Asparagus

Revised 2024

Thermal Properties

	English	Metric
Moisture, %	93.22	--
Protein, %	2.20	--
Fat, %	0.12	--
Carbohydrate, %	3.88	--
Fiber, %	2.10	--
Ash, %	0.58	--
Specific Heat Above Freezing	0.96 Btu/lb*°F	4.03 kJ/(kg*°K)
Specific Heat Below Freezing	0.43 Btu/lb*°F	1.79 kJ/(kg*°K)
Latent Heat of Fusion	133 Btu/lb	309 kJ/kg

Storage Conditions

	Fresh	Frozen	Canned
Temperature	32 to 36°F (0 to 2.2°C)	-10 to 0°F (-23 to -17.8°C)	32 to 40°F (0 to 4.4°C)
Relative Humidity	95 to 99%	Vapor-proof packaging	
Storage Period	2 to 3 weeks	1 year +	1 year +
Highest Freezing Point	30.9°F (-0.6°C)		

Storage of Fresh Asparagus

Asparagus spears are immature plant shoots that are rapidly growing at the time of harvest and can continue to grow (elongate) after harvest. Fresh asparagus is extremely perishable, with an extremely high respiration rate, and should be cooled to below 41°F (5°C) in less than 4 hours after harvest. Hydrocooling is the recommended precooling method. It is required that only potable water chlorinated at 50 ppm and adjusted to pH 7 be used for hydrocooling in order to avoid transfer of decay and pathogenic organisms to the products. Fresh asparagus can be stored a maximum of 2 to 3 weeks under ideal conditions of 36°F (2.2°C) with 95 to 99% relative humidity (RH). The storage period is usually limited by water loss or spear toughening. The actual storage life depends on various factors, such as: 1) degree of openness of the tips at harvest; those with tightly closed tips keep better than those with even slightly "feathered" tips; 2) duration of exposure to warm conditions and prevailing temperature between harvest

and cooling or processing; 3) adequacy of cooling; and 4) temperature during storage. If asparagus is to be stored 10 days or less, 32°F (0°C) is recommended. For longer storage, 36°F (2.2°C) is recommended because asparagus is susceptible to chilling injury (CI) during prolonged storage at 32°F (0°C). The first symptoms of chilling injury are loss of sheen and glossiness and graying of the spear tips.

Growth and geotropic curvature, loss of tenderness, loss of flavor, loss of vitamin C content, and development of decay all take place more rapidly at higher temperatures, particularly those above 40°F (4.4°C). A delay of 4 hours between harvest and cooling can increase shear force (toughening) by 40%; hence, asparagus should be cooled immediately after harvest. This is usually done by hydrocooling, which should be done long enough to cool the spears at the center of each container to as close to 32°F (0°C) as possible. Use of potable water chlorinated at 50 ppm and adjusted to pH 7 is required for hydrocooling in order to avoid transfer of decay and pathogenic organisms to the products.

Controlled atmosphere (CA) storage is beneficial to asparagus even for short periods because it retards decay, toughening, and loss of green color. If the temperature is maintained at 32 to 37°F (0 to 2.8°C), a CO_2 level of 10-14% in air is recommended. Less than 10% CO_2 causes spear discoloration and higher CO_2 levels cause pitting, usually just below the spear tips. Commercially, this is used more during transit than in storage.

Packaged asparagus spears should stand upright to prevent geotropic curvature, standing on wet, absorbent material to prevent drying out in storage. Alternatively, packaging (upright) in perforated plastic bags to prevent water loss also is feasible. At temperatures higher than 36°F (2.2°C), the spears can continue to grow. To avoid curvature, asparagus spears should never be packed horizontally. Setting spears in water, as is often done at retail, is undesirable even if they are sold by the bunch because the water makes an ideal medium for the propagation of bacteria. This is particularly true when the spears are not in refrigerated displays and when the water is not frequently changed. Instead, they can be sprinkled with cold water.

Asparagus is sensitive to exposure to ethylene, which accelerates lignification (toughening) of the base of asparagus spears. Asparagus must never be stored with fruits that produce substantial quantities of ethylene, including but not limited to apples, pears, and peaches. Asparagus should never be stored with grapes treated with sulfur dioxide (SO_2) due to susceptibility to bleaching. Asparagus should never be allowed to contact ice.

Diseases and Injuries

Bacterial Soft Rot	Soft, mushy decay; develops an offensive odor at temperatures above 40°F (4.4°C). Affects the tips and cut ends of injuries. There may be more decay problems with green butt asparagus than with white butt asparagus. **Control:** Discard all badly bruised or crushed stalks and refrigerate promptly. Store only spears with tightly closed heads; spears with feathered tips decay more quickly.

Fusarium Rot	White, fluffy mold on tips, later becoming slightly pink. Affected tissues are water-soaked at first, later becoming yellow or brown. No odor, but final stage is soft and watery. **Control:** Prompt cooling and refrigeration to below 40°F (4.4°C); the lower the better.
Gray Mold (Botrytis) Rot	Water-soaked areas with white surface mold; later grayish-brown mold growth and granular spore masses. **Control:** Field sanitation. Cool and refrigerate promptly to below 40°F (4.4°C); the lower the better, because Botrytis is able to grow at lower temperatures than most other decay pathogens.
Chilling Injury	Chilling injury occurs in about 10 days at 32°F (0°C), but not at all at 36°F (2.2°C). Symptoms are a dull, limp, wilted appearance and grayish discoloration of the spear tips; more sever chilling may cause darkened spots or streaks near the spear tips. **Control:** Do not hold asparagus below 36°F (2.2°C) except for short term storage.
Senescence (Toughening and Feathering)	Asparagus spears that are harvested too mature or that are stored at above optimal temperatures age rapidly and develop symptoms of senescence including toughening that develops from the butt end up, and feathering, which is opening of the bracts at the spear tip due to outgrowth of underlying buds. **Control:** Do not store asparagus that do not have very tight bracts at the tip and avoid exposure to storage temperatures greater than 40°F (4.4°C). Spears with narrower diameter tend to be more prone to toughening than spears with thicker diameter because for a given length, a narrower diameter denotes slower growth and greater spear harvest maturity.

Freezing

Blanching is advisable for retention of color during freezer storage. Blanching in steam or hot water for 2 to 3 minutes, depending on the diameter of the stalks, is usually sufficient. A moisture-vapor-proof package is necessary to prevent desiccation.

Frozen asparagus loses its brilliant green color rather rapidly when stored at temperatures above 0°F (-17.8°C). The chlorophyll changes to a brownish color. Exposure to elevated temperatures for short periods of time is not critical but repeated exposures do damage the color and cause water vapor to transpire from spears and condense as ice crystals within the package. As with most frozen products, asparagus should be frozen as rapidly as possible.

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