

# Preharvest Spray Hexanal Formulation Enhances Postharvest Quality in ‘Honeycrisp’

## Apples by Regulating Phospholipase D and Calcium Sensor Proteins Genes

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### Supplementary Materials

**Table S1:** Primer sequence of genes putatively encoding phospholipase D and calcium sensor proteins

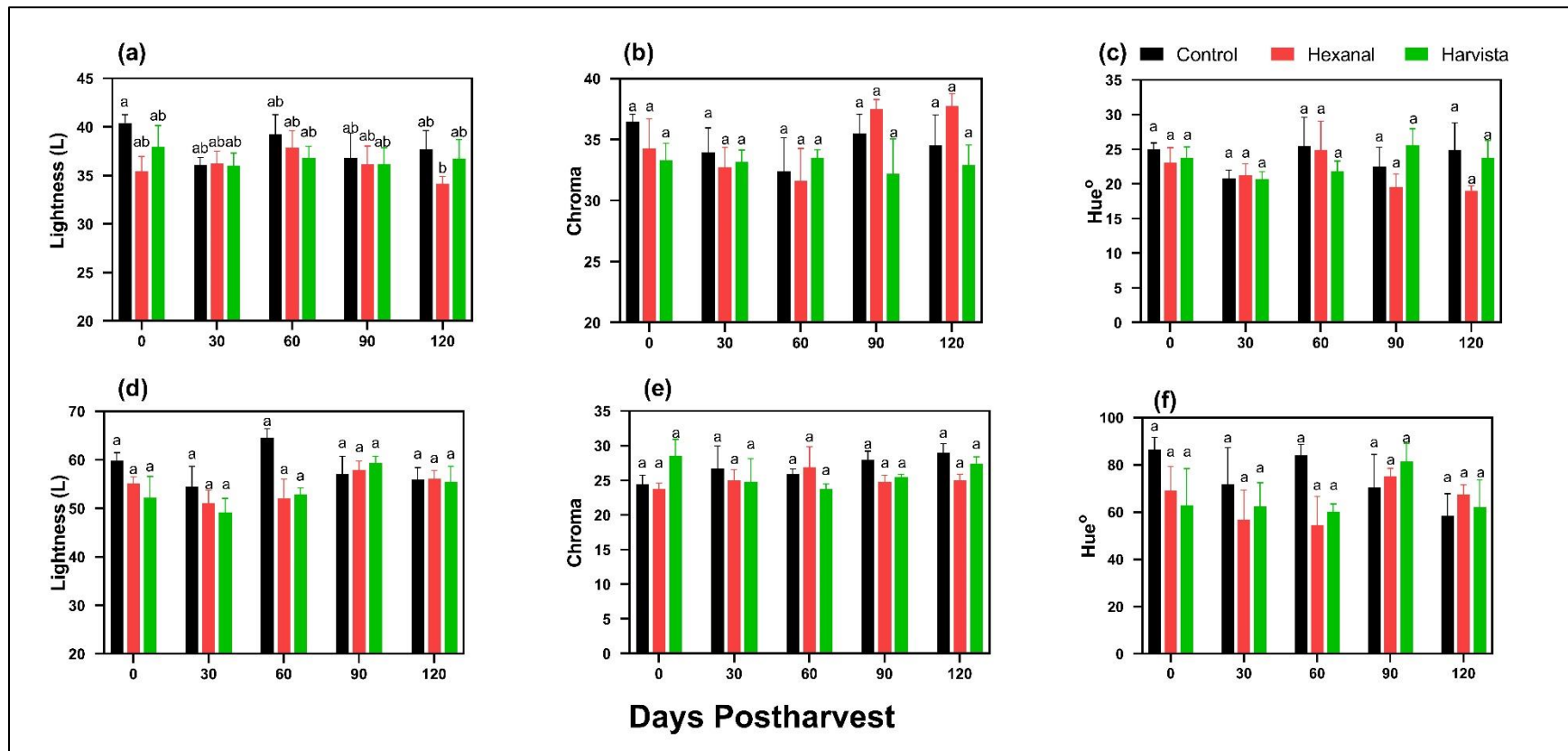
No	Gene	Gene ID/accession # ( <i>Malus domestica</i> )	Forward primer	Reverse Primer
1	MdCaM2	MDP0000183898	ATGGGACCATTGATTTTCCA	CAGCCTCACGAATCATCTCA
2	MdCaM4	MDP0000277474	TGCTACCTCCCATCCTTCAG	CATCTTCCTCGCCATCAAAT
3	MdCML1	MD02G1202000	GACGGTTACCTGGACCGTTA	TTCCCGTCTTTGTTGGAGTC
4	MdCML18	MD10G1094100	TGCAACCTCATCTTTTGCAG	TTCCCTCACAATCCCTTCAG
5	MdPLD $\alpha$ 1	XM_008375733.3	CAGAGGTGGAGAAAGCAAGG	AGCTGCATCTTCAGGCGTAT
6	MdPLD $\alpha$ 4	XM_008393094.3	TGAGATCCAAGGGGAGTTTG	GTTATCGCCATTGTCGGACT
7	MdAct	XM_008362405.3	GTGGATTGCAAAGGCAGAGT	CATAATTTGCTCGCCTCCAT
8	MdHis3	AY347801.1	TGGAAGTGTGCTCTTCGTG	CTCAAACAACCCGACAAGGT

Sequencing details to the gene set 1-6 were obtained from the Genomic Database for Rosaceae and 5 -8 from the NCBI database.

**Table S2:** Effects of preharvest sprays on fruit quality traits fresh weight, firmness and TSS in ‘Honeycrisp’ apples after removal from cold storage (2.5 °C) to room temperature storage (~20 °C)

Variant	Days removal after cold storage			
	Treatment	30	60	90
Mean fresh weight over 14 d at 20 °C (g)	Control	262 (252 - 272) <sup>b</sup>	257 (247 - 266) <sup>b</sup>	339 (317 - 360) <sup>a</sup>
	Hexanal	284 (275 - 294) <sup>a</sup>	280 (271 - 290) <sup>a</sup>	326 (305 - 348) <sup>a</sup>
	Harvista	260 (250 - 269) <sup>b</sup>	254 (245 - 264) <sup>b</sup>	272 (251 - 293) <sup>b</sup>
Mean firmness over 14 d at 20 °C (N)	Control	54.55 (52.88 - 56.21) <sup>c</sup>	54.28 (52.33 - 56.27) <sup>a</sup>	51.70 (49.66 - 53.74) <sup>a</sup>
	Hexanal	60.31 (58.64 - 61.98) <sup>b</sup>	56.9 (54.94 - 58.85) <sup>a</sup>	52.72 (50.68 - 54.77) <sup>a</sup>
	Harvista	64.27 (62.6 - 65.94) <sup>a</sup>	56.42 (54.47 - 58.37) <sup>a</sup>	50.73 (48.69 - 52.77) <sup>a</sup>
Mean TSS over 14 d at 20 °C (°Brix)	Control	12.09 (11.87 - 12.31) <sup>b</sup>	12.89 (12.75 - 12.99) <sup>a</sup>	12.58 (12.32 - 12.84) <sup>b</sup>
	Hexanal	12.99 (12.77 - 13.22) <sup>a</sup>	12.93 (12.82 - 13.03) <sup>a</sup>	13.63 (13.37 - 13.89) <sup>a</sup>
	Harvista	12.95 (12.73 - 13.17) <sup>a</sup>	12.86 (12.75 - 12.97) <sup>a</sup>	13.36 (13.10 - 13.63) <sup>a</sup>

\*Fruit were removed from cold storage after 30, 60 and 90 days postharvest and kept for 14 days at room temperature at ~20 °C (RmT). Values represent the mean  $\pm$  SD of 10 randomly selected fruit. Means followed by different letters indicate significant differences among hexanal, Harvista<sup>TM</sup> and control treatments at the same sampling time based on the Tukey-Kramer test at  $\alpha = 0.05$ .



**Figure S1:** The effects of preharvest sprays on variations in color parameters (a-c) of blush and (d-f) of background of 'Honeycrisp' throughout the cold storage (2.5 °C). L indicates the brightness in the CIE lab system readings. Chroma and Hue angle were calculated using the software available at <http://www.easyrgb.com> (accessed 5, August 2020). Each value represents the least-squares means  $\pm$  SE of eight fruit. LS means with the same letter are not significantly different when comparing treatments with days postharvest based on the Tukey-Kramer test at  $\alpha = 0.05$ .