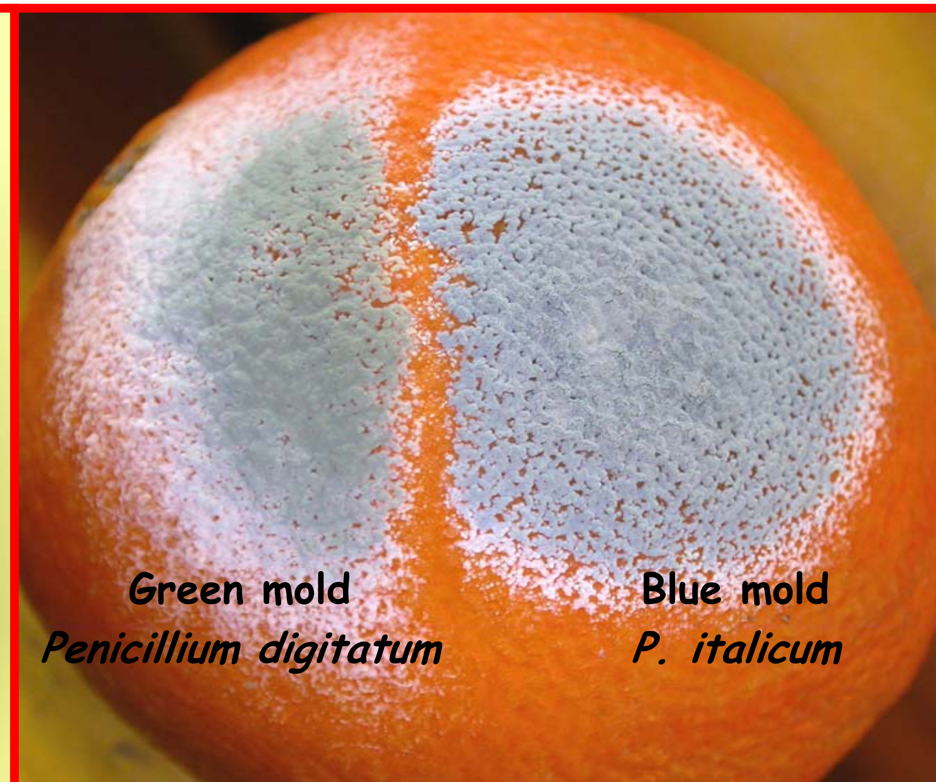
MINIMIZING DECAY LOSSES OF TABLE GRAPES AND CITRUS FRUIT DURING STORAGE AND MARKETING BY CHEMICAL AND NON-CHEMICAL MEANS



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Education	BSc Plant Sciences UC Davis, MSc Plant Pathology Colorado State U,PhD Plant Pathology UC Riverside
With ARS since 1983	
Employees managed	Support Scientist (D. Margosan) Microbiology Technician (M. Mansour) Biological Aide (G. Verduzco)

National Program assignments:

90% 306 Quality and Utilization of Agricultural Products

COMPONENT 1. Quality Characterization, Preservation, and Enhancement

Problem Area 1c and 1d. Factors and Processes that Affect Quality. Preservation and/or Enhancement of Quality and Marketability

OBJECTIVES

"Develop environmentally friendly strategies for plant and animal pathogen control."
"Improve storage technologies which maintain quality and nutrition and increase shelf life."
"Determine influence of pre-harvest factors on quality, including genetics, production practices and environment."
"Determine influence of post-harvest factors on quality, including storage, handling, grading, and processing."

10% 308 Methyl Bromide Alternatives

COMPONENT 2. Post-Harvest Alternatives

Problem Area 2c. Develop Alternatives to Methyl Bromide for Disinfestation of Post-Harvest Perishable Commodities.

OBJECTIVES

"Research to better define the effects of alternative treatments on commodity quality is needed to aid in the development of treatments that do not diminish commodity quality."

Pre- and postharvest actions to minimize post-harvest decay of citrus fruit

Before harvest:

Conventional practice: No actions

Research approaches: 1) GRAS or similar substances; 2) “Reduced-risk” or conventional fungicides.

After harvest:

Conventional practice: 1) fungicides; 2) thermal treatments

Research approaches: 1) GRAS or similar substances; 2) biological control; 3) ammonia fumigation; 4) “Reduced-risk” fungicides; 5) minimized rates of conventional fungicides; 6) fungicide resistance management

State of the art in 1925

Before fungicides were introduced, heat treatment was common

This approach has been revived, revised, and re-introduced

Soak tanks contained soda ash, sodium bicarbonate, or borax-boric acid.
Investigators: UC (Klotz and Fawcett) and USDA (Barger CA) (Winston FL)

Beginning in 1997, the use of heated solutions and tanks has become more common in California

Why is the solution heated?

Pathogen killed in the solution – no 'cross contamination'

Some rot control by heat alone

Boosts effectiveness of GRAS substances to useful levels

Fruit cleaning improved, better wax deposition and shorter drying time

If fungicides are present, they work better with lower residues, and rotary brushing is not needed

Needs some line space, energy, water disposal route

Volatiles from *Muscodor albus* control many postharvest diseases

Control

M. albus-exposed

Julien Mercier AgraQuest, Davis CA

Ammonia fumigation

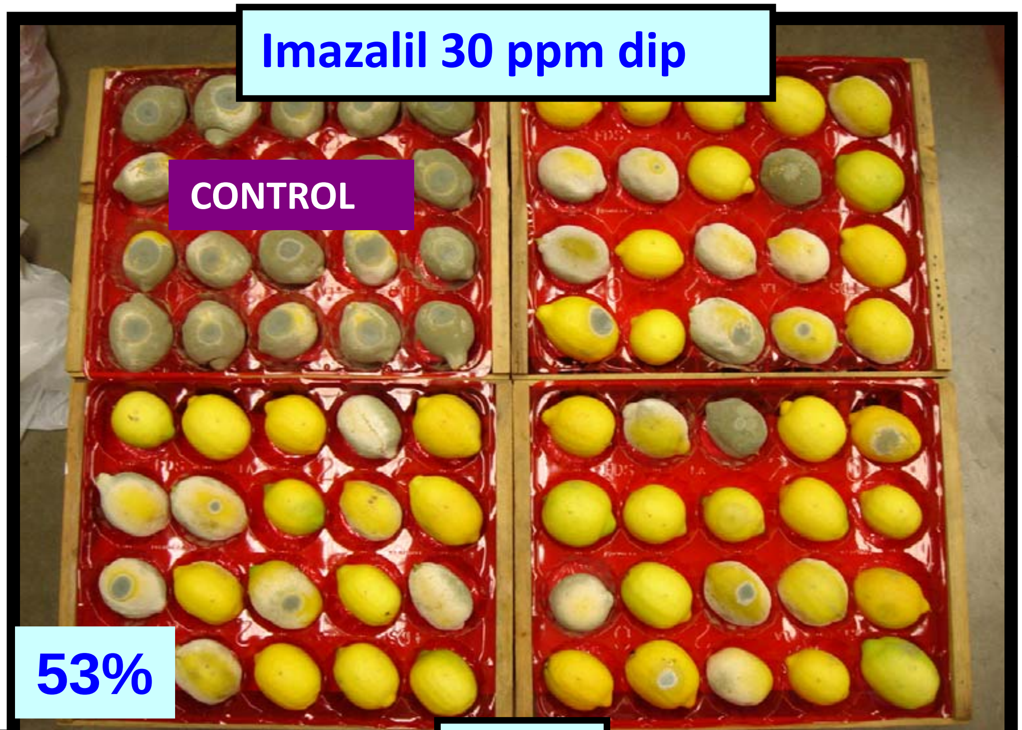
Steve Tebbets USDA ARS

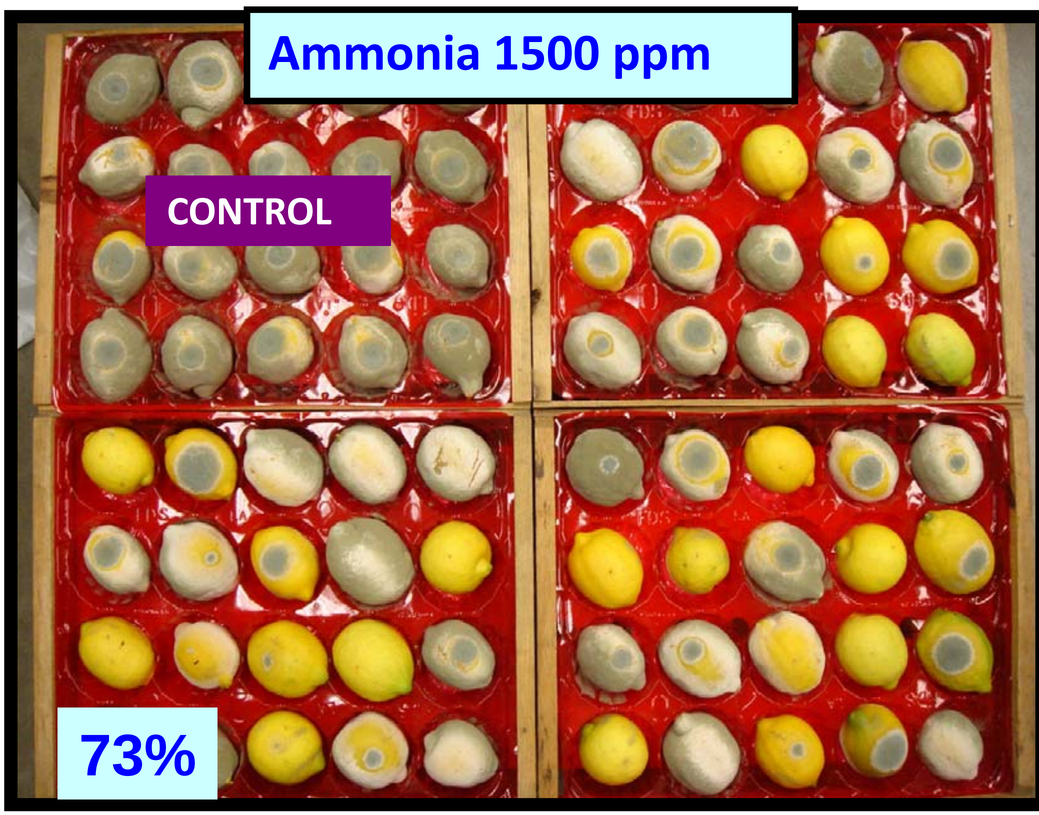
Clara Montesinos IVIA, Valencia, Spain

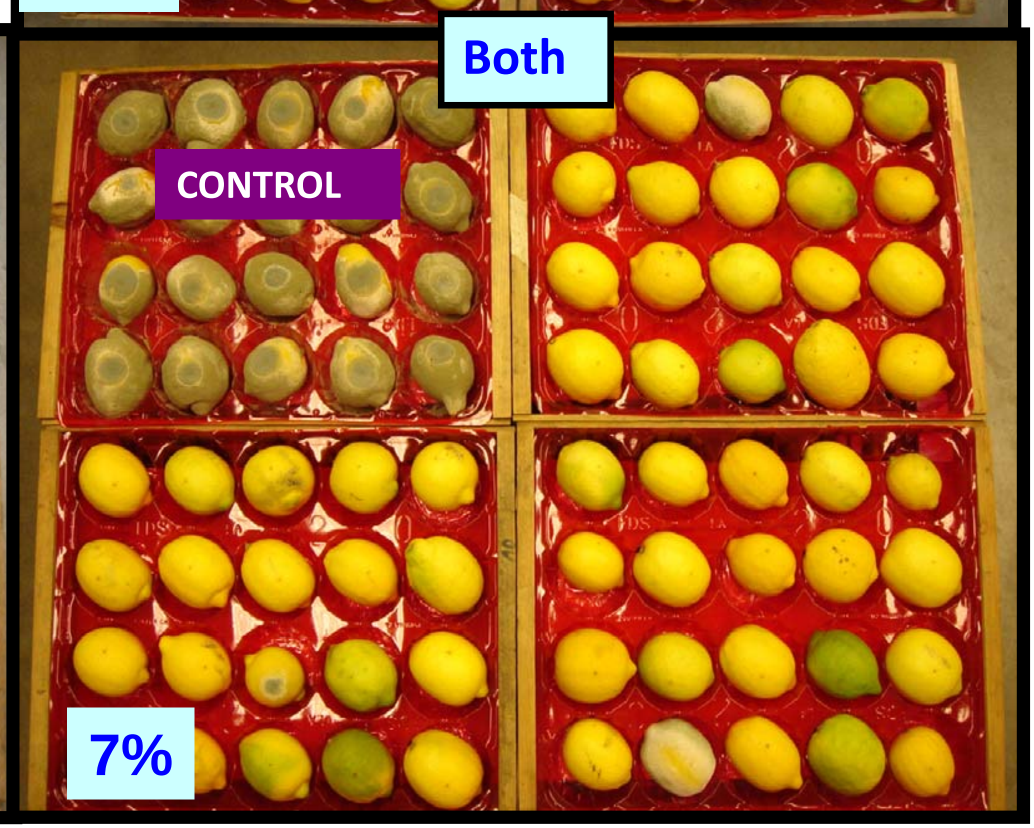
Ammonia gas fumigation

- Citrus fruit tolerate ammonia at rates that stop postharvest rot.
- Ammonia is widely available and cheap.
- Toxicological issues probably few.
- It could be used in existing ethylene degreening rooms facilities now have with upgrades in their gas-tightness.
- Insecticidal and microbial activity of ammonia fumigation needs evaluation.

Synergy between imazalil and ammonia







Grey mold limits of shelf life of grapes because it spreads rapidly from one grape to another, even in cold storage at 32F.

Pre- and postharvest actions to minimize post-harvest decay of table grapes

Before harvest:

Conventional practice: Fungicides, canopy management

Research approaches: 1) GRAS or similar substances; 2) "Reduced-risk" fungicide programs; 3) biological control; 4) disease resistant grapevine selections

After harvest:

Conventional practice: 1) sulfur dioxide fumigation

Research approaches: 1) GRAS or similar substances; 2) biological control; 3) ozone fumigation; 4) sulfur dioxide releasing film packaging

Potassium (K) grape cluster sprays

- Melons have potassium insufficiency, even with good K soil fertilization.

- Hypothesis: Does a K insufficiency exist in table grape berries?

- Yes. ‘Redglobe’ responses to K applied to the berries: faster sugar accumulation, deeper red color, and firmer berries. In 2009, found to be true with many other varieties

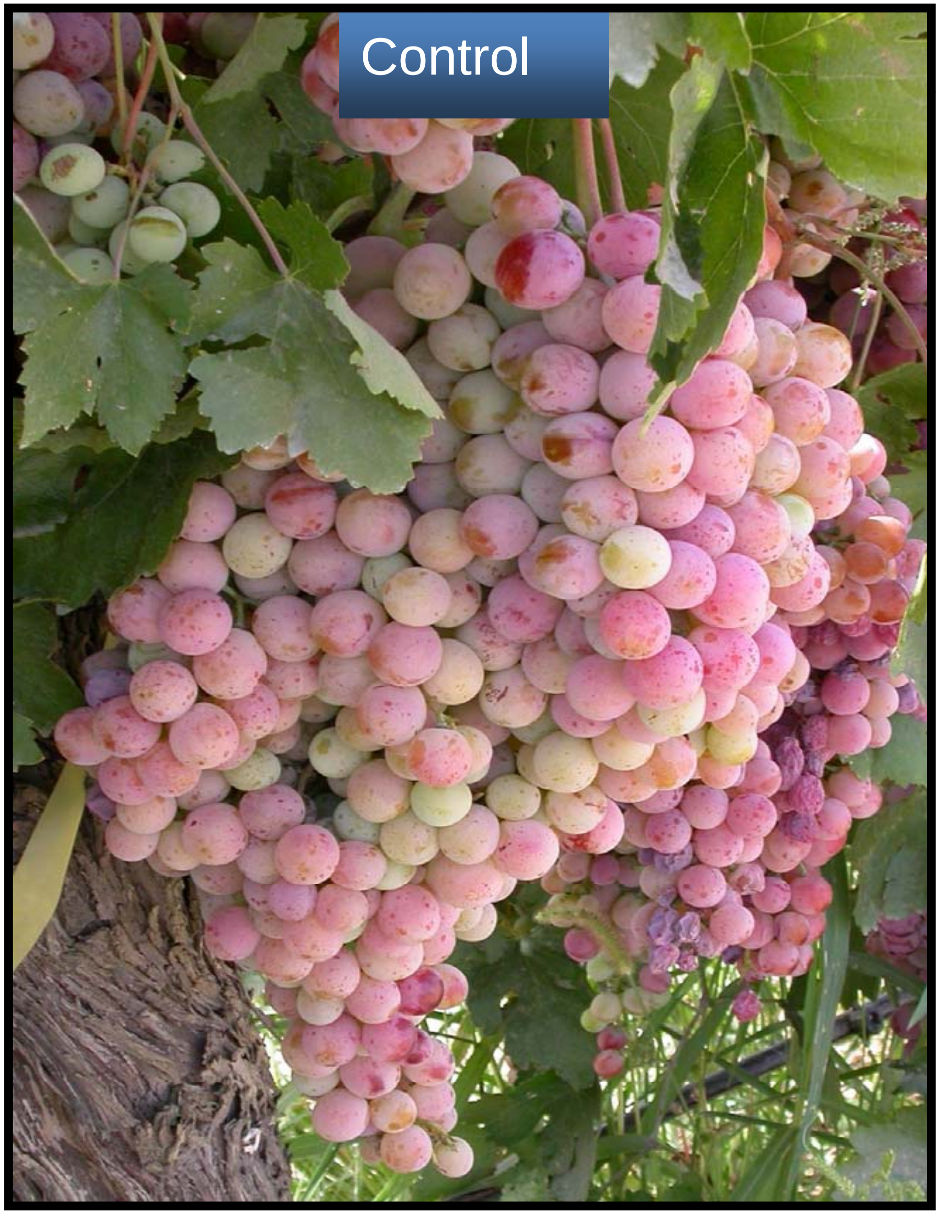
- As a source of K, potassium sorbate (a common and inexpensive food preservative exempt from residue tolerances) both supplied potassium and reduced postharvest gray mold significantly

- Potassium treatments enabled harvest to be earlier by 1 to 3 weeks; early harvest alone can reduce postharvest decay

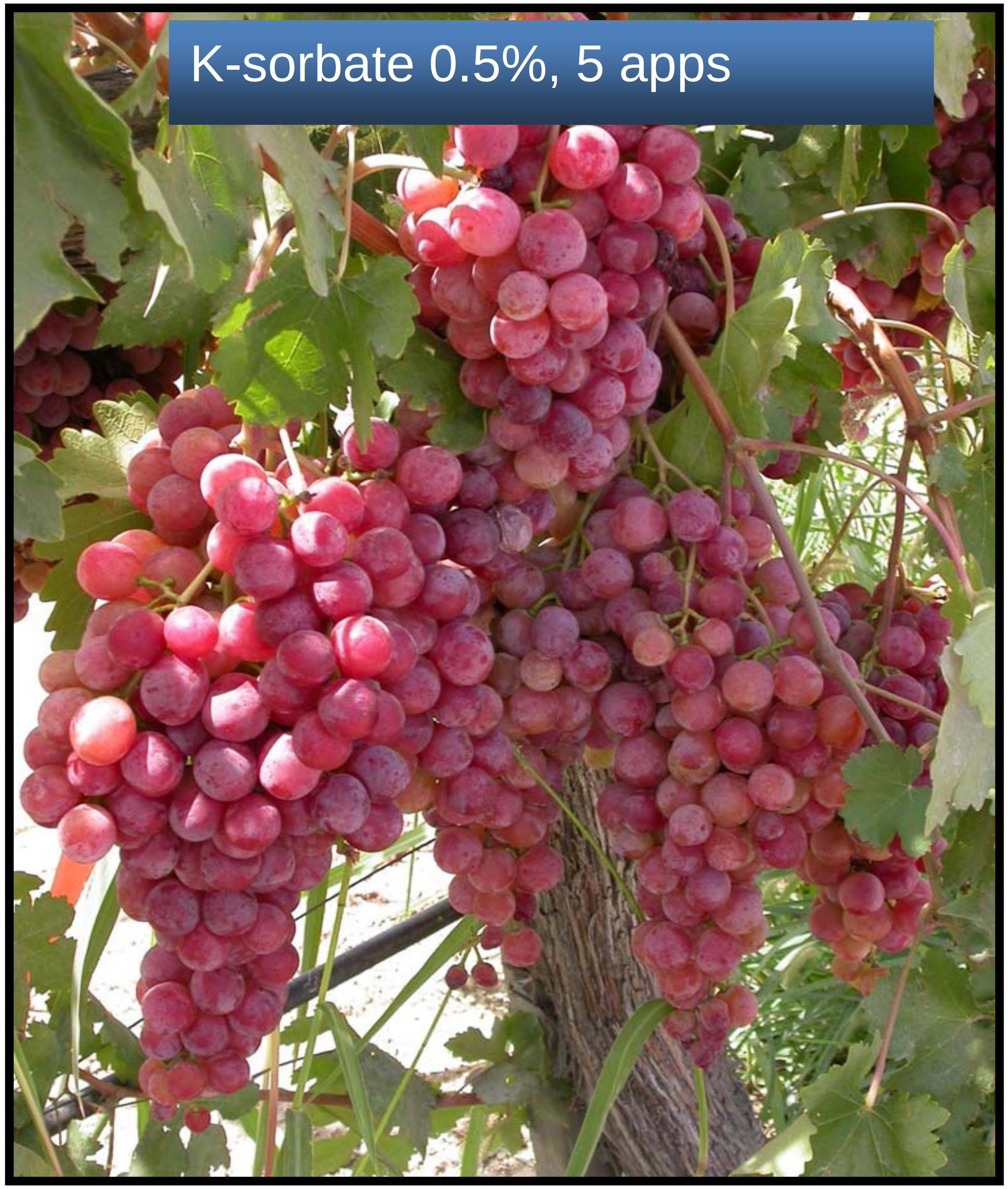
Influence of pre-harvest potassium applications on postharvest decay of table grapes

Regime	Decay (% infected berries)
Water	15.2 a
K sorbate	4.9 b
Fungicides	1.1 c

August 14, 2008 Parlier CA



Sugar content = 14.1% ± 0.6
Hue = 47.8°
Firmness = 336.2 g of Force



Sugar content = 17.6% ± 0.8
Hue = 23.8°
Firmness = 389.2 g of Force

Potassium (K) cluster sprays

“**§ 180.1233 Potassium sorbate; exemption from the requirement of a tolerance.** An exemption from the requirement of a tolerance is established for residues of potassium sorbate.” [70 FR 33363, June 8, 2005]