Ripening (R)	Color	Red	35.63	11.55
		Black	34.21	7.68

Factors	P-value		N
T	0.767		12
AS	0.353		24
R	0.637		24
T * AS	0.776		6
T * R	0.815		6
AS * R	0.266		12
T * AS * R	0.256		3

Hydroxycinnamic acids (µg caffeic acid g^{-1} FW)

Factor		Level	Mean	SD
Treatment (T)		Control	41.28	6.21
	$CaCl_2$* $2H_2O$	0.25M	40.17	9.24
		0.5M	43.01	9.36
		1M	39.01	6.6
Age of spur (AS)	Flower buds	1st	40.45	9.25
		2nd	41.29	6.37
Ripening (R)	Color	Red	43.41	8.15
		Black	38.33	6.83

Factors	P-value		N
T	0.616		12
AS	0.703		24
R	0.027	*	24
T * AS	0.601		6
T * R	0.95		6
AS * R	0.158		12
T * AS * R	0.096		3

Skin cracking (%, Christensen method)

Factor		Level	Mean	SD
Treatment (T)	$CaCl_2$	Control	76.94	7.84
		1M	70.83	12.84
Age of spur (AS)	Flower buds	1st	75.28	11.34
		2nd	72.5	10.67
Ripening (R)	Color	Red	66.39	10.05
		Black	81.39	4.81

Factors	P-value		N
T	0.068		12
AS	0.387		12
R	<0.001	***	12
T * AS	0.174		6
T * R	0.487		6
AS * R	0.861		6
T * AS * R	0.727		3

Different letters indicate significant difference based on Duncan's Multiple Range Test P ≤ 0.05

Skin cracking (%, Waterfall method)

Factor		Level	Mean	SD
Treatment (T)	$CaCl_2$	Control	35	16.78
		1M	31.67	13.57
Age of spur (AS)	Flower buds	1st	32.5	15.52
		2nd	34.17	15.14
Ripening (R)	Color	Red	22.78	7.13
		Black	43.89	13.34

Factors	P-value		N
T	0.463		12
AS	0.712		12
R	<0.001	***	12
T * AS	0.07		6
T * R	0.667		6
AS * R	0.581		6
T * AS * R	0.581		3

Fruit water absorption (%, Christensen method)

Factor		Level	Mean	SD
Treatment (T)	$CaCl_2$	Control	3.17	0.35
		1M	3.25	0.27
Age of spur (AS)	Flower buds	1st	3.3	0.48
		2nd	3.22	0.27
Ripening (R)	Color	Red	3.37	0.43
		Black	3.16	0.31

Factors	P-value		N
T	0.216		12
AS	0.563		12
R	0.159		12
T * AS	0.422		6
T * R	0.144		6
AS * R	0.059		6
T * AS * R	0.354		3

Different letters indicate significant difference based on Duncan's Multiple Range Test P ≤ 0.05

Fruit water absorption (%, Waterfall method)

Factor		Level	Mean	SD
Treatment (T)	$CaCl_2$	Control	1.53	0.34
		1M	1.31	0.57
Age of spur (AS)	Flower buds	1st	1.43	0.33
		2nd	1.48	0.47
Ripening (R)	Color	Red	1.18	0.31
		Black	1.73	0.28

Factors	P-value		N
T	0.204		12
AS	0.693		12
R	<0.001	***	12
T * AS	0.122		6
T * R	0.153		6
AS * R	0.974		6
T * AS * R	0.164		3

Table S3. Quantitative results of metabolites in sweet cherry skin.

Metabolite reporting checklist			
Level	**Aspect**	**Information**	**Fill in**
general aspect	Type of metabolome analysis	targeted metabolite analysis	FALSE
		non-targeted metabolite class scale profiling	TRUE
		non-targeted metabolome scale profiling	FALSE
		non-targeted finger printing of mass features	FALSE
	Type of quantification	absolute or quantification	Quantification
	Type of reference samples	chemicially defined	-
		biologically defined	Frozen grinding skin tissue of *Prunus avium* (0.5gr.)
	Type of replication	analytical (same analytical sample preparation)	0
		technological (same biological preparation)	0
		biological (same experimental condition)	3
		full experiment	12
	Type of technology	reference publication	Lisec, J., Schauer, N., Kopka, J., Willmitzer, L., and Fernie, A.R. (2006). Gas chromatography mass spectrometry-based metabolite profiling in plants. Nat. Protoc. 1: 387–396.
	Sample preparation	method of sample preparation	Derivariation with methoxyamine hydrochloride and then with N-methyl-N- (trimethylsilyl) tri-fluoroacetamide reagent (MSTFA)
		method of chromatography/separation	Samples (1 μL) was injected and split ratio was 70:1. A TR-5MS capillary column 30m×0.25 mm x 0.25 μm was used. Injector temperature was 220 °C . Carrier gas flow rate was 1mL min−1. Temperature program was held at 70 °C for 2 min, then increased to 260 °C (rate 8 °C min−1), where it remained for 18 min, .
		method of ionization	Ion source 230 °C and the interface 250 °C
		method of detection	Detection type (ISQ MS), m/ z 50–600 was recorded
metabolite/mass feature	Metabolite	metabolite name	NIST, GOLM, Pubchem
		metabolite sum formula	CnHnOn, n=number
		metabolite structure and public source of metabolite identifier	NIST, GOLM, Pubchem, KEGG
	Identification	identification process	Manually
		by authentic mass isotopomer added to one or all biological sample(s)	TRUE
		by authentic reference compound within a co-processed reference mixture	FALSE
		by authentic reference compound previously mapped to the analytical system	TRUE
		reference library	NIST GOLM
		type of mass spectrum	m / z 50-600
		by match of molecular mass (single mass fragment)	-
		by match of fragments	-
		by match of fragmentation pattern	-
		by match of mass spectrum to reference library	Yes
		type of retention index	time elution
		by match of retention time (index) to reference library	3%
	Quantification	type of quantification	Relative abundance
	Validity testing	Recovery testing (chemical analog)	-
		Recovery testing (internally added mass isotopomer)	Adonitol
		Recovery testing (mixture of most divergent samples from the experiment)	-
		Test for linear range	-
		Limit of quantification (LOQ)	0.001
		Limit of detection (LOD)	0.0005

Experiment title:
Organism/Plant species: ***Prunus avium L.***
Organ/tissue: fruit skin
Analytical tool: GC-MS

Peak no.- number referenced back to the main text
Ret . Time- Retention time, in minutes (difference in Ret.Time between ES(+) and ES(-) modes was less than XX minutes)
Putative Name- putative identification of the metabolite
Mol. Formula- molecular formula of the metabolite or its FA adduct;
MSMS fragments- fragments (10 largest)
(S)- identification confirmed by a standard compound
I, II, III- different isomers
Identification level (A; B; C; D)- (A) standard or NMR; (B) MS/MS; (C) MS^E; (D) MS only

Peak no.	Ret. Time	Putative metabolite name	Coresponding metabolite in literature	Metabolite Class	Mol. formula	MS/MS ES(+) fragments (10 largest)	Species detected before	References	Identification level (A-D)
1	8.185	Oxalic acid (2TMS)	Oxalic acid	Acid	$C_8H_{18}O_4Si_2$	147/999, 73/118, 75/67, 52/3, 79/3, 66/2	*Solanum lycopersicum L.*	nist, golm, pubchem	D
2	11.39	Silanol, trimethyl-, phosphate (3:1)	Phosphoric acid	Other Compound	$C_9H_{27}O_4PSi_3$	299/999, 73/287, 300/222, 301/127, 283/66, 133/62, 225/53, 314/53, 207/52, 147/50	*Actinidia chinensis*	nist, golm, pubchem	D
3	11.86	L-Proline, 2tms derivative	Proline	Amino Acid	$C_{11}H_{25}NO_2Si_2$	142/999, 73/281, 75/135	*Arabidopsis thaliana*	nist, golm, pubchem	A
4	12.15	Butanedioic acid, 2tms derivative	Succinic acid	Acid	$C_{10}H_{22}O_4Si_2$	147/999, 73/522, 75/184, 148/108, 149/26, 55/11, 74/7	*Arabidopsis thaliana, Crataegus scabrifolia*	nist, golm, pubchem	D
5	15.05	Malic acid, 3tms derivative	Malic acid	Acid	$C_{13}H_{30}O_5Si_3$	73/999, 147/785, 233/126, 133/126, 245/126, 148/125, 189/121, 75/113, 74/91, 190/84	*Arabidopsis thaliana*	nist, golm, pubchem	A
6	15.5	5-Oxoproline, 2tms derivative	Oxoproline	Amino Acid	$C_{11}H_{23}NO_3Si_2$	73/999, 156/231, 75/179, 147/11	*Arabidopsis thaliana*	nist, golm, pubchem	D
7	15.67	4-aminobutanoic acid (3TMS)	GABA	Amino Acid	$C_{13}H_{33}O_2NSi_3$	174/999, 73/959, 147/382, 75/131	*Malus domestica*	nist, golm, pubchem	D
8	17.39	D-(-)-ribose, tetrakis(trimethylsilyl) ether, trimethylsilyloxime (isomer 2)	Ribose	Sugar	$C_{18}H_{45}NO_5Si_4$	73/999, 103/773, 217/388, 147/341, 75/75, 189/62, 160/45, 74/42, 117/42, 133/31	*Prunus persica L.*	nist, golm, pubchem	D
9	17.52	D-arabinose, tetrakis(trimethylsilyl) ether, ethyloxime (isomer 2)	Arabinose	Sugar	$C_{19}H_{47}O_5NSi_4$	73/999, 103/715, 217/518, 147/362, 160/138, 189/119, 218/90, 117/83, 74/81, 133/75	*Actinidia chinensis*	nist, golm, pubchem	D
10	17.61	D-(+)-xylose, tetrakis(trimethylsilyl) ether, methyloxime (syn)	Xylose	Sugar	$C_{18}H_{45}NO_5Si_4$	73/999, 204/760, 217/719, 109/542, 147/398, 205/ 256, 218/82, 129/80, 75/58, 117/43	*Prunus avium*	nist, golm, pubchem	D
11	18.22	L-(-)-arabitol, 5tms derivative	Arabitol	Alcohol	$C_{20}H_{52}O_5Si_5$	73/999, 147/661, 217/631, 103/613, 205/204, 117/64, 129/54, 75/24, 148/5, 189/3	*Zizyphus jujube Mill.*	nist, golm, pubchem	D
12	18.32	L-Rhamnose, 4tms derivative	Rhamnose	Sugar	$C_{18}H_{44}O_5Si_4$	73/999, 204/987, 147/412, 217/151, 191/75, 75/65, 205/36, 189/1	*Arabidopsis thaliana*	nist, golm, pubchem	D
13	20.09	D-(+)-Talofuranose, pentakis (trimethylsilyl) ether (isomer 2)	Talose	Sugar	$C_{21}H_{52}O_6Si_5$	73/999, 204/987, 147/412, 217/151, 191/75, 75/65, 205/36, 189/1	*Amaranthus tricolor*	nist, golm, pubchem	D
14	20.168	Gulonic acid, .gamma.-lactone, 4tms derivavative	Gulonic acid	Sugar	$C_{18}H_{42}O_6Si_4$	73/999, 217/467, 147/427, 204/409, 205/173, 103/150, 129/116, 189/107, 75/96, 117/84	*Arabidopsis thaliana*	nist, golm, pubchem	
14	20.27	Quininic acid (5tms)	Quininic acid	Acid	$C_{22}H_{52}O_6Si_5$	73/999, 147/435, 345/359, 255/252, 217/228, 103/214, 191/87, 75/86, 204/58, 205/51	*Malus domestica*	nist, golm, pubchem	D
15	20.54	D-Fructose, 1,3,4,5,6-pentakis-O-(trimethylsilyl)-, O-methyloxime	Fructose	Sugar	$C_{22}H_{55}NO_6Si_5$	73/999, 103/890, 217/597, 147/384, 307/158, 133/114, 218/110, 277/105, 189/95, 117/89	*Prunus avium*	nist, golm, pubchem	D
16	20.88	D-glucose, 2,3,4,5,6-pentakis-o-(trimethylsilyl)-, o-methyloxyme, (1z)-	Glucose	Sugar	$C_{22}H_{55}NO_6Si_5$	73/999, 147/571, 205/491, 160/461, 319/229, 103/223, 217/219, 117/169, 129/109, 148/90	*Arabidopsis thaliana*	nist, golm, pubchem	A
17	21.07	D-galactose, 2,3,4,5,6-pentakis-o-(trimethylsilyl)-, o-methyloxyme, (1z)-	Galactose	Sugar	$C_{22}H_{55}NO_6Si_5$	73/999, 147/658, 205/535, 160/401, 103/324, 319/270, 217/238, 117/180, 133/119, 129/115	*Arabidopsis thaliana*	nist, golm, pubchem	D
18	21.36	D-Sorbitol, 6tms derivative	Sorbitol	Alcohol	$C_{24}H_{62}O_6Si_6$	73/999, 147/622, 205/575, 103/422, 217/413, 319/304, 117/180, 129/110, 189/102,	*Arabidopsis thaliana*	nist, golm, pubchem	A
20	22.01	D-(+)-Galacturonic acid, 5tms derivative	Galacturonic acid	Acid	$C_{21}H_{50}O_7Si_5$	73/999, 147/461, 204/278, 217/275, 205/223, 103/169, 75/82, 117/38, 218/32, 191/29	*Arabidopsis thaliana*	nist, golm, pubchem	A
21	23.13	Inositol, (z)-, 6tms derivative	Inositol	Alcohol	$C_{24}H_{60}O_6Si_6$	73/999, 217/680, 147/508, 305/482, 191/192, 204/170, 318/133, 75/66, 129/46, 103/38	*Arabidopsis thaliana*	nist, golm, pubchem	A
22	29.25	Sucrose, 8tms derivative	Sucrose	Sugar	$C_{36}H_{86}O_{11}Si_8$	73/999, 361/977, 217/623, 147/384, 271/313, 169/292, 243/272, 362/252, 129/223,	*Actinidia chinensis*	nist, golm, pubchem	D
23	30.43	Maltose, 8tms derivative, isomer 1	Maltose	Sugar	$C_{36}H_{86}O_{11}Si_8$	204/999, 73/472, 205/187, 217/174, 147/157, 191/125, 129/104, 206/78, 103/55, 117/46	*Malus domestica*	nist, golm, pubchem	D
24	31.66	Melibiose, octakis (trimethylsilyl)-	Melibiose	Sugar	$C_{36}H_{86}O_{11}Si_8$	217/999, 73/937, 147/324, 204/292, 361/210, 103/148, 205/121, 129/88, 218/54, 75/22	*Solanum lycopersicum L.*	nist, golm, pubchem	D
25	32.182	3-.alpha.-mannobiose, octakis(trimethylsilyl) ether (isomer 2)	Mannobiose	Sugar	$C_{36}H_{86}O_{11}Si_8$	217/999, 73/937, 147/324, 204/292, 361/210, 103/148, 205/121, 129/88, 218/54, 75/22	*Bryonia lacinosa*	nist, golm, pubchem	D
26	32.66	D-(+)-Cellobiose, octakis (trimethylsilyl) ether, methyloxime (isomer 1)	Cellobiose	Sugar	$C_{37}H_{89}O_{11}NSi_8$	204/999, 73/785, 217/380, 361/300, 147/282, 205/208, 160/173, 103/130, 129/117, 75/57	*Olea europaea*	nist, golm, pubchem	D
28	33.97	D-lactose, octakis(trimethylsilyl) ether, methyloxime (isomer 2)	Lactose	Sugar	$C_{37}H_{89}O_{11}NSi_8$	204/999, 73/667, 217/394, 205/371, 147/356, 361/228, 103/204, 129/112, 206/92, 319/89	*Actinidia chinensis*	nist, golm, pubchem	D
29	34.43	D-Lactitol, nonakis (trimethylsilyl) ether	Lactitol	Alcohol	$C_{39}H_{96}O_{11}Si_9$	204/999, 73/760, 217/454, 205/396, 147/395, 361/317, 103/223, 129/152, 319/135,	*Malus domestica*	nist, golm, pubchem	D
30	40.24	3-o-coumaroul-D-Quinic acid	3-o-coumaroul-D-Quinic acid	Other Compound	$C_{31}H_{58}O_8Si_5$	73/999, 219/836, 345/514, 255/206, 147/103, 75/4, 346/2	*Arabidopsis thaliana*	nist, golm, pubchem	D

Full ripe sweet cherries

	1st-year-old spur						2nd-year-old spur					
	Control		1M Ca				Control		1M Ca			
	Mean	*SD*	*Mean*	*SD*	*t-test*		*Mean*	*SD*	*Mean*	*SD*	*t-test*	
Oxalic acid	0.009	0.012	0.000	0.000	0.265		0.004	0.003	0.007	0.009	0.678	
Phosphoric acid	0.895	0.082	1.027	0.119	0.190		1.003	0.083	1.144	0.020	0.045	*
Proline	0.013	0.011	0.016	0.007	0.729		0.012	0.005	0.009	0.008	0.527	
Succinic acid	0.094	0.037	0.116	0.019	0.420		0.120	0.014	0.122	0.014	0.836	
Malic acid	6.878	0.530	8.261	0.277	0.016	*	7.754	0.244	7.775	0.229	0.917	
Oxoproline	0.003	0.000	0.001	0.000	0.001	**	0.004	0.001	0.004	0.003	0.997	
GABA	0.009	0.006	0.008	0.003	0.697		0.010	0.005	0.008	0.004	0.562	
Ribose	0.193	0.008	0.141	0.010	0.002	**	0.168	0.005	0.152	0.008	0.040	*
Arabinose	1.256	0.034	0.999	0.061	0.003	**	1.147	0.066	1.023	0.054	0.067	
Xylose	0.014	0.002	0.009	0.001	0.010	*	0.013	0.002	0.011	0.002	0.226	
Arabitol	0.062	0.009	0.071	0.003	0.148		0.075	0.011	0.069	0.002	0.411	
Rhamnose	0.004	0.002	0.036	0.020	0.042	*	0.021	0.007	0.024	0.009	0.656	
Talose	3.481	2.291	2.639	0.658	0.574		2.287	0.480	2.487	0.441	0.624	
Gulonic acid	0.304	0.526	0.425	0.424	0.771		0.244	0.221	0.000	0.000	0.129	
Quininic acid	0.322	0.053	0.693	0.101	0.005	**	0.494	0.099	0.506	0.099	0.892	
Fructose	132.644	3.680	141.678	7.517	0.135		128.288	1.784	124.462	5.111	0.288	
Glucose	162.730	6.673	176.427	18.584	0.296		159.489	11.711	151.230	3.236	0.304	
Galactose	22.630	1.676	16.634	2.413	0.024	*	17.483	1.233	16.632	0.823	0.376	
Sorbitol	83.091	4.620	84.469	11.091	0.852		74.686	5.169	70.020	2.240	0.225	
Galacturonic acid	0.356	0.109	0.354	0.108	0.977		0.424	0.093	0.415	0.021	0.881	
Inositol	0.130	0.014	0.111	0.026	0.319		0.077	0.066	0.060	0.103	0.822	
Sucrose	15.441	0.567	16.814	0.923	0.093		12.222	0.380	14.140	0.913	0.028	*
Maltose	1.362	0.051	1.589	0.067	0.009	**	1.346	0.141	1.394	0.055	0.611	
Melibiose	1.117	0.100	1.201	0.124	0.410		1.043	0.182	1.077	0.055	0.771	
Mannobiose	0.109	0.022	0.136	0.029	0.269		0.122	0.029	0.158	0.037	0.261	
Cellobiose	1.328	0.086	1.172	0.167	0.223		1.020	0.106	1.107	0.094	0.350	
Lactose	1.510	0.097	1.694	0.066	0.054		1.316	0.155	1.390	0.044	0.470	
Lactitol	2.477	0.220	2.957	0.078	0.023	*	2.171	0.225	2.270	0.060	0.506	
3-o-coumaroul-D-Quinic acid	0.003	0.004	0.050	0.061	0.248		0.001	0.001	0.048	0.057	0.227	
Sugars	344.122	12.127	361.596	28.196	0.380		326.208	13.524	315.286	4.826	0.258	
Alcohols	85.761	4.404	87.609	11.141	0.803		77.008	5.046	72.418	2.180	0.222	
Acids	7.660	0.699	9.425	0.466	0.022	*	8.796	0.154	8.826	0.326	0.895	
Other compounds	0.898	0.081	1.077	0.179	0.189		1.004	0.083	1.192	0.069	0.039	*
Amino acids	0.026	0.017	0.024	0.010	0.896		0.027	0.011	0.021	0.008	0.474	

Table S4. PCA extraction variables.

Variables	Extraction
P	0.864
K	0.227
Ca	0.69
Mg	0.808
Na	0.368
Zn	0.547
Cu	0.651
Mn	0.783
Fe	0.439
Anthocyanins	0.745
Flavonols	0.061
Hydroxycinnamic acid	0.204
Polyphenols	0.44
Christensen water abs	0.305
Christensen cracking	0.375
Waterfall water abs	0.39
Waterfall cracking	0.437
Cracking in the field	0.726
Dry weight	0.653
Penetration	0.414
Respiration rate	0.844
Ratio flesh to fruit	0.28
TSS	0.411
TA	0.274

Variables	Extraction
P	0.865
K	0.231
Ca	0.685
Mg	0.811
Na	0.372
Zn	0.545
Cu	0.675
Mn	0.782
Fe	0.437
Anthocyanins	0.741
Hydroxycinnamic acid	0.181
Polyphenols	0.442
Christensen water abs	0.303
Christensen cracking	0.381
Waterfall water abs	0.396
Waterfall cracking	0.445
Cracking in the field	0.739
Dry weight	0.65
Penetration	0.416
Respiration rate	0.857
Ratio flesh to fruit	0.282
TSS	0.402
TA	0.252

Variables	Extraction
P	0.858
K	0.232
Ca	0.682
Mg	0.836
Na	0.412
Zn	0.529
Cu	0.717
Mn	0.784
Fe	0.421
Anthocyanins	0.743
Polyphenols	0.461
Christensen water abs	0.298
Christensen cracking	0.392
Waterfall water abs	0.395
Waterfall cracking	0.441
Cracking in the field	0.744
Dry weight	0.649
Penetration	0.417
Respiration rate	0.849
Ratio flesh to fruit	0.291
TSS	0.394
TA	0.201

Variables	Extraction
P	0.866
K	0.212
Ca	0.659
Mg	0.834
Na	0.486
Zn	0.521
Cu	0.738
Mn	0.788
Fe	0.431
Anthocyanins	0.744
Polyphenols	0.464
Christensen water abs	0.262
Christensen cracking	0.433
Waterfall water abs	0.418
Waterfall cracking	0.452
Cracking in the field	0.742
Dry weight	0.656
Penetration	0.402
Respiration rate	0.796
Ratio flesh to fruit	0.291
TSS	0.404

Variables	Extraction
P	0.867
Ca	0.659
Mg	0.831
Na	0.523
Zn	0.547
Cu	0.731
Mn	0.812
Fe	0.46
Anthocyanins	0.747
Polyphenols	0.471
Christensen water abs	0.262
Christensen cracking	0.424
Waterfall water abs	0.415
Waterfall cracking	0.448
Cracking in the field	0.744
Dry weight	0.628
Penetration	0.409
Respiration rate	0.754
Ratio flesh to fruit	0.272
TSS	0.42

Variables	Extraction
P	0.884
Ca	0.648
Mg	0.84
Na	0.531
Zn	0.544
Cu	0.737
Mn	0.815
Fe	0.45
Anthocyanins	0.758
Polyphenols	0.475
Christensen cracking	0.467
Waterfall water abs	0.435
Waterfall cracking	0.451
Cracking in the field	0.713
Dry weight	0.631
Penetration	0.388
Respiration rate	0.757
Ratio flesh to fruit	0.274
TSS	0.4

Variables	Extraction
P	0.891
Ca	0.638
Mg	0.825
Na	0.529
Zn	0.571
Cu	0.738
Mn	0.8
Fe	0.466
Anthocyanins	0.751
Polyphenols	0.471
Christensen cracking	0.503
Waterfall water abs	0.456
Waterfall cracking	0.468
Cracking in the field	0.706
Dry weight	0.611
Penetration	0.386
Respiration rate	0.757
TSS	0.386

The lowest variable extraction was rejected from the model until all remaining variables to have extraction higher than 0.5.

Variables	Extraction
P	0.883
Ca	0.634
Mg	0.827
Na	0.483
Zn	0.573
Cu	0.776
Mn	0.801
Fe	0.464
Anthocyanins	0.728
Polyphenols	0.472
Christensen cracking	0.538
Waterfall water abs	0.514
Waterfall cracking	0.52
Cracking in the field	0.643
Dry weight	0.588
Penetration	0.408
Respiration rate	0.78

Variables	Extraction
P	0.912
Ca	0.604
Mg	0.839
Na	0.48
Zn	0.597
Cu	0.776
Mn	0.787
Fe	0.424
Anthocyanins	0.74
Polyphenols	0.494
Christensen cracking	0.568
Waterfall water abs	0.531
Waterfall cracking	0.514
Cracking in the field	0.635
Dry weight	0.593
Respiration rate	0.77

Variables	Extraction
P	0.929
Ca	0.6
Mg	0.871
Na	0.462
Zn	0.591
Cu	0.77
Mn	0.76
Anthocyanins	0.744
Polyphenols	0.516
Christensen cracking	0.57
Waterfall water abs	0.537
Waterfall cracking	0.505
Cracking in the field	0.644
Dry weight	0.608
Respiration rate	0.781

Variables	Extraction
P	0.932
Ca	0.623
Mg	0.877
Zn	0.614
Cu	0.769
Mn	0.743
Anthocyanins	0.746
Polyphenols	0.509
Christensen cracking	0.56
Waterfall water abs	0.542
Waterfall cracking	0.515
Cracking in the field	0.622
Dry weight	0.617
Respiration rate	0.84

Table S5. Quantitative results of nutrients in fruits.

			Phosphorus (P, % DW)		Potassium (K, % DW)		Magnesium (Mg, % DW)		Sodium (Na, % DW)		Iron (Fe, ppm)	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Treatment (T)		Control	0.29	0.04	1.32	0.17	0.06	0.01	0.02	0	18.98	3.11
	$CaCl_2$* $2H_2O$	0.25M	0.3	0.05	1.28	0.2	0.06	0.01	0.02	0	19.93	3.73
		0.5M	0.29	0.03	1.32	0.16	0.05	0.01	0.02	0	17.73	3.61
		1M	0.29	0.03	1.17	0.12	0.05	0.01	0.02	0	18.69	1.48
Age of spur (AS)	Flower buds	1st	0.29	0.04	1.28	0.19	0.06	0.01	0.02	0	18.84	3.68
		2nd	0.29	0.03	1.27	0.16	0.06	0.01	0.02	0	18.82	2.53
Ripening (R)	Color	Red	0.32	0.03	1.32	0.15	0.06	0.01	0.02	0	19.17	2.27
		Black	0.27	0.02	1.22	0.18	0.05	0	0.02	0	18.49	3.81

Factors	Phosphorus P-value		N	Potassium P-value		N	Magnesium P-value		N	Sodium P-value		N	Iron P-value		N
T	0.755		12	0.051		12	0.169		12	0.489		12	0.333		12
AS	0.461		24	0.858		24	0.609		24	0.021	*	24	0.978		24
R	<0.001	***	24	0.021	*	24	<0.001	***	24	0.58		24	0.419		24
T * AS	0.655		6	0.611		6	0.732		6	0.301		6	0.081		6
T * R	0.5		6	0.119		6	0.615		6	0.679		6	0.088		6
AS * R	0.078		12	0.03	*	12	0.157		12	0.758		12	0.576		12
T * AS * R	0.807		3	0.109		3	0.618		3	0.772		3	0.314		3

Different letters indicate significant difference based on Duncan's Multiple Range Test P ≤ 0.05

Different letters indicate significant difference based on Duncan's Multiple Range Test P ≤ 0.05