

# Postharvest Pome Fruit Disease Identification, Prevention & Control



US Apple.org

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# OUTLINE

I. Background

II. Rot identification

III. Management tools



# POSTHARVEST DECAY



- Occurs after the fruit are harvested
- Caused by fungal plant pathogens
- Infections can start as early as bloom

# POSTHARVEST DECAY



- **Worsened by rain events prior to or during harvest**
- **Losses due to costs associated with repacking, additional fungicide treatments, and rejection from processors**
- **Persistent problem for growers, packers, processors and consumers = EVERYONE LOSES!**

# IMPACT

Value: Farm gate value of nearly \$4 billion dollars  
(U.S. Apple Association)



Losses: Range from 1-5% on fungicide-treated fruit

1% of \$4 billion = \$4 million

5% of \$4 billion = \$20 million

# IMPACT

## Additional negative effects of decay:

- Reduces fruit quality
- Patulin contamination of juices etc.
- Can block trade – (e.g. quarantine pathogens)
- Contributes to food waste



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# POSTHARVEST DISEASES

Diseases that show up mainly in storage

**Blue Mold** – *Penicillium* species

**Gray Mold** – *Botrytis cinerea*

**Mucor Rot** – *Mucor pyriformis*



**Blue Mold**



**Grey Mold**



**Mucor Rot**



# POSTHARVEST DISEASES



**Infection starts in the field and manifests in storage**

Alternaria rot - *Alternaria* spp.

Bitter rot - *Colletotrichum* spp.

Black rot - *Botryosphaeria obtusa*

Moldy core - *Alternaria alternata*

Storage scab - *Venturia inequalis*

White rot - *Botryosphaeria dothidea*

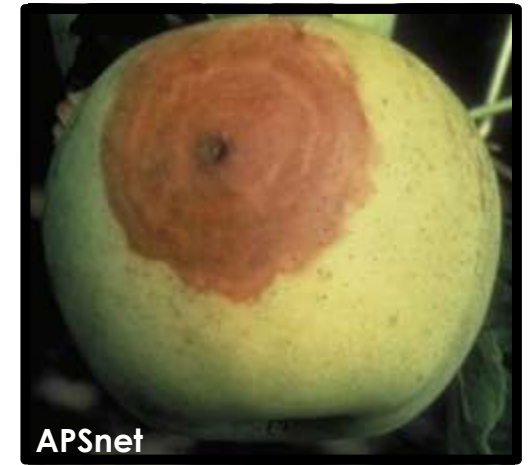
# POSTHARVEST DISEASES



**Moldy core**



**Bitter rot**



**White rot**



**Alternaria rot**



**Storage scab**



**Black rot**

# QUARANTINE PATHOGENS

- Not detected in MD, PA, WV, DE to date
- March 2012 – Sphaeropsis rot – NY (Orleans county) 0.1% incidence on 'Empire' in commercial storage
- Shut down trade of apples from Washington State to China in 2012



**Speck rot**



**Bull's-eye rot**



**Sphaeropsis rot**

# MANAGEMENT STRATEGIES

1. Chemical & biological controls
2. Cultural practices



# CHEMICAL

## Preharvest fungicides



- Applied in the field (bloom → petal fall AND before harvest)
- Merivon [7+11], Luna sensation [7 +11], Topsin M [1]
- High to medium-high risk materials

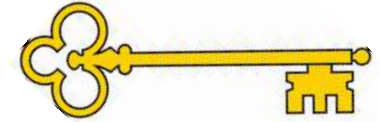
# CHEMICAL



## Postharvest fungicides

- Applied after the fruit are harvested
- Mertect [1], Penbotec [9], Scholar [12], Academy [12+3]
- Low-medium, medium and high risk chemistries

# CHEMICAL



## 3 Keys to Maintaining Fungicide Efficacy:

- **Rotate applications with different FRAC codes in the field and in storage**
  
- **Follow the label: Use full rates and be aware of max number of season applications**
  
- **Tank mix with a broad spectrum fungicide – (field)**
  - **Mancozeb (early season)**
  - **Captan and/or Ziram (2<sup>nd</sup> cover → harvest)**
  - **Mindful of PHI**

# BIOLOGICAL

## Bio-Save (*Pseudomonas syringae*)



- Labeled for pome fruit, citrus, potato, and cherries
- Can be integrated with conventional management programs
- Organic approved and OMRI listed





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## Truck drench



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## Bin drench



W.J. Janisiewicz, USDA-ARS

## Waxing



J.E Adaskaveg, UC-Riverside

## Dip



J.E Adaskaveg, UC-Riverside

## Thermofog

# CULTURAL PRACTICES



- 1) Bin sanitation
- 2) Remove leaves and infected fruit from the orchard floor, packinghouse, and bins
- 3) Avoid wounding and bruising fruit
- 4) Maintain proper storage temperature (33.8-39.2°F)/(0-4°C)
- 5) Harvest fruit at proper maturity
- 6) During dormancy: Remove dead/cankered wood and fruit mummies



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**Keep bin surfaces  
clean**

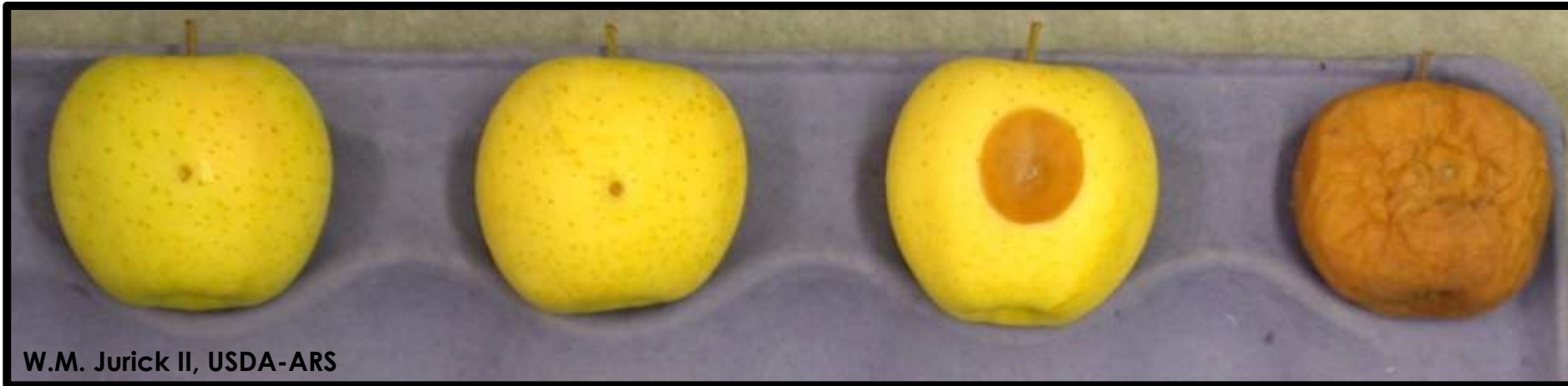
**Remove leaves**



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**Remove infected  
materials**

## Warmer Temperature



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32°F (0°C)  
(Optimal)

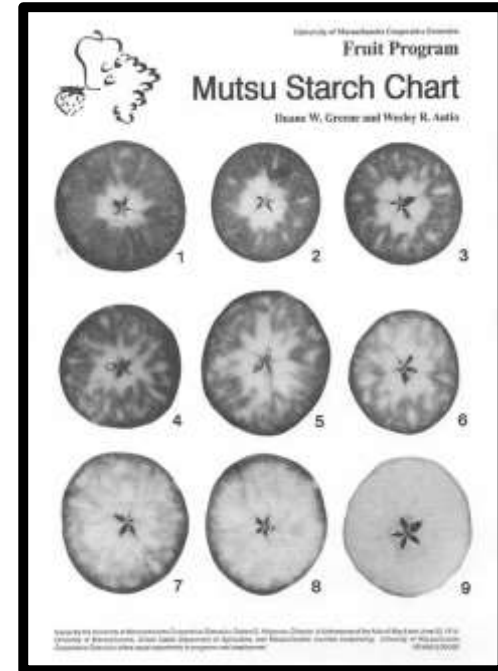
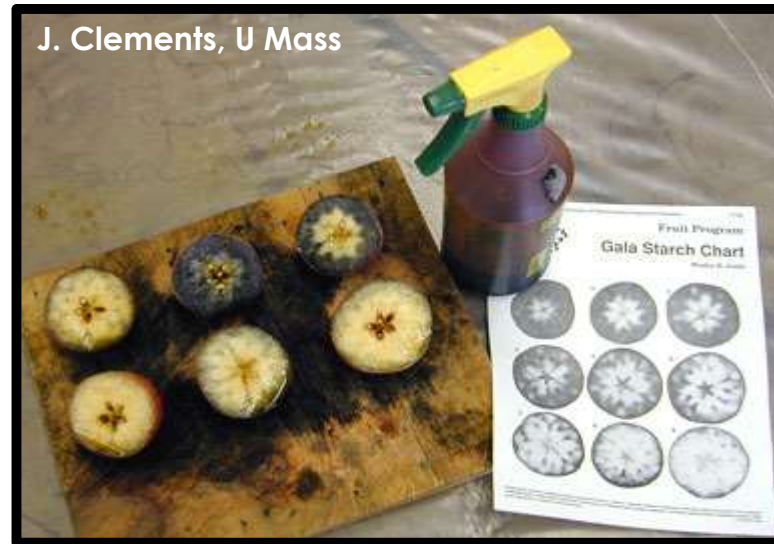
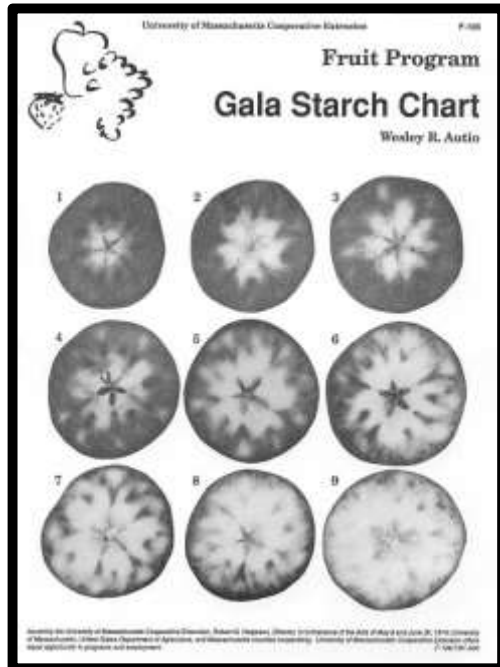
41°F (5°C)  
(Refrigerator)

50°F (10°C)  
(Abusive)

68°F (20°C)  
(Room temp)

- Inoculated with equal amounts of spores
- Incubated for 7 days at different temperatures
- Warmer temperature = MORE ROT!!!!

# STARCH-IODINE TEST



- **Reliable test to predict fruit maturity**
- **Rapid and cheap**
- **Variety dependent scales available**

# SUMMARY

- **Postharvest rots cost everyone time, money, and aggravation!**
- **Postharvest rots can be caused by many different fungi; infection can start in the field for several.**
- **Fungicides are effective tools for decay management and should be used according to the label.**

# **SUMMARY**

- **Rotate chemistries with different FRAC codes to limit fungicide resistance.**
- **Alternative options available: Biological control (Bio-Save) a viable option for conventional and organic markets; resistance issues limited.**
- **Cultural practices are important to incorporate into your integrated pest management program to combat decay.**

# **WHERE TO GO FOR MORE INFORMATION**

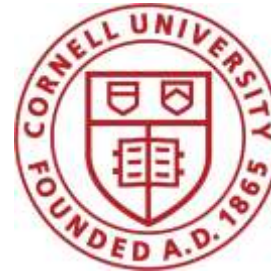
- **Penn State Tree Fruit Production Guide**
- **Your state tree fruit pathologist, county extension agent**
- **World Wide Web – Extension website resources**  
**(Penn State, WVU, Cornell, WSU etc)**



# ACKNOWLEDGEMENTS

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# QUESTIONS?



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