

Supplementary Materials

Table S1. Effect of ClO₂ Treatment on Fruit Firmness, Mass Loss, Soluble Solid Content (SSC), Titratable Acidity (TA), Ascorbic Acid (AA) of Four Citrus Fruit

Varieties during Storage.

Variety	Group	Storage time (d)	Firmness (kg/cm ²)	Mass loss rate (%)	TA (%)	SSC (%)	AA (mg/100g)
kumquat	Control	0	3.67±0.38	0	0.43±0.06	9.78±0.51	15.67±1.26
	ClO ₂		3.67±0.38	0	0.43±0.06	9.78±0.51	15.67±1.26
	Control	3	2.72±0.23	2.34±0.12	0.38±0.07	9.81±0.68	14.14±1.18
	ClO ₂		3.47±0.32	0.21±0.10	0.42±0.03	9.77±0.77	15.36±1.21
	Control	6	1.72±0.24	4.33±0.23	0.35±0.05	9.79±0.81	12.39±0.99
	ClO ₂		3.33±0.37	1.08±0.15	0.41±0.02	9.78±0.92	15.17±1.32
	Control	12	0.87±0.27	5.29±0.28	0.31±0.04	9.70±0.58	9.10±1.17
	ClO ₂		2.56±0.31	1.67±0.25	0.40±0.05	9.76±0.47	14.02±1.27
mandarin	Control	0	5.04±0.45	0	0.74±0.18	10.25±1.21	19.01±2.08
	ClO ₂		5.04±0.45	0	0.74±0.18	10.25±1.21	19.01±2.08
	Control	3	4.67±0.43	1.31±0.15	0.67±0.12	10.23±1.17	17.64±1.98
	ClO ₂		4.98±0.47	0.31±0.10	0.73±0.17	10.24±1.20	18.87±2.21
	Control	6	3.78±0.33	2.67±0.18	0.62±0.15	10.28±1.01	15.39±1.99
	ClO ₂		4.57±0.35	0.88±0.14	0.72±0.17	10.25±0.92	16.77±1.32
	Control	12	2.47±0.21	4.21±0.27	0.48±0.11	10.37±1.19	11.10±1.17
	ClO ₂		4.37±0.35	1.51±0.23	0.65±0.14	10.26±1.12	15.52±1.27
Peru's orange	Control	0	12.57±0.88	0	0.64±0.07	10.78±1.08	20.25±2.16
	ClO ₂		12.57±0.88	0	0.64±0.07	10.78±1.08	20.25±2.16
	Control	3	12.17±0.78	2.34±0.25	0.63±0.05	10.75±1.09	19.67±2.08
	ClO ₂		12.47±0.81	0.13±0.10	0.63±0.03	10.77±1.02	20.01±2.12
	Control	6	10.72±0.56	4.33±0.36	0.56±0.02	10.74±1.04	17.35±1.98
	ClO ₂		11.33±0.70	1.08±0.25	0.60±0.05	10.76±1.10	19.78±2.22
	Control	12	8.87±0.45	5.29±0.65	0.44±0.04	10.73±0.98	14.33±1.19

			ClO ₂	10.86±0.82	1.67±0.38	0.54±0.05	10.77±1.01	18.01±2.01
			Control	17.67±1.22	0	0.99±0.09	9.45±0.89	26.13±2.16
			ClO ₂	17.67±1.22	0	0.99±0.09	9.45±0.89	26.13±2.16
			Control	16.89±1.11	1.34±0.16	0.87±0.08	9.44±0.81	25.34±1.68
grapefruit		3	ClO ₂	17.47±1.17	0.19±0.09	0.95±0.10	9.44±0.67	25.86±1.71
			Control	13.79±1.01	3.33±0.27	0.81±0.09	9.42±0.78	22.45±1.75
		6	ClO ₂	16.33±1.21	0.98±0.26	0.90±0.09	9.44±0.88	24.78±2.01
			Control	11.87±1.07	4.79±0.42	0.76±0.08	9.47±0.67	17.21±1.23
		12	ClO ₂	15.56±1.23	1.87±0.28	0.83±0.10	9.46±0.85	23.05±1.57

Note: Aliquots (20 µL) of the spore suspension at 1×10^6 spores/mL were inoculated into each wound. After treatment with 1000, 800, 1600, and 1800 mg/L of ClO₂, respectively, varieties of kumquat, mandarin, Peru's orange, and grapefruit were stored for 12 d at 25 °C. Data presented was the average of three replicates.

Table S2. Effect of ClO₂ Treatment on Respiration Rate (mgCO₂/(kg·h) of Four Citrus Fruit Varieties During Storage.

Storage time (d)	kumquat		mandarin		Peru's orange		grapefruit	
	Control	ClO ₂	Control	ClO ₂	Control	ClO ₂	Control	ClO ₂
0	24.15±1.12	24.15±1.12	32.67±2.06	32.67±2.06	35.13±2.14	35.13±2.14	43.18±2.25	43.18±2.25
3	23.16±0.98	22.78±1.24	30.32±2.04	29.68±2.10	34.22±2.15	33.67±2.11	43.09±2.01	41.12±2.01
6	20.11±1.01	19.66±1.56	29.12±1.89	25.56±1.78	33.27±2.19	29.55±1.78	42.11±2.18	39.23±2.10
12	18.56±1.07	16.46±1.02	25.56±2.01	22.46±1.67	29.89±2.03	26.19±1.12	39.44±2.01	35.21±2.00

Note: After treatment with 800 mg/L of ClO₂, respectively, whole fruits of kumquat, mandarin, Peru's orange, and grapefruit were stored for 12 d at 25 °C. Data presented was the average of three replicates.

Table S3. Effect of ClO₂ Treatment on Free Amino Acids (FAA) of Fresh Mandarin Pulp (0 d) and Stored Samples (12 d).

Taste	Amino Acid (mg/100g)	Fresh	Control	ClO ₂	
Sweet	Ala	5.69±0.12 ^a	4.19±0.08 ^c	5.02±0.12 ^b	
	Ser	10.22±1.92 ^a	7.15±0.28 ^b	7.22±0.21 ^b	
	Pro	53.55±2.12 ^a	41.17±2.40 ^b	43.67±2.06 ^c	
	Thr	2.74±0.11 ^a	1.16±0.09 ^b	1.68±0.05 ^c	
	Gly	1.82±0.09 ^a	0.86±0.02 ^b	0.87±0.07 ^b	
Umami	Asp	21.02±1.15 ^a	17.11±0.48 ^c	18.86±1.04 ^b	
	Glu	10.36±0.42 ^a	7.62±0.32 ^c	8.22±0.31 ^b	
Bitter	Val	1.11±0.05 ^a	0.78±0.03 ^b	0.81±0.06 ^b	
	Leu	1.55±0.03 ^a	1.25±0.09 ^b	1.18±0.07 ^b	
	Met	nd	nd	nd	
	Ile	1.79±0.08 ^a	1.29±0.07 ^b	1.02±0.02 ^c	
	His	2.32±0.05 ^a	1.67±0.08 ^b	1.52±0.07 ^b	
	Trp	nd	nd	nd	
	Phe	5.22±0.14 ^a	2.19±0.04 ^b	1.13±0.08 ^c	
	None	Asn	101.05±9.78 ^a	70.45±2.27 ^c	74.77±1.78 ^b
		Cys	1.82±0.01 ^a	1.12±0.03 ^c	1.23±0.02 ^b
Tyr		1.92±0.02 ^a	0.78±0.01 ^b	0.72±0.02 ^b	
Lys		7.05±0.12 ^a	4.47±0.09 ^c	5.01±0.07 ^b	
Total	Essential TFAA	19.87±0.19 ^a	12.85±0.15 ^b	12.64±0.18 ^c	
	Sweet umami TFAA	105.31±5.76 ^a	78.83±2.43 ^c	86.45±3.12 ^b	
	TFAA	213.24±11.09 ^a	166.42±8.12 ^c	173.21±5.72 ^b	

Note: After treatment with 800 mg/L of ClO₂, mandarin fruits were stored for 12 d at 25 °C.

Mandarin pulp samples were analysed using the L-8900 free amino acids analyser. Amino acid abbreviations follow IUPA standard; values are averages of duplicate determinations (mg/100g Wet wt) ± SD (n = 3). nd, not detected. Essential TFAA= sum of His, Ile, Leu, Lys, Met, Phe, Thr,

Trp, and Val. Sweet umami TFAA=Ala, Ser, Pro, Thr, Gly, Asp, Glu. TFAA= sum of all free amino acids.

Table S4. Effect of ClO₂ Treatment on Volatile Compounds of Mandarin Fruit Stored for 12 d Using HS-SPME-GC–MS.

Peak	RT	Formula	Name	MP (%)		Concentration (%)	
				Control	ClO ₂	Control	ClO ₂
1	2.1949	C ₃ H ₆ O	Acetone	91.8	90.9	2.67	1.85
2	3.0889	C ₂ H ₆ O	Dimethyl ether	91.4	94.9	8.32	4.64
3	4.2487	C ₂ H ₃ N	Acetonitrile	92.6	85.9	1.89	0.79
4	4.3835	C ₁₀ H ₁₆	alpha.-Pinene	85.6	nd	0.23	nd
5	4.5224	C ₁₀ H ₁₆ O	1,5-Heptadien-4-one, 3,3,6-trimethyl-	85.5	nd	0.31	nd
6	5.0398	C ₅ H ₁₀ O	3-Buten-2-ol	nd	88.4	nd	0.35
7	5.9648	C ₆ H ₁₂ O	Hexanal	95.5	85.6	1.12	1.09
8	7.1901	C ₆ H ₁₅ NO	1-Hexanol,6-amino-	nd	85.2	nd	0.41
9	7.1993	C ₁₂ H ₁₆ N ₄ O ₅	Pyrazole[4,5-b]imidazole	85.5	nd	3.31	nd
10	7.3536	C ₅ H ₈ O	Furan, 2,3-dihydro-4-methyl-	nd	85.4	nd	2.55
11	7.8414	C ₁₀ H ₁₆	beta.-Myrcene	93	nd	2.14	nd
12	8.7600	C ₁₀ H ₁₆	Cyclohexene,1-methyl-5-(1-methylethenyl)	97	97.6	16.03	13.12
13	9.8288	C ₆ H ₁₀ O	2-Hexena	92.1	90.3	3.67	3.22
14	10.2204	C ₁₀ H ₁₆	Terpinene	97.1	94.5	4.42	4.7
15	11.0237	C ₁₀ H ₁₄	o-Cymene	nd	85.6	nd	2.01
16	11.8311	C ₄ H ₈ O ₂	Acetoin	nd	92.0	nd	3.64
17	17.7843	C ₁₀ H ₁₈ O	Linalool	nd	90.2	nd	0.12
18	21.1522	C ₁₅ H ₂₄	Selina-3,7(11)-diene	nd	80.0	nd	0.09
19	21.9990	C ₁₅ H ₂₄	(-).alpha.-Panasinsen	nd	86.5	nd	0.12
20	25.2179	C ₈ H ₁₆ O ₂	Valproic Acid	nd	93.9	11.01	9.43
21	29.3046	C ₁₂ H ₂₆	Decane	nd	85.9	nd	1.12
22	30.1029	C ₂₇ H ₅₆	Heptacosane	nd	85.1	nd	0.04
23	30.8015	C ₁₆ H ₃₄ O	Tridecanol	94	85.3	1.67	2.01

Note: MP is matching percentage; Nd is not found; data is measured after mixing ten mandarin pulp.