

Effects of Preharvest Factors on Postharvest Physiological Disorders

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Stem-end Rind Breakdown

Peel Pitting



Possible Causes

- Water stress?
 - Worse with HLB?
- Nutrient Imbalances?
- Low RH postharvest or sudden changes in relative humidity ("RH shock")?

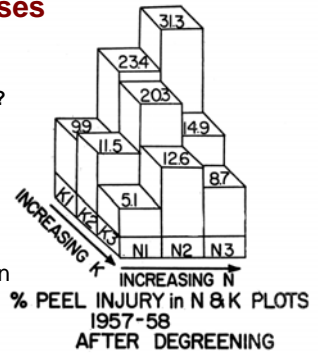


Figure 1. Peel injury as percentage of stem-end rind breakdowns in Valencia oranges from Nite & Koo nitrogen-potash plots. Each figure is the average of samples from four plots.

Water Stress Results

- White grapefruit harvested 48 days after withholding water, held for 3 d at 70F (60% RH), washed (no wax), and then held under ambient conditions on the air-conditioned room floor ~73F.

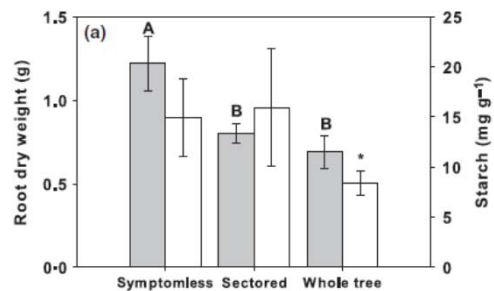
Days after harvest	Treatment	Marketable (%)	Stem-end rot (%)	Penicillium (%)	Total decay (%)	Peel pitting (%)	Stem-end rind breakdown (%)	Total peel breakdown (%)
13	Control	91.33 a ¹	3.33	1.33	3.33	2.67	3.33	6.00 a
	Water def.	78.67 b	5.33	4.67	5.33	10.00	6.00	16.00 b
	Significance	*	NS	NS	NS	NS	NS	*
25	Control	81.00 a	4.67	1.33	5.33	3.33 a	13.00	14.33
	Water def.	60.00 b	15.33	6.00	17.33	11.33 b	13.33	24.00
	Significance	*	NS	NS	NS	*	NS	NS

¹Values within each column followed by unlike letters are significantly different by Duncan's multiple range test at $P \leq 0.05$.

²Irrigation and rain withheld for 49 days prior to harvest.

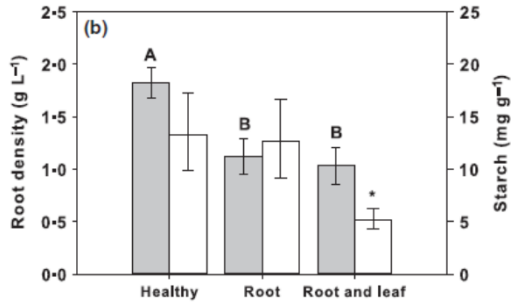
³NS: Nonsignificant or significant at $P \leq 0.05$, respectively.

Possible HLB Effects?



Johnson et al., 2014

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Johnson et al., 2014

Results – Postharvest RH

Star Ruby grapefruit, held for 3 d at 73F at indicated RH, run on packingline, then held at ~73F (room airconditioning). Evaluated 49 d after harvest.

Pre-run RH (%)	Packingline treatment	Marketable (%)	Stem-end rot (%)	Penicillium (%)	Total decay (%)	Pitting (%)	Stem-end rind breakdown (%)	Total peel breakdown (%)
30	Wax	24.51 a ¹	43.01 a	2.29 ab	51.16 a	16.23 a	13.44 a	23.90 a
55	Wax	35.29 d	46.25 a	4.62 ab	49.82 a	8.72 b	7.74 ab	14.89 ab
95	Wax	62.89 bc	26.41 abc	3.41 ab	29.75 b	0.50 de	6.85 ab	6.85 c

Valencia Oranges	Weight Loss (%)		
	Pre-run RH (%)	3 Days	7 days
	30	2.62 a	1.44 a
	60	1.62 b	1.36 ab
	95	0.35 c	1.32 b
	Significance	***	**

Possible HLB Effects?

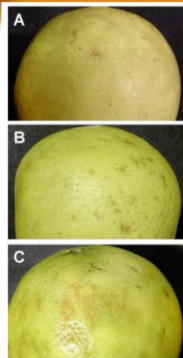
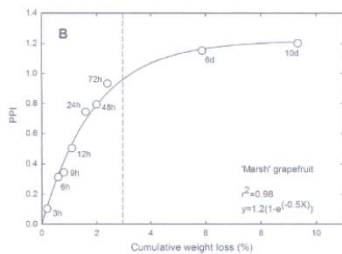


Fig. 3. Postharvest peel pitting in 'Marsh' grapefruit 10 days after maturity from 30 to 90% RH. Unwashed (A), washed (B) and washed and waxed (C) fruit.

Alferez et al., 2004 & 2005

Grove Treatments

- Control – normal grove practices
- Withhold irrigation & rain
- Foliar MKP Treatments (23.5 lb MKP/acre + 4 lb/acre low-biuret urea, 125 gal/acre) – 8 lb K₂O/acre
- Foliar Magnesium (6% Epsom salts)
- Foliar MKP + Mg
- 1% or 2% Vapor Gard®
- WashGard
- Polymer Delivery System

Results – Foliar MKP

- Star Ruby red grapefruit harvested two weeks after commercial MKP application, held for 4 d at 73F (60% RH), washed (no wax), and then held under ambient conditions on the air-conditioned room floor ~73F.

Harvest ¹ (weeks)	Days after harvest ²	Treatment	Marketable (%)	Total decay (%)	Pitting (%)	Stem-end rind breakdown (%)	Total peel breakdown (%)
2	25	Control	70.50 a [*]	1.00	1.00	27.50 a	27.50 a
		MKP	86.50 b	1.00	1.50	11.00 b	11.00 b
		Significance	**	NS	NS	**	**
3	27	Control	82.58	10.25	1.67	7.67 a	9.33 a
		MKP	85.70	9.66	0.67	2.64 b	2.97 b
		Significance	NS	NS	NS	*	*
4	12	Control	64.32 b	2.52	6.87	25.32 a	32.10 a
		MKP	72.89 a	3.19	4.61	18.89 b	23.50 b
		Significance	***	NS	NS	***	***

Results - 2009

- Fruit held 2 to 4 days at 70F (60% RH), washed & waxed (carnauba), and then held under ambient conditions on the air-conditioned room floor ~73F.

	Peel Breakdown (%)		
	Grapefruit 1	Grapefruit 2	Valencia
Control	40.3ab	46.2	33.9a
MKP	29.1abc	28.2	22.7ab
Mg	21.6abc	27.8	19.5b
MKP + Mg			2.6c
Vapor Gard®	12.5c	17.6	10.7bc

2012 Peel Breakdown Studies

- Ruby Red grapefruit trees sprayed 12/21/11. Fruit harvested 1/30/12 and then stored for 50 days at ambient conditions (~73F, 60% RH).

Treatment	SERB (%)
Control (Water)	37 a
MKP	42 a
Wash Guard (1%)	27 b
PDS B-14 (1%)	26 b
Vapor Gard® (2%)	21 b

Result: Marsh White Grapefruit

Marsh white grapefruit after **50 days** of storage under ambient conditions. The fruit were harvested 5 weeks after treatment application. First peel breakdown symptom recorded 22 days (only SERB was observed)

Treatment	Healthy (%)	Decay(%)	Total Breakdown(%)
Water	60	30	13 a
MPK	66	29	17 a
1% Vapor Gard	73	23	7 b
1% Wash Gard	58	37	8 b
1% PDS	62	33	7 b
Significance	NS	NS	*

Values within each column followed by different letters are significantly different by Duncan's multiple range test at $P \leq 0.05$.
*0.235lbs MKP with 0.04lbs urea per tree
**0.225lbs CaCl₂ per tree

Conclusion

- Postharvest peel breakdown is promoted by:
 - Tree water stress before harvest.
 - Low RH conditions after harvest.
 - Excessive brushing during packingline procedures.
- HLB damages tree roots
 - Thus, may increase tree/fruit water stress and PH peel breakdown. **THIS NEEDS TO BE TESTED!**

Conclusion

- Foliar application of K often significantly reduced peel breakdown
 - But not always: occasionally promotes it.
- Vapor Gard has performed consistently well over several seasons in reducing postharvest peel breakdown.
- WashGard and PDS also reduced peel breakdown, but further tests are needed to confirm.

Thank You!

- For more information, visit the UF Postharvest Website

<http://postharvest.ifas.ufl.edu>