Lettuce: Crisphead or Iceberg

Recommendations for Maintaining Postharvest Quality

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Produce Facts

MATURITY INDICES

Maturity is based on head compactness. A compact head which can be compressed with moderate hand pressure is considered ideal maturity. A very loose head is immature and a very firm or hard head is overmature. Heads that are immature and mature have much better flavor than overmature heads and also have fewer postharvest problems.

QUALITY INDICES

After trimming outer wrapper leaves, the leaves should be a bright light green color. Leaves should be crisp and turgid.

OPTIMUM TEMPERATURE AND RELATIVE HUMIDITY

0°C (32°F) with >95% RH are required to optimize lettuce storage life. A shelf-life of 21-28 days can be expected at this temperature and RH. At 5°C (41°F) a shelf-life of 14 days can be expected as long as no ethylene is in the environment. Vacuum cooling is usually used for iceberg lettuce, but forced-air cooling may also be used successfully.

FREEZING INJURY

Freeze damage can occur in the field and cause separation of the epidermis from the leaf. This weakens the leaf and leads to more rapid bacterial decay. During storage, freeze damage can occur if the lettuce is stored at <-0.2°C (31.7°F). This appears as a darkened translucent or water-soaked area which will turn slimy and deteriorate rapidly after thawing.

RATES OF RESPIRATION

Iceberg lettuce heads have moderate respiration rates:

Temperature	0°C (32°F)	5°C (41°F)	10°C (50°F)	15°C (59°F)	20°C (68°F)
ml CO_2/kg·hr	3-8	6-10	11-20	16-23	25-30

To calculate heat of production multiply ml CO_2/kg·hr by 440 to get BTU/ton/day

RATES OF ETHYLENE PRODUCTION

Very low, <0.1 µL/kg·hr at 20°C (68°F).

RESPONSES TO ETHYLENE

Iceberg lettuce is extremely sensitive to ethylene. Russet spotting (see physiological disorders) is the most common symptom of ethylene exposure.

RESPONSES TO CONTROLLED ATMOSPHERES (CA)

Some benefit to shelf-life can be obtained with low O_2 atmospheres (1-3%) at temperatures of 0-5°C (32-41°F). Low O_2 atmospheres will reduce respiration rates and reduce the detrimental effects of ethylene. Intact heads are not benefitted by atmospheres containing CO_2 and injury may occur with >2% CO_2 (see physiological disorders, brown stain). Lettuce cut for salad products, however, is commonly packaged in low O_2 (<1%) and high CO_2 (10%) atmospheres because these conditions control browning on the cut surfaces. On salad pieces, cut surface browning occurs more rapidly and more extensively than do symptoms of brown stain caused by CO_2.

PHYSIOLOGICAL DISORDERS

Many disorders have been identified for iceberg lettuce. Some very common and important disorders are the following:

Tipburn. A disorder caused in the field and is related to climactic conditions, cultivar selection and mineral nutrition. Leaves with tipburn are unsightly and the damaged leaf margins are weaker and susceptible to decay.

Russet Spotting. A common disorder due to exposure to low concentrations of ethylene which stimulates the production of phenolic compounds which lead to brown pigments. Russet spots appear as dark brown spots especially on the midribs. Under severe conditions, russet spots
are found on the green leaf tissue and throughout the head. The disorder is strictly cosmetic but makes the lettuce unmarketable. Ethylene contamination may occur from propane fork lifts, transport in mixed loads, or storage with ethylene-generating fruits such as apples, pears and peaches.

Brown Stain. The symptoms of this disorder are yellowish-reddish-brown large, depressed spots on the midribs mostly. These may darken or enlarge with time. Brown stain also appears as reddish-brown streaks in some cases. Brown stain is caused by exposure to above 3% CO_2 atmospheres, especially at low temperatures.

Pink rib. A disorder in which the midribs take on a pinkish coloration. Overmature heads and high storage temperatures increase the disorder. Ethylene exposure does not increase the disorder and low O_2 atmospheres do not control it.

PATHOLOGICAL DISORDERS

Bacterial soft-rots are caused by numerous bacteria species and result in a slimy breakdown of the infected tissue. Soft-rots may follow fungal infections. Trimming outer leaves, rapid cooling and low temperature storage reduce development of bacterial soft-rots.

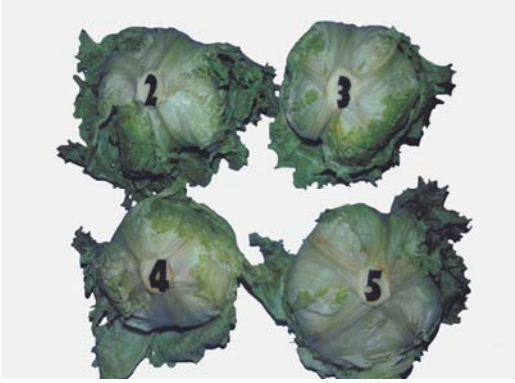
Fungal pathogens. May also lead to a watery breakdown of lettuce (watery soft-rot caused by Sclerotinia or gray mold rot caused by *Botrytis cinerea*) but are distinguished from bacterial soft-rots by the development of black and gray spores. Trimming and low temperatures also reduce the severity of these rots.

PHYSICAL DISORDERS

Breakage of the midribs often occurs during field packing and causes increased browning and increased susceptibility to decay.

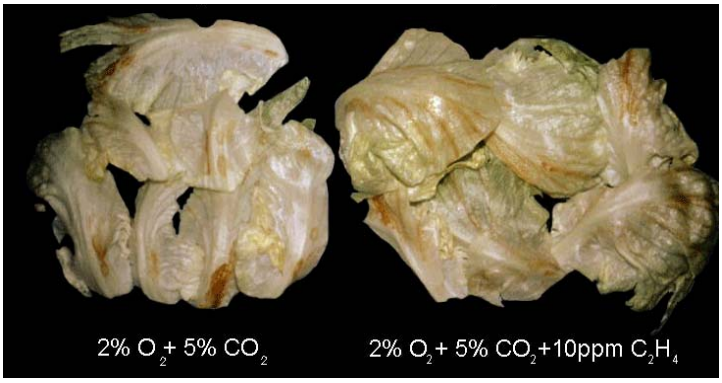
POSTHARVEST PHOTO GUIDE

MATURITY AND QUALITY



LETTUCE MATURITY

RESPONSES TO CONTROLLED ATMOSPHERES (CA)



BROWN STAIN

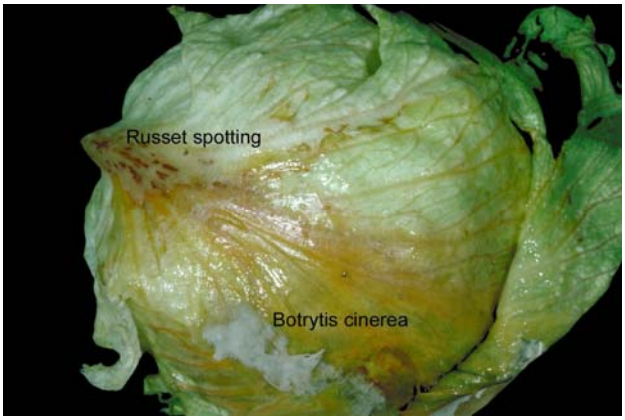
DISORDERS

RUSSET SPOTTING

BROWN STAIN

PINK RIB

MECHANICAL DAMAGE



GREY MOLD

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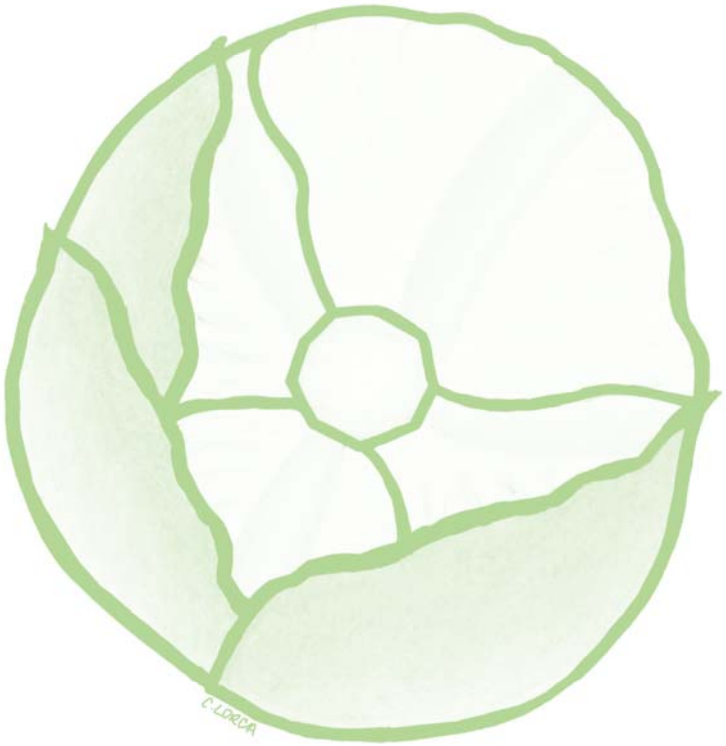

Lettuce Produce Facts
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