Phytosanitary Irradiation Quality Studies

Anuradha Prakash
Chapman University
• Dose response studies to determine tolerance of fruit to irradiation
• Comparison to conventional treatments
• Effect of commercial treatment and distribution
Peaches shipped from GA/SC to FTSI

Irradiated at 0 and 0.4 kGy at FTSI

Shipped to Chapman by refrigerated truck

Quality tests performed at 1, 7, and 14 days following irradiation

Weight loss
Internal disorder development
Percentage decay

Texture
 Analyzed using a penetrometer

Sensory
 Consumer testing with untrained panels using 9 point hedonic scales

Chemical
 pH, Titratable Acidity, Brix
Consumers preferred Irradiated Peaches

Titan - Blaze Prince
Ground shipment study: blueberries

- Fresh *Vaccinium ashei*, Rabbiteye “Premier” blueberries harvested in Georgia, June 2014

**MeBr**

- 15.56 °C and 32g/m³ for 3.5 hours
- Forced air cooled to 1°C
- Ground shipment to Gateway America, Gulfport, MS
- Ground shipment to Chapman Univ, Orange, CA

**Irradiation**

- Forced air cooled to 1°C
- Ground shipment to Gateway America, Gulfport, MS
- Gamma irradiation at 150 and 400 Gy
- Ground shipment to Chapman Univ, Orange, CA

Retail display, ambient temperature
The image shows a bar chart illustrating the percentage of damage (Good Berries, Decay, Softness, Physical Defects) over different days in a retail display. The treatments include MeBr, 150 Gy, and 400 Gy, measured on Day 1, Day 3, and Day 5.
California Retail Conditions

Day 8

Day 10

Day 12

MeBr  150 Gy  400 Gy
Strawberry Air Shipment study

Freshly harvested strawberries
- Marquee: June 2014, Santa Maria
- Amado: October and November 2014, Oxnard

**MeBr**
- 15.56 °C and 32g/m³ for 3.5 hours, Raymond Express
- Forced air cooled to 1°C

**Irradiation**
- Forced air cooled to 1°C
- Transported to Sterigenics, 400 Gy

**Control**
- Forced air cooled to 1°C

- Insulated for air shipment 1 day
- Unwrapped, retail display, ambient temperature, 4 days

Transported to Chapman University

Stored overnight at 1°C
Packaging with astrofoil

Chapman University
Texture

![Bar chart showing force (N) for different conditions over Day 2 and Day 4.](chart)

- **Refrigerated Control**
- **Air freight control**
- **Air freight irradiated**
- **Air freight MeBr**
Sensory analysis of Marquee (trial 2) strawberries.

- **Appearance**: 7.2
- **Flavor**: 7.4
- **Texture**: 6.8
- **Overall Liking**: 7.0

**Comparisons**:
- Trial 4 Refrigerated control
- Trial 4 Air freight irradiated
- Trial 4 Air freight MeBr
- Trial 4 Air freight control
Day 4 ambient temperature display

Control

MeBr

Irradiation

Marquee

Amado
Seedless Kishu Mandarins

Control

150 Gy

400 Gy

1000 Gy
Chandler Pummelos

Control

150 Gy

1000 Gy
Future Studies

Peaches

- Harvest Immature
  - Irradiate immediately
    - Quality, Sensory and shelf life testing
      - Store at ideal temperatures
      - Store at commercial and/or home refrigeration temperatures
  - Irradiate after delay
    - Quality, Sensory and shelf life testing
- Harvest at more mature stage
  - Irradiate immediately
    - Quality, Sensory and shelf life testing
Considerations

• Harvest times
• How many varieties?
• Maturity at harvest
• Other qualifiers-size, color
• How is the fruit packed?
• Where is the product exported to?
• How long does it take?
  • Shipping conditions
• Storage conditions
• Storage life
• How is quality measured?
Acknowledgments

• Heather Mcdonald
• Karina Rodriguez
• Akanksha Jain
• Tamar Serapian
• Dr. Jose de Jesus Ornelas Paz
• USDA-APHIS
• Titan Farms
• Lane Southern Orchards
• Georgia and South Carolina Peach Council
• FTSI
• Naturipe
• Gateway America
• Sterigenics