Good Agriculture Practices for Lettuce

Western Kentucky University

General Information

- Two categories: Head (iceberg) and leaf
- Lettuce is third-most consumed vegetable in United States
- Americans consume more than 14 pounds of head lettuce and 10 pounds of leaf lettuce per capita annually

Harvest Considerations

- Growers should implement sanitation policies for knives used in cutting lettuce, as well as for knife scabbards and other tools.
- Consider using single-use liners for containers.
- Soiled containers should not be stacked on top of another.
- Cut surfaces on lettuce should never be allowed to contact soil or other unsanitized surfaces.
- Harvesters should immediately wash cut surfaces of lettuce with FDA-approved sanitizing agent, not chlorine.
- Workers harvesting lettuce should have access to handwashing stations, and also use clean gloves during harvest.

Foodborne Illness Outbreaks

Microbial contamination of leafy green vegetables, including lettuce, is attributed to 22% of foodborne illness outbreaks in the United States annually. Lettuce has been responsible for a number of recent large foodborne illness outbreaks, including a 2013 case in Arizona which caused 59 illnesses. In 2010, 114 consumers in Illinois were sickened by *Salmonella* after consuming lettuce. Table 1 shows notable foodborne illness outbreaks attributed to lettuce since 2010:

Bacteria	Year	Food Vehicle	Location	States Affected	Illnesses	Deaths
E.coli O157:H7	2013	Lettuce	Arizona	1	35	0
E.coli O157:H7	2012	Lettuce	International	1	28	0
E.coli O157:H7	2011	Lettuce	Missouri	5	58	Unknown
Norovirus	2010	Lettuce	International	Unknown	260	0

Table 1. Selected Foodborne Illness Outbreaks Attributed to Lettuce, 2010-Present (Outbreak Database, 2015)

Storage and Cooling Conditions

Lettuce is best maintained as close to 0°C as possible. Because of lettuce's large water content, a high humidity level is preferable. Lettuce is highly sensitive to ethylene and will decay if not isolated from high ethylene-producing produce in storage. Figure 2 indicates ideal storage conditions:

Produce	Optimal Storage Temp., °C	Optimal Humidity (%)	Cooling with top ice acceptable	Cooling with water sprinkle acceptable	Ethylene Production	Ethylene Sensitivity to	Storage Life
Lettuce	0	98-100	No	Yes	No	Yes	2-3 Weeks

Table 2. Storage and Cooling Conditions for Lettuce (Fellow, 2000)

Good Agriculture Practices (FDA, 2006)

- Develop and implement procedures for preventing pest infestation in irrigation pipe and drip tape.
- Ensure that water used in all pre- and post- harvest applications meets microbial water standards. This includes water used for hydrovac cooling.
- Any cooling equipment used on lettuce should be cleaned and sanitized regularly.
- Never use raw animal manure on or near lettuce.
- Chlorine is insufficient to kill pathogens in lettuce latex after cutting and coring. A stronger FDA-approved sanitizing agent should be used.

Pathogenic Behavior in Commodity

Typical cleaning practices are incapable of completely eliminating bacteria from surface-contaminated produce. The only way to eliminate contamination is to prevent pathogens from coming into contact with lettuce during the entire farm-to-fork process. Pathogens can easily be splashed onto plants from soil or transferred by human or animal contact. Dried manure can also be wind-blown onto plants, and *Salmonella* has been shown to be resistant to drying. Noroviruses are another concern for lettuce. Noroviruses are the most common foodborne disease and are often found in lettuce. Norovirus is significantly smaller than bacteria, and has been shown to be capable of transferring up into the lettuce plant from the roots.

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