

Effects of Preharvest Fungicides on Postharvest Decay of Fresh Citrus

James Salvatore and
Dr. Mark A. Ritenour
UF/IFAS Indian River REC

The Need

- Control of postharvest decay is always a concern.
- Many factors influence the potential for decay development:
 - Preharvest field conditions
 - Harvesting practices
 - Postharvest temperatures, relative humidity, exposure to ethylene, etc.

Purpose

- To determine the most effective preharvest fungicide or compound available to control postharvest decay.
 - Especially important for early season decay from *Diplodia* stem-end rot, anthracnose, and brown rot (*Phytophthora*).

Previous Studies – 1999-2004

- Topsin M (Thiophanate-methyl) – 2 lb/acre
- Benlate (Benomyl) – 2 lb/acre
- Kocide DF (Copper) – 4 lb/acre
- Abound (Azoxystrobin) – 16 oz/acre
- Enable (Fenbuconazole) – 8 oz/acre
- Aliette (Fosetyl-AI) – 5 lb/acre
- Phosphorous acid (Nutriphite or Phostrol) – 4 pints/acre
- Pristine – 18.5 oz/acre
- Actigard (Acibenzolar-S-methyl) – 100ppm + 0.025% Silwet.
- Headline (Pyraclostrobin) – 16 oz/acre
- Scholar (Fludioxonil) – 8oz/acre

Methods 1999-2004

- Materials applied at 125 gal/acre.
- Fruit harvested 2 days and then 2 to 3 weeks after spray application.
- Fruit was degreened if necessary, washed and waxed (shellac).
 - No additional fungicides used or added to the wax.
- Stored at 50°F with 95% RH until evaluated.

Results: 1999-2001 Stem-end rot (%)

Compound	'Sunburst' 4 Nov. 1999 ¹		'Fallglo' 18 Sept. 2000		'Sunburst' 11 Dec. 2000		'Marsh' 16 Mar. 2001	
	23 Nov. 58 d ²	20 Sept. 34 d	9 Oct. 78 d	13 Dec. 77 d	21 Dec. 41 d	19 Mar. 86 d	2 Apr. 79 d	
Control	11.3	0.5	63.8	16.8 a ³	10.4 b	34.6 a	37.3 ab	
Ferbam	11.6	---	---	---	---	---	---	
Acibenzolar-S-Methyl	---	0.9	73.2	15.3 a	8.8 b	49.2 a	42.4 a	
Fenbuconazole	18.8	0.0	65.6	15.8 a	14.1 b	36.5 a	45.5 a	
Fosetyl AL	14.1	0.4	57.6	14.0 a	7.2 b	30.0 a	31.1 abc	
Phosphorous acid	13.4	1.4	77.0	18.8 a	19.9 ab	30.3 a	21.5 bc	
Copper hydroxide	18.1	0.0	72.0	11.5 a	31.9 a	39.2 a	25.0 bc	
Azoxystrobin	---	0.5	56.9	13.5 a	18.8 ab	36.7 a	35.5 ab	
Benomyl	1.6	0.0	65.2	0.5 b	0.5 c	2.9 b	17.2 c	
Significance	NS	NS	NS	***	***	***	**	

¹Application date.

²Harvest date.

³Days after harvest for final decay evaluation.

⁴Values within each column followed by unlike letters are significantly different by Duncan's multiple

NS, **, *** Nonsignificant or significant at $P < 0.01$, or 0.001, respectively.

Results: 2001-2003 Stem-end rot (%)

Compound	'Sanbarot' 4 Dec. 2001 ¹		'Marsh' 25 Feb. 2002		'Valencia' 23 Apr. 2002		Navel 21 Oct. 2002		Ruby Red ² 14 Nov. 2002		'Marcott' 4 Feb. 2003	
	6 Dec. ²	18 Dec.	27 Feb.	11 Mar.	25 Apr.	6 May.	28 Oct.	21 Nov.	5 Dec.	11 Feb.	25 Feb.	
	81 d ³	84 d	118 d	123 d	133 d	122 d	67 d	123 d	109 d	59 d	56 d	
Control	16.8	33.9	37.3 a ^{**}	25.2 a	25.5	30.4 a	32.2 a	15.7 a	10.3	10.0 a	20.9 a	
Pyraclostrobin	11.3	17.4	30.1 ab	15.9 ab	25.8	36.8 a	---	---	---	---	---	
Phosphorous acid	12.8	22.8	24.7 ab	12.0 abc	23.9	31.0 a	---	---	---	---	---	
Thiophanate methyl	9.4	12.6	10.7 c	4.1 c	13.6	9.2 b	9.4 b	4.6 b	4.3	4.1 b	1.5 b	
Benomyl	10.3	12.2	19.6 bc	7.9 bc	10.9	10.1 b	11.6 b	7.8 b	4.5	3.1 b	2.7 b	
Significance	NS	NS	**	**	NS	***	**	**	NS	*	**	

Application date.
Harvest date.
Days after harvest for final decay evaluation.
Values within each column followed by unlike letters are significantly different by Duncan's multiple range test at $P \leq 0.05$.
NS, **, *** Nonsignificant or significant at $P \leq 0.05, 0.01, \text{ or } 0.001$, respectively.

Results: 2004 Red GFT

Treated 10.20.04
Harvested 10.22.04

Stored 56 d

Treatment	Stem end rot	Anthraco	% Decay
Headline	13.1	6.5 d	18.6
Pristine	11.6	12.2 cd	24.4
Topsin	4.8	13.5 cd	18.3
Scholar	17.5	15.5 cd	31.5
Benlate	7.5	20.1 bcd	19.6
Abound	11.9	22.6 abc	26.9
Phostrol	12.8	33.6 ab	45.0
Control	6.9	41.5 a	33.4

Materials and Methods

- Fungicides were applied at a rate of 125 gpa
- Trees were sprayed until run-off using a Stihl® backpack sprayer. (Prior studies were applied using an air blast sprayer)



Methods

- Sprays were applied on 11/4/05 and fruit was harvested on 11/9/05.
- USDA 77-19 Grapefruit Hybrid
- Half of the fruit was de-greened at 4ppm Ethylene, 85F and 90% RH.
- Fruit was not washed or waxed.
- Stored in cold rooms at 58F and evaluated every 2 weeks for decay.
- New formulation added: Topsin F
 - 40 oz/A (Equivalent to 2lbs/A of Topsin M)

Results: 2005 USDA 77-19

Treated 11.04.05
Harvested 11.09.05

Stored 28 d

Treatment	Stem end rot	Anthraco	% Decay
Topsin F	1.5 cd	5.8 b	7.0 d
Topsin M	3.9 bc	13.6 ab	16.8 c
Benlate	1.7 c	15.8 ab	17.4 bc
Headline	8.4 b	11.1 ab	19.1 bc
Pristine	8.6 b	22.0 a	29.7 ab
Phostrol	19.3 a	13.7 ab	31.3 a
Control	19.5 a	18.5 a	36.0 a

Conclusions

- Benlate & Topsin were the most consistent product we have tested.
- Both Benlate & Topsin showed a significant reduction of stem end rot & increase in healthy fruit after storage.
- Aliette, Abound, Enable, Actigard, and Kocide were never significantly better than the control.
- Benlate occasionally reduced Anthracnose prior to 2004.
 - Headline, Benlate, and Topsin significantly reduced the incidence of Anthracnose in 2004 and Topsin F in 2005

Conclusions

- In the only test with Topsin F in 2005, it reduced stem-end rot, Anthracnose, and total decay more than the other fungicides.
- Further trials of Topsin F in grapefruit and other citrus varieties are planned.

Thank You

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- Mike Burton & Bob Pelosi – UF/IFAS
- Website: <http://postharvest.ifas.ufl.edu>