Asparagus



Recommendations for Maintaining Postharvest Quality

Trevor Suslow
Department of Plant Sciences, University of California, Davis

MATURITY INDICES

Asparagus spears are harvested as they emerge through the soil from the underground crowns. Typically, spears are cut when they reach approximately 23 cm (9 in). Stalk diameter is not a good indicator of proper maturity and associated tenderness. (See Quality Indices)

QUALITY INDICES

Quality, fresh asparagus will be dark green and firm with tightly closed, compact tips. Stalks are straight, tender and glossy in appearance.

U.S. grades are No. 1 and No. 2. California grades range from small (0.47 cm/ 3/16 in) to Jumbo (2.1 cm/ 13/16) but diameter is not a good indicator of tenderness quality. Washington state standards, XF (Extra Fancy), are being adopted that specify tolerances which are somewhat more stringent than U.S. No. 1.

OPTIMUM TEMPERATURE

0 - 2°C (32 - 35.6°F)

Storage life is typically 14-21 days at 2° C and can be extended up to 31 days by 7-10 days storage at 0°C and atmospheric modification. Extended storage (~10-12 days) in air at 0°C may cause chilling injury.

OPTIMUM RELATIVE HUMIDITY

95-100%; High relative humidity is essential to prevent dessication and loss of glossiness. Drying of the buttend of spears is a negative quality factor. Commonly asparagus is packed and shipped in cartons with a water-saturated pad to maintain high humidity.

RATES OF RESPIRATION

To calculate heat production multiply ml CO₂/kg·hr by 440 to get BTU/ton/day or by 122 to get kcal/metric ton/day.

Temp. °C (°F)	ml CO₂/kg·hr
0 (32)	14-40
5 (41)	28-68
10 (50)	45-152
15 (59)	80-168
20 (68)	138-250
25 (77)	250-300

RATES OF ETHYLENE PRODUCTION

< 0.1µl/kg·hr at 20°C (68°F)

Produc



RESPONSES TO ETHYLENE

Exposure to ethylene will accelerate the lignification (toughening) of asparagus spears in controlled studies. The concentration and duration of exposure to exogenous ethylene, to cause this effect, at commonly encountered levels during storage and distribution are not available.

RESPONSES TO CONTROLLED ATMOSPHERES (CA)

Elevated CO₂ at 5-10% (typically 7%) in air is beneficial in preventing decay and reducing the rate of toughening of the spears. The beneficial effect is most pronounced if temperatures cannot be maintained below 5°C (41°F). Short (CA) exposure to higher CO₂ concentrations (12-20%) is safe and beneficial only if temperatures can be maintained at 0°C-1°C (32°F-33.8°F). Signs of CO₂ injury are small to elongated pits, generally first observed just below the tips. Severe injury results in ribbiness.

PHYSIOLOGICAL DISORDERS

- Asparagus will continue to develop after harvest which is why low temperature postharvest
 management is critical. Common disorders include upward bending of tips away from gravity and "feathering" (expansion and opening) of tips. Bending will also occur if tips expand
 to the top of the packaging and are deflected.
- Spear toughening occurs rapidly at temperatures above 10°C (50°F).
- Bruising and tip-breakage are signs of rough handling and can result in toughening of the spears from wound ethylene.
- Asparagus is sensitive to chilling injury after 10 days at 0°C (32°F). Symptoms of chilling
 injury include loss of sheen or glossiness and graying of the tips. A limp, wilted appearance
 may be observed. Severe chilling injury may result in darkening near tips in spots or
 streaks.
- Freezing injury (water-soaked appearance leading to extreme softening) will likely result at temperatures of -0.6°C (30.9°F) or lower.

PATHOLOGICAL DISORDERS

The most prominent postharvest disease concern is acterial soft rot, induced by *Erwinia caroto-vora* subsp *carotovora*. Decay may initiate at the tips or the butt end. Spears that are re-cut above the white portion of the butt end are reported to be most susceptible to bacterial decay.

SPECIAL CONSIDERATIONS

Rapid hydrocooling soon after harvest is strongly recommended. Pyramid-shaped wooden or waxed corrugated boxes for hydrocooling combined with center-loading during shipment promote good cooling-air circulation.

POSTHARVEST PHOTO GUIDE

DISORDERS



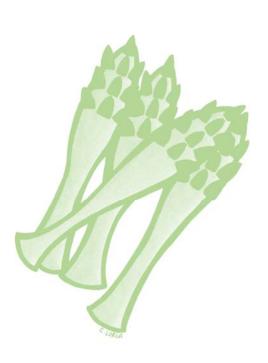
TIP-BREAKAGE



FREEZING INJURY



BACTERIAL SOFT ROT





It is the policy of the University of California not to engage in discrimination against or harassment of any person, employed by or seeking employment with the University, or in any of its programs or activities, on the basis of race, color, national origin, religion, sex, gender, gender expression, gender identity, pregnancy, physical or mental disability, medical condition (cancer-related or genetic characteristics), genetic information (including family medical history), ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services, as well as state military and naval service. This policy is intended to be consistent with the provisions of applicable state and federal laws and University policies. University policy also prohibits retaliation against any employee or person seeking employment for bringing a complaint of discrimination or harassment pursuant to this policy. This policy also prohibits retaliation against a person who assists someone with a complaint of discrimination or harassment, or participants in any manner in an investigation or resolution of a complaint of discrimination or harassment. Retaliation includes threats, intimidation, reprisals, and/or adverse

In addition, it is the policy of the University of California to undertake affirmative action, consistent with its obligations as a Federal Contractor, for minorities and women, for persons with disabilities, and for covered veterans. The University commits itself to apply every good faith effort to achieve prompt and full utilization of minorities and women in all segments of its workforce where deficiencies exist. These efforts conform to all current legal and regulatory requirements, and are consistent with University standards of quality and excellence. In conformance with Federal regulations, written affirmative action plans shall be prepared and maintained by each campus of the University of California, by the Lawrence Berkeley National Laboratory, by the Office of the President, and by the Division of Agriculture and Natural Resources. Such plans shall be reviewed and approved by the Office of the President and the Office of the General Counsel before they are officially promulgated. Inquiries regarding the University's equal employment opportunity policies may be directed to the Affirmative Action Contact, University of California, Agriculture and Natural Resources, 2801 Second Street, Davis, CA 95618 (530) 750-1318.