

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

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Carbohydrate Materials

- ❖ Cellulose
- ❖ Starch
- ❖ Pectin
- ❖ Alginate
- ❖ Carrageenan
- ❖ Furcellaran
- ❖ Chitosan
- ❖ Gum arabic
- ❖ Gum ghatti
- ❖ gum karaya
- ❖ 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

- | <u>Advantages</u> | <u>Disadvantages</u> |
|-----------------------------------|------------------------------|
| ❖ Reduce water loss (weight loss) | ❖ Increase water loss |
| ❖ Slow down ripening | ❖ Cause anaerobic conditions |
| ❖ Reduce chilling injury | ❖ Temperature dependent |
| ❖ Reduce mechanical injury | ❖ Alter flavor |
| ❖ Reduce decay | ❖ Undesirable texture |
| ❖ Reduce color changes | ❖ Discoloration |
| ❖ Add shine | ❖ 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)

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Application of coatings



- ❖ Overhead sprayer
- ❖ Saturated brushes
- ❖ Dipping
- ❖ Dryer

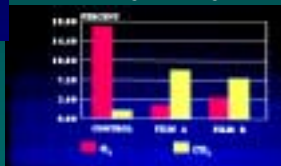
Coatings work like MAP



Effect of Coating on Internal Fruit Atmosphere



Internal gas - orange



Use of Coatings to Delay Ripening

Uncoated control



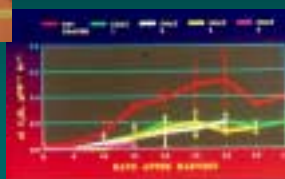
Coated with Nature Seal



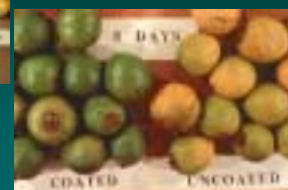
How Coatings Affect Ripening



Ethylene



Effect of Coatings to Delay Yellowing of Lemons/guava

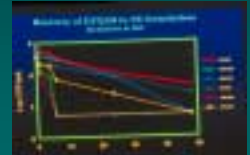


Coatings that add shine



Coatings that Carry Natural Antagonists to Pathogens

Treatment	% Decay
❖ Control	❖ 47.2
❖ Nature Seal	❖ 47.5
❖ NS + US 7	❖ 34.0
❖ NS + Imazalil	❖ 21.6
❖ Shellac + Imazalil	❖ 25.6



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



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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

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