


# Subtropical Fruits




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# Subtropical Fruits



- Some of these fruits are grown in tropical areas
- These fruit are diverse in:
  - Morphology
  - Composition
  - Postharvest physiology
  - And in their optimum postharvest handling requirements




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# Subtropical Fruits Include




- Atemoya <http://www.2ndlight.com/forum42ndlight/attachments/Atemoya901ASIT.jpg>
- Avocado 
- Carob (Chinese date)  <http://www.cookbookwiki.com/images/e/ef/Carob.jpg>



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# Subtropical Fruits Include

- Cherimoya  <http://bigy.com/content/prod//var/cherimoya.jpg>
- Citrus 
- Date  <http://www.wegmans.com/kitchen/ingredients/produce/fruit/images/date.jpg>

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# Subtropical Fruits Include

- Fig 
- Jujube  [http://bulletin.coa.gov.tw/htmlarea\\_english/web\\_articles/5761/ffujube01.jpg](http://bulletin.coa.gov.tw/htmlarea_english/web_articles/5761/ffujube01.jpg)

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# Subtropical Fruits Include

- Kiwifruit  <http://media.apn.co.nz/webcontent/image/jpg/kiwifruit.JPG>
- Longan  [http://www.khmerkromrecipes.com/photo\\_recipes/longan.jpg](http://www.khmerkromrecipes.com/photo_recipes/longan.jpg)
- Loquat  <http://darkwing.uoregon.edu/~inaasim/Hist%20410/Loquat.jpg>

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## Subtropical Fruits Include

- Lychee  <http://www.pakissan.com/english/advisory/images/dat.lychee05.jpg>
- Olive  [http://springstonphoto.com/adm/photo/47\\_Olive.jpg](http://springstonphoto.com/adm/photo/47_Olive.jpg)
- Persimmon  <http://elise.o3.net/ml/persimmon.jpg>
- Pomegranate  <http://www.coral-cure.com/images/pomegranate-fruit.jpg>

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## Groupings

- Highly Perishable:
  - Fresh figs, loquat, lychee
- Moderately Perishable:
  - Avocado, cherimoya, olive, persimmon
- Less Perishable:
  - Citrus, carob (dry), dried figs, date, jujube, kiwifruit, pomegranate




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Class	(mg CO <sub>2</sub> /kg-hr) at 5 °C (41 °F)	Commodities
Very Low	< 5	Dates, dried fruits and vegetables, nuts
Low	5 - 10	Apple, beet, celery, citrus fruits, cranberry, garlic, grape, honeydew melon, kiwifruit, onion, papaya, persimmon, pineapple, potato (mature), sweet potato, watermelon
Moderate	10 - 20	Apricot, banana, blueberry, cabbage, cantaloupe, carrot (topped), celeriac, cherry, cucumber, fig, gooseberry, lettuce (head), mango, nectarine, olive, peach, pear, plum, potato (immature), radish (topped), summer squash, tomato
High	20 - 40	Avocado, blackberry, carrot (with tops), cauliflower, leeks, lettuce (leaf), lima bean, radish (with tops), raspberry
Very High	40 - 60	Artichoke, bean sprouts, broccoli, Brussels sprouts, cut flowers, endive, green onions, kale, okra, snap bean, watercress
Extremely High	> 60	Asparagus, mushroom, parsley, peas, spinach, sweet corn

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## Ripening Patterns


- Climacteric:
  - Avocado, Cherimoya, Fig, Kiwifruit, Persimmon
  - Avocados do not ripen on the tree.
- Non-climacteric:
  - Citrus, Date, Jujube, Longan, Loquat, Lychee, Olive, Pomegranate




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## Compositional Characteristics

- Citrus:
  - Good source of vitamin C (#1 contributor of vitamin C to human diet in U.S.)
- Avocados:
  - High energy value (higher than meat of equal weight)
  - (along with olives) have the highest protein and fat content of any tree fruit (excluding nuts)
  - Good source of niacin and thiamin



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**Brooks Lite Avocado**  
35% FEWER CALORIES  
50% LESS FAT  
THAN THE LEADING CALIFORNIA AVOCADO!



	FAT	CALORIES
PER 100 SERVING		
Brooks Lite™	2.5g	35
California	5.0g	55

**Nutrition Facts**  
Serving Size 1.0 Cup (100g) (100g)  
Amount Per Serving  
Calories 35    Calories from Fat 30  
% Daily Value  
Total Fat 2.5g    5%  
Saturated Fat 0.5g    1%  
Cholesterol 0g    0%  
Sodium 0g    0%  
Total Carbohydrate 3g    1%  
Dietary Fiber less than 1g    2%  
Sugar 0g  
Protein 0g

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## ■ ■ ■ Maturity & Quality Standards



- Includes:
  - **Internal quality** attributes (sugars, acids, ratio, etc.)
    - Avocado (CA): minimum dry weight (19 to 25% depending on cultivar)
    - Citrus: juice content, sugars, acids, sugar/acid ratio
  - **Exterior attributes** (color, shape, size, freedom from defects, etc.)
  - Avocado (FL): **days after full bloom**

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## Optimum Storage Conditions



	(°F)	(°C)	RH (%)	Max. Shelf Life
Citrus (FL)				
Orange	32-34	0-1	85-90	3-6 wk
Grapefruit	50-60	10-16	85-90	6-8 wk
Tangerine (mandarins)	40	4	90-95	2-4 wk
Lemon	50	10	85-90	1-4 mo
Lime	50	10	85-90	6-8 wk
Kumquat	39	4	90-95	2-4 wk
Pummelo	45-48	7-9	85-90	1-2 wk
Avocado	40-55	4-13	85-90	4-6 wk
Cherimoya	55	13	90-95	2-4 wk
Dates	32	0	75	6-12 mo
Figs (fresh)	31-32	-1-0	85-90	7-10 days
Kiwifruits	32-36	0-2	90-98	3-5 mo
Loquat	32	0	90	3 wk
Lychee	35	2	90-95	3-5 wk
Olive	41-50	5-10	85-90	4-6 wk
Persimmon	30	-1	90	3-4 mo
Pomegranate	41	5	90-95	2-3 mo

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## ■ ■ ■ MA or CA



- **Avocado:**
  - Potential use of 2-5% O<sub>2</sub> and 3-10% CO<sub>2</sub>
- **Citrus:**
  - Potential use of 5-10% O<sub>2</sub> and 0-10% CO<sub>2</sub>

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## ■ ■ ■ Physiological Disorders



- Most are sensitive to **chilling injury**
  - Wide differences in susceptibility
    - E.g. Florida oranges vs. grapefruit
  - Those **not sensitive to chilling injury** include those that are harvested fully ripe (date and figs), and 'Hachiya' persimmons
  - 'Fuyu' persimmons are chilling sensitive

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## ■ ■ ■ Physiological Disorders



- **Freezing injury**
  - Freezing injured fruit can be separated at the packinghouse based on density, or using x-ray or light transmission methods

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## ■ ■ ■ Physiological Disorders



- **Citrus** fruit have a variety of physiological disorders (besides CI)
  - Postharvest Pitting
  - Stem-end Rind Breakdown (SERB)
  - Aging
  - Stylar-end Russetting
  - Blossom-end clearing
  - Creasing
  - Blue Albedo
  - Zebra Skin

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## Decay Control



- **Avocado:**
  - Anthracnose – esp. in humid Florida. Not serious in California
  - *Dothiorella gregaria* – important in California
  - Stem-end rots (*Diplodia natalesis*, *Phomopsis citri*) – serious in Florida and other humid places

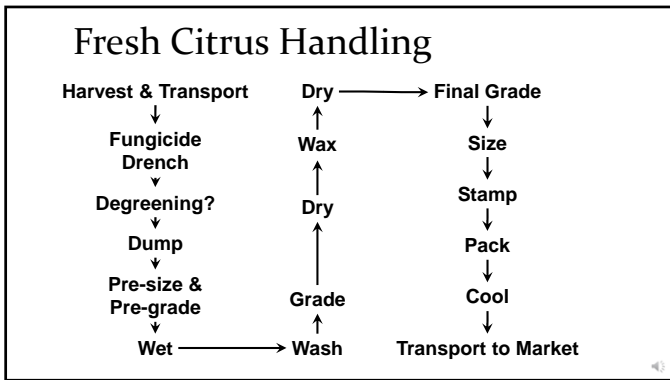
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## Decay Control

- **Citrus:**
  - Stem-end rots (*Diplodia natalesis*, *Phomopsis citri*) – serious in Florida and other humid places
  - Anthracnose – esp. in humid Florida. Not serious in California
  - Sour rot (*Geotrichum candidum*).
  - Green & Blue mold (*Penicillium digitatum* & *italicum*)

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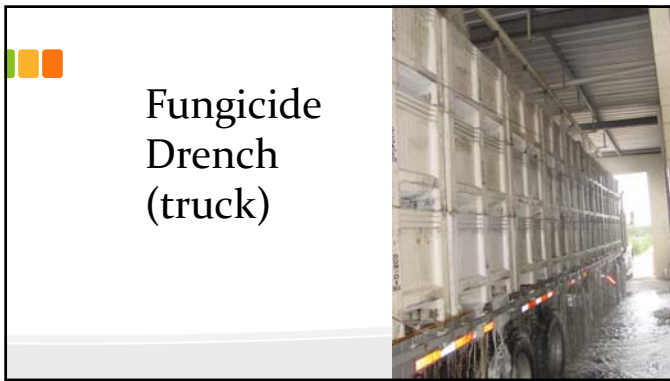


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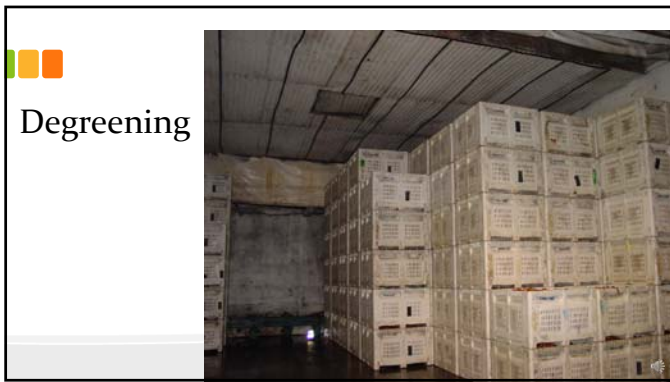




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**Degreening**

	<b>Florida</b>
Temperature	28 to 29°C (82 to 85°F)
Ethylene	5 ppm
Humidity	90 to 96%
Ventilation (keep below 0.1% CO <sub>2</sub> )	1 air change per hour
Air Circulation (CFM = cubic feet per minute)	100 CFM per 900 lb. bin
	<b>California</b>
Temperature	20 to 25°C (68 to 77°F)
Ethylene	5 to 10 ppm
Humidity	90%
Ventilation (keep below 0.1% CO <sub>2</sub> )	1 to 2 air changes per hour
Air Circulation	1 room volume per minute

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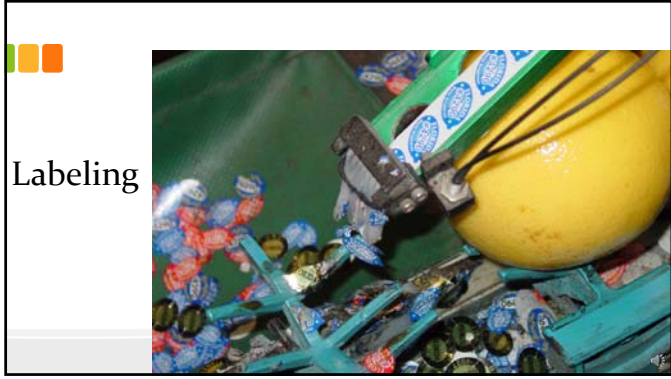
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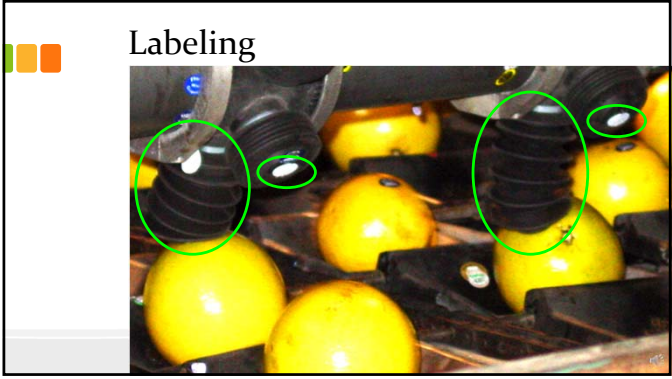
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## Sizing & Packing



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## Packing



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## Palletizing



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## Accumulating / Staging



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## Quality Control



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## Cooling & Storage



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