

Beets

Revised 2008

Thermal Properties

	English		Metric
	Roots	Greens	
Moisture, %	87.58	91.02	--
Protein, %	1.61	2.20	--
Fat, %	0.17	0.13	--
Carbohydrate, %	9.56	4.33	--
Fiber, %	2.80	3.70	--
Ash, %	1.08	2.33	--
Specific Heat Above Freezing	0.93 Btu/lb*°F		3.91 kJ/(kg*K)
Specific Heat Below Freezing	0.46 Btu/lb*°F		1.94 kJ/(kg*K)
Latent Heat of Fusion	126 Btu/lb		293 kJ/kg

Storage Conditions

	Fresh		Frozen
Temperature	32°F (0°C)		0°F (-18°C)
Relative Humidity	98 to 100%		Vapor proof packaging
Storage Period	Topped beets	4 to 6 months	1 year
	Bunched beets	10 to 14 days	
Highest Freezing Point	Topped beets	30.3°F (-0.9°C)	
	Bunched beets	31.3°F (-0.6°C)	

Beets are handled either as topped roots or bunched beets, with bunched beets being much more perishable than topped beets. Before storage, beet roots should be well sorted after topping to remove those that are diseased and/or mechanically damaged. Bunched beets should be hydro-cooled within 4 to 6 hours after harvest to reduce leaf discoloration, weight loss, and decay during storage. If precooling equipment is not available, bunched beets may be packed in crushed ice. Topped beets should be cooled

to below 41°F (5°C) within 24 hours after harvest, which may be accomplished by forced-air cooling or room cooling if adequate air circulation is provided.

Beet roots may be stored in common storage if the temperature can be maintained above their highest freezing point of 30.3°F (-0.9°C) and below 41°F (5°C). While common storage is sometimes used in cooler areas, the temperatures during some seasons make it impossible to get suitably low temperatures soon enough after the beets are stored. Therefore, storage in refrigerated warehouses is much safer if late marketing or processing is planned. Do not store beets in large bulk; use ventilated bin boxes or slatted crates. Air circulation in storage must be adequate to remove respiratory heat. Air velocity of about 14 to 20 ft. per minute (4 to 6 m per minute) should be adequate.

Topped red beet roots stored at 32°F (0°C) for fresh market can be expected to keep 4 to 6 months if high humidity is maintained. A relative humidity of 98 to 100% is beneficial for beets, as long as temperature near 32°F (0°C) is maintained. However, if storage is above 34°F (1°C), the relative humidity should be no more than 95% to avoid condensation of liquid water, or decay may be substantial. Beets shrivel readily so they should be kept where excessive evaporation can be minimized. Small beets soften and shrivel earlier than larger beets.

Sprouting and rooting of beets may be serious during prolonged storage if higher than recommended temperatures are maintained. Decay can cause substantial losses during even a week to 10 days if beets are held above 41°F (5°C). Beets stored for processing may be held up to 8 months at 32°F (0°C).

Bunched beets should be stored rather loosely so that air can circulate; otherwise, there will be heating and discoloration of the tops. Bunched beets can be stored 10-14 days at 32°F (0°C) but only half as long at 41°F (5°C).

Diseases and Injuries

<p>Bacterial Soft Rot</p>	<p>Chief cause of loss in beets, especially in leaves and stems of bunched beets. Soft rot appears as darkened water-soaked areas that tend to increase rapidly in size, tissues becoming soft and slimy and often accompanied by disagreeable odor.</p> <p>Control: Very careful handling, avoiding bruising of beets and cutting of leaf stalks when bunching. Evidence of disease should be watched for during inspection of beets before storage. Refrigerate promptly to 32°F (0°C). Use sanitary practices during handling and storage to reduce contamination.</p>
<p>Black Rot</p>	<p>Causes water soaked, brown lesions mostly at the root tip that become black.</p> <p>Control: Adequate air circulation and maintenance of recommended storage temperature retards Black Rot development.</p>
<p>Gray Mold Rot</p>	<p>Occasionally infects beet tops and develops during distribution, including storage. Under moist conditions, decay is moist or even wet with definite borders, slightly water-soaked. Under dry conditions, diseased tissues are not water-soaked, but appear dark brown, firm,</p>

	<p>and dry and discolor more deeply than bruises. May have a grayish appearance with velvety, grayish-brown spore masses.</p> <p>Control: Fungus grows even at 32°F (0°C) although very slowly. Decay can penetrate unbroken skin of beets, but wounding or killing of tissues, as by freezing, facilitates spread of decay. Field sanitation is essential for proper control, but maintenance of refrigeration temperatures near 32°F (0°C) will retard spreading.</p>
<p>Freezing Injury</p>	<p>Beets should never be held below 30.3°F (-0.9°C) for topped beets or 31.3°F (-0.6°C) for bunched beets, otherwise they may freeze within a few hours. Severe freezing of beet roots causes external and internal water-soaking and sometimes blackening of the ring and rays of conducting tissue. Partially frozen beets also become soft and susceptible to decay.</p> <p>Control: Avoid holding beets where they may cool below their freezing point for more than a few hours. Slightly frozen beets can be salvaged if they are thawed slowly and then used within 1-2 days. During such delays, they must be held at between 32°F (0°C) and 40°F (4.4°C) to prevent decay.</p>

Freezing

Beets up to 2 inches (5 cm) in diameter can be frozen as a cooked or fresh vegetable and packed whole, sliced or diced. Since betanin, the red pigment that colors beets, is water soluble, washing, blanching and cutting should be done in a minimum of time and with minimal water. Blanching should be done in a steam blancher to preserve color. Beets are also subject to discoloration by a combination of oxidation and enzyme activity. Blanching to a center temperature of 165°F (74°C) helps prevent this discoloration. Iron will also produce darkened areas, thus iron equipment should be avoided during the preparation process.

Blanching before steaming, slicing, or dicing will 1) minimize loss of the water soluble pigment; 2) inactivate enzymes to prevent blackening of cut surfaces upon exposure to air; and 3) result in a smooth cut surface as well as better uniformity in size and shape of pieces. Size grading of beets before blanching helps assure a uniform blanch. The larger sizes can then be adequately blanched without overcooking the smaller sizes. There is less color loss with steam blanching than water blanching.

Handling

Exposure of frozen beets to elevated temperatures results in some draining of the juice to the bottom of the package with less color in the vegetable. No appreciable flavor change is noted with this product.

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