

Celery

Revised 2008

Thermal Properties

	English	Metric
Moisture, %	95.43	--
Protein, %	0.69	--
Fat, %	0.17	--
Carbohydrate, %	2.97	--
Fiber, %	1.60	--
Ash, %	0.75	--
Specific Heat Above Freezing	0.97 Btu/lb*°F	4.07 kJ/(kg*K)
Specific Heat Below Freezing	0.42 Btu/lb*°F	1.74 kJ/(kg*K)
Latent Heat of Fusion	136 Btu/lb	316 kJ/kg

Storage Conditions

	Fresh	Frozen (blanched)
Temperature	32°F (0°C)	0°F (-18°C)
Relative Humidity	98 to 100%	Vapor-proof packaging
Storage Period	1-3 months	1 year
Highest Freezing Point	31.1°F (-0.5°C)	

Celery should be stored at low temperature, ideally just above its freezing point, and near saturated humidity to retain its desired crispness and green color.

Green cultivars generally keep better than those that have been blanched. All celery keeps better if harvested before the outer stalks become pithy. Celery with a portion of the root system intact keeps best.

Prompt cooling after harvest is essential for maintenance of freshness and crispness and for successful storage. Celery may be cooled by forced-air cooling, hydro-cooling, or hydrovac cooling. Hydro-cooling and hydrovac cooling are the most common cooling methods, and temperatures should be brought to as near 32°F (0°C) as possible. In practice, initial temperature reduction is often only to 36 to 40°F (2 to

4.4°C), followed by room cooling. Vacuum cooling is widely used for celery packed in plastic sleeves in corrugated waxed cartons. If vacuum cooled, celery should first be wetted to minimize moisture loss from the celery during cooling, especially during the hydrovac process.

A poor job of hydro-cooling is dangerous because warm and wet celery decays rapidly. It is recommended that potable water chlorinated at 50 ppm, or pH 7, be used in order to avoid transfer of decay and pathogenic organisms during hydro-cooling of the products. If ice is used in crates or waxed cartons during marketing, it should be sufficient to keep the celery near 32°F (0°C), or decay initiation is likely within 1 week. Use potable water for making package ice.

Some growth may take place in celery while in storage at temperatures higher than 36°F (2°C). The central stalks lengthen, obtaining their food at the expense of the outer stalks and the roots.

Use of the jacketed-room system (near 100% RH) for cold storage has proved successful for celery in Canadian tests. Weight losses at 32°F (0°C) were reduced and averaged 1.25% per month in jacketed storage versus 2.5% per month in directly cooled rooms. However, lower relative humidity (about 95%) is recommended if storage is above 34°F (1°C) to avoid condensation of liquid water and the resulting risk of decay.

Research on controlled atmosphere (CA) for celery has shown some benefit where maximum storage life is essential. A CA of 2-4% O₂ and 3-5% CO₂ is recommended and will reduce loss of green color and decay. Injury may occur at less than 2% O₂ or greater than 10% CO₂, resulting in off-odors, off-flavors, and internal leaf yellowing. Scrubbing ethylene from CA storage is beneficial. Good quality celery can be stored in CA for 10 weeks at 32°F (0°C).

Celery should not be stored with fruits (e.g.,) that produce substantial quantities of ethylene, such as apples, pears, melons or peaches, because the ethylene gas accelerates yellowing of the celery, especially of the leaves.

Since wilting is a major cause of deterioration, celery stalks are often pre-packed in moisture-retentive film bags or sleeves. These bags should be ventilated with a few holes or left open at one end to avoid dangerous accumulation of CO₂ or depletion of O₂.

Diseases and Injuries

<p>Bacterial Soft Rot</p>	<p>Mushy soft water-soaked areas. The decay usually progresses rapidly. Control: Avoid mechanical damage in handling; promptly cool to at least 40°F (4.4°C). Warehouse sanitation is important to prevent contamination.</p>
<p>Black Heart</p>	<p>Brown or black discoloration of heart leaves. Affected celery should not be stored. Control: No warehouse control; discard celery with black heart. Control is by field spraying with calcium nitrate or calcium chloride.</p>

<p>Watery Soft Rot, Pink Rot</p>	<p>Often severe on field frozen celery and on that harvested after prolonged cool, moist weather. Has pink colored border around brown lesions in early stages. The fungus responsible (<i>Fusarium</i>) is able to develop to some extent even at 32 to 36°F (0 to 2°C).</p> <p>Control: Sanitation practices at time of harvest. Avoid damage that allows pathogen to enter. Maintain recommended storage temperature near 32°F (0°C).</p>
<p>Freezing Injury</p>	<p>Characteristic loosening of epidermis can be demonstrated by twisting a stalk. Severe freezing causes water-soaked appearance and limpness on thawing. Sometimes sunken lesions develop on the leafstalks, which soon turn brown.</p> <p>Control: Keep temperature above 31°F (-0.5°C).</p>
<p>Pithiness</p>	<p>Whitish appearance and air spaces within the center tissues of celery stalks is a symptom of over-maturity at harvest, but may also develop during storage due to senescence (aging).</p> <p>Control: Keeping the storage temperature at 32°F (0°C) delays the development of pithiness.</p>

Freezing

Celery slices and small pieces are commercially Individually Quick Frozen (IQF) frozen for a wide variety of usages such as for soups, salads, and vegetable mixes, especially for Oriental foods.

Storage

Blanched celery can be stored at 0°F (-18°C) for up to 1 year without significant loss of quality and for considerably longer periods at colder storage temperatures, such as -5 to -10°F (-20.6 to -23.3°C). Un-blanched celery is very susceptible to discoloration (browning) during storage, which may occur in as little as 3 to 4 weeks at 0°F (-18°C) if there are significant temperature fluctuations. For a storage period of 90 to 120 days, it would be advisable to hold storage temperatures at -5 to -10°F (-20.6 to -23.3°C).

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