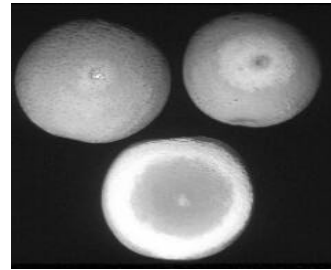


**Citrus Postharvest Decay Control:
Synthetic Fungicides and Natural Products**

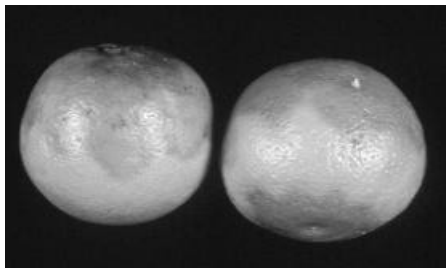
**The Impact of Citrus Fruit Decay for
Florida Citrus Industry**

- Citrus diseases can cause significant losses for growers, packers, shippers, and consumers.
- Postharvest losses are usually greater than are often realized because of added cost of harvesting and handling.

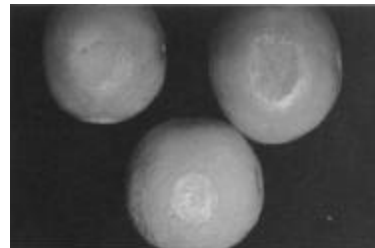
**Major postharvest decays on
Florida citrus**



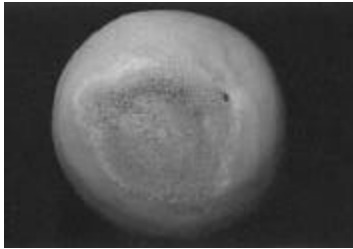
Green mold--*Penicillium digitatum*



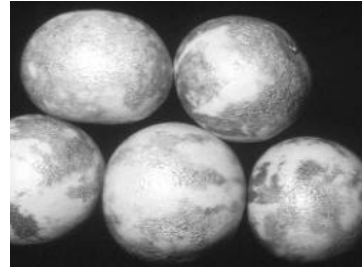
Diplodia stem-end rot--*Diplodia natalensis*



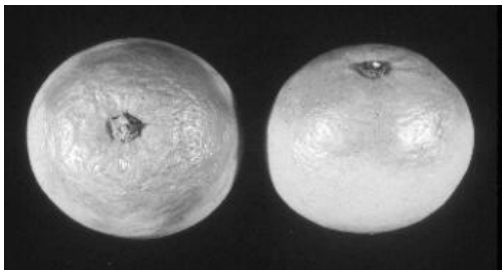
Sour rot--*Geotrichum candidum*



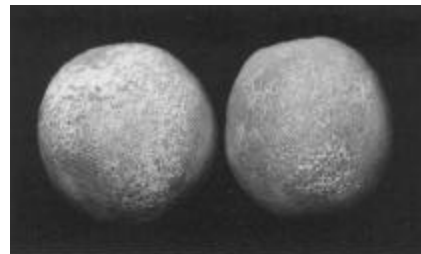
Blue mold--*Penicillium italicum*



Anthracnose – *Collectotrichum gloeosporioides*



Phomopsis stem-end rot – *Phomopsis citri*



Brown rot -- *Phytophthora palmivora* or *P. nicotianae*

Postharvest Decay Control Practices

Postharvest decay control in Florida is conducted by an integrated system using fungicides as the core.

- Minimize fruit injury during fruit harvesting and handling
- Postharvest drenching
- Minimize ethylene concentration and degreening time
- Pre-washing with sanitizers
- Postharvest washing
- Aqueous fungicide application
- Wax containing fungicides
- Packinghouse and storage room sanitation
- Low temperature refrigeration

Synthetic fungicides on citrus

- Sodium *o*-phenylphenate (SOPP)
- Thiabendazole (TBZ)
- Imazalil

Potential problems associated with currently used fungicides

- Only three registered fungicides
- Hazard risks, residues
- Regulatory issues
- Pathogen resistance
- Economic costs
- No alternative methods in place

Evaluation of new synthetic fungicides for postharvest decay control

- Two new fungicides from Janssen Pharmaceutica Inc. are in the process of being evaluated for decay control.
- Janssen is in the process of registering at least one new chemical for postharvest treatment.

Reduced risk chemical

- Abound (Azoxystrobin) from Zeneca Inc.
- Abound has been registered for citrus preharvest use.
- California is pursuing Abound registration for citrus postharvest use.

Develop alternative postharvest decay control methods using safe and natural products

- Evaluate commercial natural products for postharvest decay control.
- Develop biocontrol agents for postharvest decay control.
- Discover naturally-occurring compounds for decay control.

Evaluation of commercial natural products

- Messenger
- Three bicarbonate based products

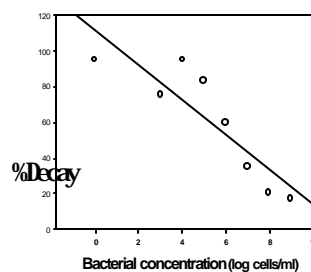
Effects of bicarbonate-based products on green mold of inoculated citrus fruit

Biocontrol agent development

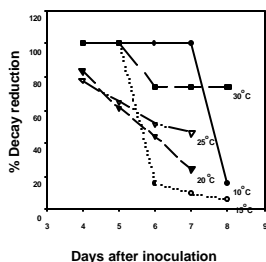
- Commercially registered biocontrol agents --Biosave 1000 (EcoScience Inc.) and Aspire (Ecogen Corporation).
- Biocontrol agent development by FDOC Scientific Research--biocontrol agents based on *Bacillus* spp.

Effects of *Bacillus* spp. isolates on green mold of 'Valencia' fruit using a fruit inoculation method

Effect of *Bacillus subtilis* on green mold of 'Valencia' fruit using a simulated commercial application procedure (Study 2001-02-D)



Correlation between percentage decay and *Bacillus subtilis* GB07 concentrations



Effect of *Bacillus subtilis* GB07 on green mold on 'Valencia' orange under different temperatures

Ultimate Research Goal

Establish an effective, integrated citrus postharvest decay control system for the Florida citrus industry. This system includes physical, chemical and biological methods.