Belgian Endive or Witloof Chicory

Recommendations for Maintaining Postharvest Quality

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Link to Produce Facts Photos

General Information

Witloof chicory or Belgian endive is a "chicon" or compact oval head of overlapping leaves produced from a harvested tap root. Forcing occurs in the dark at elevated temperatures 16-20°C (60-68°F) often in hydroponic trays and results in the cream-yellowish compact head or chicon after 3 - 4 weeks. Witloof chicory is a member of the lettuce family.

Maturity Indices

Maturity is based on chicon size and compactness and varies according to cultivar and the quality of the tap root (amount of carbohydrate reserves). The firm heads are harvested by snapping from the root.

Quality Indices

Quality is based on size, compactness, shape, and color. After trimming outer leaves, the chicons should be white with closed cream-yellow points and not have any torn leaves. Witloof chicory cultivars vary in flavor and bitterness (caused by sesquiterpene lactones). Chicons rapidly turn green if exposed to light and the flavor changes (see **Special Considerations**). Good quality chicons do not have any traces of green but are white with cream-yellow leaf edges.

Optimum Temperature and Relative Humidity

0°C (32°F) with >95% RH is required to optimize witloof chicory storage and life. A shelf-life of 21-28 days can be expected at this temperature. At 5°C (41°F) a shelf-life of about 14 days can be expected. Witloof chicory is usually room cooled after packing. Placing chicons on ice for retail display will cause discoloration.

Freezing Injury

Freeze damage weakens the leaves and can lead to more rapid bacterial decay. During storage, freeze damage can occur if chicons are stored at < -0.1 to -0.2°C (31.7-31.5°F).

Rates of Respiration

Belgian endive chicons have moderate respiration rates:

Temperature	0°C (32°F)	10°C (50°F)	20°C (68°F)
ml CO_2 / kg·hr	4 - 5	14 - 17	35 - 44

§ To calculate heat production, multiply ml CO_2 / kg·hr by 440 to get BTU/ton/day or by 122 to get kcal/metric ton-day.

Rates of Ethylene Production

Ethylene production rates of harvested chicons are < 0.1, 0.2, and 0.7 µL/kg·hr at 0, 10 and 20°C (32, 50 and 68°F), respectively.

Responses to Ethylene

Witloof chicory or Belgian endive is moderately sensitive to ethylene exposure. The main symptoms of ethylene injury are accelerated decay and discoloration of the leaf margins. Ethylene could also be expected to induce leaf abscission, but this effect may require a very long period at low storage temperatures.

Responses to Controlled Atmosphere (CA)

Some benefit to shelf-life can be obtained with low O_2 (3-4%) and high CO_2 to (4-5%) atmospheres at temperatures of 0-5°C (32-41°F). CA retards the development of browning on leaf edges. CO_2 atmospheres also retard discoloration of the butt also. To control greening, extremely low O_2 concentrations (<0.1%) are required.

Physiological Disorders

Internal browning. The warm forcing conditions for witloof chicory production can cause browning of the chicon axis. This is thought to be due to a localized calcium deficiency in the rapidly developing head.

Physical Injury

Breakage of the outer leaf margins often occurs during harvest, trimming and packing and causes increased browning and increased susceptibility to bacterial decay.

Pathological Disorders

Decay is not a common cause of postharvest losses of witloof chicory. However, bacterial rots caused by numerous bacteria (*Erwinia*, *Pseudomonas* and *Xanthomonas* spp.) can occur and result in a slimy breakdown of the infected tissue. Trimming outer leaves, rapid cooling and low storage temperature reduce development of bacterial rots. Sanitation during initial harvest, trimming and washing reduce bacterial decays.

Special Considerations

Exposure to light causes the chicons to turn green and become unmarketable. Packaging in paper liners in unvented boxes ensures dark storage during distribution. However at retail, the chicons will turn green within a few hours at 10-15°C (50-59°F) of exposure to display lights. Therefore only a few should be removed from the box at a time to reduce exposure to light. Another option is to place the chicons in a plastic box with a lid that excludes light. If kept cold 0-5°C (32-41°F) it takes longer than 2 days for greening to occur.