New Coating Formulations for the Conservation of Tropical Fruits

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Types of Fruits
- Climacteric
- Non-Climacteric

Coatings can Extend shelf life and marketability
- Delay ripening of climacteric fruit
- Delay color changes
- Reduce water loss
- Reduce decay
- Improve appearance
- Simple technology
- Environmentally friendly

Materials Used in Coatings
- Lipids
- Resins
- Polysaccharides
- Proteins
- Other polymers
- Composite
- Bilayer
- Plastisizers - low MW polyols
- Antifoam agents
- Surfactants
- Emulsifiers

Lipid Materials
- Carnauba wax
- Candelilla wax
- Beeswax
- Rice bran wax
- Paraffin wax
- Polyethylene
- Vegetable oil
- Paraffin oil
- Mineral oil
- Acetylated monoglycerides

Resin Materials
- Shellac
- Wood rosin
- Coumarone indene (petroleum-based)
- Copal
- Damar
- Elemi

**Carbohydrate Materials**
- Cellulose
- Starch
- Pectin
- Alginate
- Carrageenan
- Furcellaran
- Chitosan
- Gum arabic
- Gum ghatti
- Gum tragacanth
- Guar gum
- Locust bean gum
- Xanthan gum
- Gellan gum

**Protein Materials**
- Soy protein
- Zein (corn)
- Casein
- Whey
- Wheat gluten
- Peanut protein

**Coatings can be Carriers of Useful Ingredients**
- Antimicrobial compounds
- Color
- Aroma
- Anti-browning agents
- Acidulants
- Anti-ripening compounds
- Antioxidants

**Advantages/Disadvantages to Coating Fruits**

**Advantages**
- Reduce water loss (weight loss)
- Slow down ripening
- Reduce chilling injury
- Reduce mechanical injury
- Reduce decay
- Reduce color changes
- Add shine

**Disadvantages**
- Increase water loss
- Cause anaerobic conditions
- Temperature dependent
- Alter flavor
- Undesirable texture
- Discoloration
- Unsightly peeling

**Problem with Tropical Fruits**
- Often climacteric
- Need to ship long distance
- Chilling sensitive
- Harvest immature

**Compromise Quality**

**Coatings for Tropical Fruits**
- Mineral oil (limes)
- Shellac (oranges)
- Paraffin wax (yams, coconut)
- Vegetable oil (papaya)
- Carnauba wax (various fruits)
- Carnauba/shellac mixture (various fruits)
- Carbohydrate (Nature Seal/various fruits)
- Carbohydrate/sucrose ester (SemperFresh)
- Protein (zein/oranges)
- Chitosan
- Polyvinylacetate (PVA)

Application of coatings

- Overhead sprayer
- Saturated brushes
- Dipping
- Dryer

Coatings work like MAP

Effect of Coating on Internal Fruit Atmosphere

Internal gas - orange

Use of Coatings to Delay Ripening

Uncoated control

Coated with Nature Seal

How Coatings Affect Ripening

Ethylene

Effect of Coatings to Delay Yellowing of Lemons/guava

Coatings that add shine

Coatings that Carry Natural Antagonists to Pathogens

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Decay</th>
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<tbody>
<tr>
<td>Control</td>
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<tr>
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<tr>
<td>Shellac + Imazalil</td>
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Use of Coatings to Extend Mango Shelf Life

Effect of Coatings on Mango Flavor Compounds

Effect of Coatings on Mango Flavor

Comparing CA and Coatings to Extend Mango Shelf Life

Conclusions

- Coatings are a cheap technology
- Can extend shelf life of fruit
- Technology relies on good temperature control
- Materials need to be tested on each type of fruit and even each variety