Pre- and Postharvest Practices to Reduce Peel Breakdown of Fresh Citrus

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Stem-end Rind Breakdown

Peel Pitting

Possible Causes

- Water stress?
- Nutrient Imbalances?
- Sudden changes in relative humidity ("RH shock")?

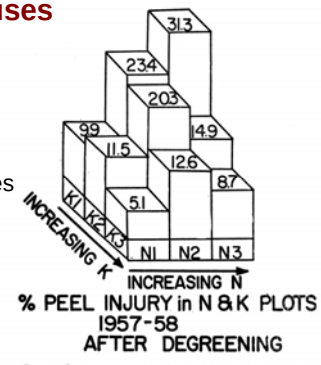


Figure 1. Peel injury as percentage of stem-end rind breakdown in Valencia oranges from Reitz 6 Koo nitrogen-potash plots. Each figure is the average of samples from four plots.

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 K_2O/acre**
- Foliar Magnesium (6% Epsom salts)
- Foliar MKP + Mg
- Foliar MKP + Mg + 1% Vapor Gard®
- 1% or 2% Vapor Gard®

Results: 2008

- 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[z]	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

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

[y]Irrigation and rain witheld for 49 days prior to harvest.

[NS,*]Nonsignificant or significant at $P \leq 0.05$, respectively.

Results: 2008

- 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[z] (weeks)	Days after harvest[y]	Treatment	Marketable (%)	Total decay (%)	Pitting (%)	Stem-end rind breakdown (%)	Total peel breakdown (%)
2	25	Control	70.50 a[x]	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	***	***

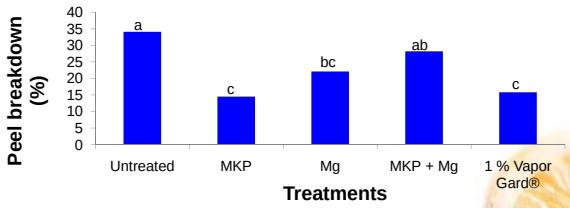
Results: 2009

- 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**

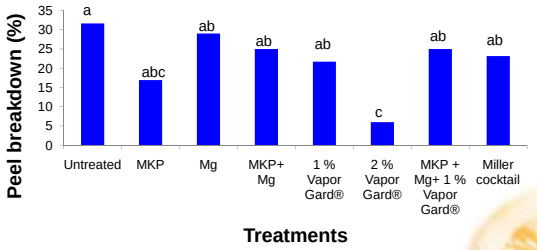
Results: 2009-10

- **'Marsh' white** grapefruit sprayed Nov. 20, 2009.
  - **Very little peel breakdown developed.**
- **Valencia** oranges: Peel breakdown, 2nd harvest fruit after 44 days of storage under ambient conditions.



Results: 2010

'Ruby' red grapefruit peel breakdown. 1st harvest fruit after 31 days of storage under ambient conditions.



Postharvest Treatments

- Relative humidities held ~3 days before packingline treatments.
  - 30%, 60%, or ≥95%
- Fungicides
  - Thiabendazole or Imazalil
- Wax vs. no-wax (carnauba)
- No rinse of detergent

Results

- Star Ruby grapefruit harvested March 11, 2008, held for 3 d at 73F & indicated RH, given packingline treatments, then held under ambient conditions on the air-conditioned room floor ~73F. 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 d[z]	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

Results

- Marsh grapefruit harvested March 18, 2008, held for 3 d at 73F & indicated RH, given packingline treatments, then held under ambient conditions on the air-conditioned room floor ~73F. Evaluated 43 d after harvest.

Pre-run RH (%)	Packingline treatment	Marketable (%)	Stem-end rot (%)	Penicillium (%)	Total decay (%)	Pitting (%)	Stem-end rind breakdown (%)	Total peel disorders (%)
95	Wax	73.50 bc	19.00 ab	1.50 bc	19.50 ab	1.00 ab	6.00 ab	7.00 abc
95	Wax + TBZ[y]	95.50 a	1.00 c	0.00 c	1.00 c	0.50 b	3.00 bc	3.50 bc
95	Wax + Imazalil[y]	79.00 b	10.00 b	0.00 c	10.50 b	3.50 ab	6.50 ab	9.50 ab
95	No Wax	61.50 bc	25.00 a	3.50 ab	26.50 a	5.00 a	7.00 ab	12.00 a
95	No Rinse or Wax[x]	66.50 bc	22.50 ab	7.00 a	23.50 ab	3.00 ab	7.50 ab	10.00 ab
	Significance	***	***	**	***	**	*	*

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Thank You!

- For more information, visit the UF Postharvest Website

http://postharvest.ifas.ufl.edu