Grapefruit

Revised 2018

Thermal Properties

	English	Metric
Moisture, %	90.89	--
Protein, %	0.63	--
Fat, %	0.10	--
Carbohydrate, %	8.08	--
Fiber, %	1.10	--
Ash, %	0.31	--
Specific Heat Above Freezing	0.95 Btu/lb*°F	3.96 kJ/(kg*K)
Specific Heat Below Freezing	0.45 Btu/lb*°F	1.89 kJ/(kg*K)
Latent Heat of Fusion	131 Btu/lb	304 kJ/kg

Storage Conditions

Florida and Texas Varieties	
Temperature	50-60°F (10-15°C)
Relative Humidity	85-90%
Storage Period	6 to 10 weeks
California and Arizona Varieties	
Stored at 54-57°F (12-14°C)	

Florida and Texas Grapefruit

Grapefruit harvested after January can usually be stored 6-8 weeks at 50°F (10°C) without serious spoilage. Grapefruit harvested for storage should be sound, in prime condition, carefully handled, and not over mature. Fruit harvested late in the season, in April or May in Florida and Texas, are not suitable for extended storage because of increased decay susceptibility.

Grapefruit is very susceptible to decay and rind breakdown that may develop during extended transit, storage, or following removal from storage. Rind pitting, brown staining, or oil gland darkening may become serious problems when held at low temperatures, especially when grapefruit is stored near 40°F (4.4°C), commonly called chilling injury (CI). Florida and Texas grapefruit picked before January may also develop CI when stored at 50°F (10°C) but will keep well at 60°F (15°C).

Decay can be a serious problem with early-season fruit, especially when climactic conditions delay color development of the peel and an extended postharvest de-greening treatment is required. Storage of late-season fruit is often a problem because of the rapid development of decay. Blue and green-mold are serious diseases. Stem end rot is common on fruit grown in the Gulf States but is of minor importance in semi-arid states. Proper postharvest treatment of the fruit with imazalil, Thiabendazole (TBZ), sodium-o-phenylphenate (SOPP), pyrimethanil, and fludioxonil, singly or in combination, can greatly reduce the development of decay during transit and storage. Two biological pesticides, Aspire and BioSave-10, have been approved for decay control.

The selection of a proper storage temperature should be based on fruit maturity, condition prior to storage and the length of the storage and marketing period. Storing grapefruit at less than 85% relative humidity favors rind breakdown. Incoming fruit should be inspected carefully to avoid storing fruit which is obviously infected. Waxing is very desirable to minimize moisture loss.

The average freezing point of grapefruit is 28.4°F (-2°C), with minimum and maximum averages 28.0°F (-2°C) and 29.0°F (-1°C), respectively.

Grapefruit quality does not improve in storage. The longer the storage period, the greater will be the loss of juice and flavor. Rind breakdown and decay also increase in proportion to the length of the storage period.

Research has shown that shrink-wrapping grapefruit in polyethylene film is helpful in reducing chilling injury (rind pitting) of fruit held at 33-45°F (0.6-7.2°C). The beneficial effect of the film in reducing chilling injury is thought to be related to restricting moisture loss and increased internal carbon dioxide concentration during exposure to chilling temperatures.

Controlled atmospheres (CA) of 3-10% oxygen and 5-10% carbon dioxide may aid in quality retention of grapefruit. However, CA is not commonly used commercially because tolerable oxygen and carbon dioxide levels do not significantly inhibit decay, which limits grapefruit shelf life the most.

California and Arizona Grapefruit

The current recommendation for California-Arizona fruit is a storage temperature of 54-57°F (12-14°C). Avoid storage temperatures of 32-40°F (0-4.4°C), as they promote chilling injury such as brown staining and pitting of the rind.

Diseases and Injuries

Most frequent decay problems are: blue and green-mold decay, stem end rot, sour rot, and *Alternaria*.

Aging	Aging is characterized by wilting, shriveling, and browning of rind around the stem "button" or elsewhere on upper parts of fruit. Oil cells in affected rind may collapse, thus resembling pitting. The fruit flavor may have a pronounced aged taste. **Control:** Avoid prolonged storage.

Black Rot (Alternaria)	A black core rot at stem end following long (>10 weeks) storage, which may or may not be evident without cutting. **Control:** The stored fruit should be marketed before significant amounts of black rot develop. Market promptly after removal from storage.
Blue Mold and Green Mold	These rots are identified by characteristic soft, watery, discolored areas or spots, which later produce easily distinguished blue or green spores. Infections usually begin at wound sites created during harvesting, handling, and packing. **Control:** Use of postharvest fungicides and careful handling to minimize injury are primary means of control.
Chilling Injury	Chilling injury is characterized by areas of the peel that collapse and darken to form pits. The pitting is not targeted to the oil glands. Less severe symptoms may show up as circular or arched areas of discoloration or scalding. Symptoms of CI are typically more pronounced after fruit are warmed to room temperature following exposure to the chilling temperature. **Control:** Store fruit at recommended storage temperatures.
Freezing	In frozen fruit, membranes between segments are water-soaked. Rind may be discolored brown or gray in severe cases, or both rind and flesh may become soft and mushy. Grapefruit may taste bitter for a time after defrosting. Fruit frozen on the tree is soft and light in weight, exhibits woodiness in pulp, and has cavities within or between segments. **Control:** Avoid freezing temperatures.
Oil Spotting (Oleocellosis)	Caused by the release of oil from oil glands when turgid fruit receive even slight bumps and abrasions. The oil is toxic to the surrounding cells. Symptoms appear as irregularly shaped green, yellow, or brown areas. **Control:** Avoid harvesting turgid fruit, such as when dew is present or immediately after rain or irrigation.
Postharvest Pitting	Pitting is characterized by clusters of collapsed oil glands (often 5 to 20) scattered over the fruit surface that can begin to develop two days after packing. Collapsed regions turn bronze/brown or brown/black over time. This disorder is associated with low oxygen levels within the fruit following application of low-oxygen permeable wax coating and holding at warm temperatures. **Control:** Rapidly cool fruit after packing and use wax coatings with good gas permeability.
Stem End Rind Breakdown (SERB)	Characterized by the collapse of rind tissue around the stem end of citrus fruit. The affected area is irregular in shape and becomes dark and sunken. A thin ring of unaffected tissue immediately around the stem (button) is a distinctive symptom of SERB. Symptoms usually develop after harvest and during storage within 2-7 days after packing. SERB is more common and severe on small fruit and on well-colored

	fruit. Thinner-skinned fruit from humid growing environments tend to be more prone to SERB than thicker-skinned fruit grown in arid environments. Fruit with SERB are much more prone to decay. **Control:** SERB is primarily associated with conditions promoting fruit water loss. Postharvest practices that reduce water loss such as maintaining high humidity during de-greening, rapid handling, and wax application are currently the best means for reducing SERB.
Stem End Rot	Usually caused by infection with either *Lasiodiplodia* or *Phomopsis*, the principal decay organisms in areas with abundant summer rainfall (e.g. Florida and Texas). Decay develops primarily from preharvest infections of the button at the stem end of the fruit. Infected areas soften and turn tan or brown. Affected fruit do not shrivel and usually show no surface fungus growth. Affected fruit taste flat and bitter; affected tissues have a rancid odor. **Control:** Use of postharvest fungicides. Rapidly reduce fruit temperature and store fruit at the lowest safe temperature.

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