Enhancing The Safety of Locally Grown Produce

Harvesting and Storage

Importance of safe food handling during harvest and storage

Harvest time means that fruits and vegetables will soon be on a consumer's table. Consequently, it is critical to handle produce in a way that minimizes potential contamination with disease-causing microorganisms. It is important to follow some simple guidelines to prevent contamination and to control the growth of bacteria that might be present. The following steps can help to reduce risk of foodborne illness.

Steps to take prior to harvest

- When washing and sanitizing surfaces, use the appropriate cleaning and sanitizing agents (additional information follows).
- Wash tractors and trucks that have been used in areas of the farm that might have contacted raw manures or composts before going into the growing areas. Pressure washing is a good way to clean.
- Clean and sanitize packing and storage areas. Pressure washing is a good way to clean.
- Clean and sanitize harvesting tools such as knives, pruners, machetes, etc. and surface areas that will come in contact with produce.
- Use containers made of plastic that can be washed and sanitized between uses. Plastics labeled as "food grade" are ideal.
- If cardboard boxes are to be used, the best practice is to purchase new, clean ones and only use them once. If boxes will be reused, they should be lined and the lining changed between uses.
- Train workers about the importance of thorough handwashing, use of toilet facilities and good personal hygiene.
- Provide handwashing facilities and post signs showing the steps of proper handwashing.
- Train workers to use gloves properly if they will be used during harvesting or packing. Gloves are not required for use by workers during harvesting. If gloves are not used, monitor handwashing. If gloves are used, disposable single use gloves are the best choice. Keep in mind when purchasing gloves that some workers may have a latex sensitivity. Teach workers when using gloves to:
  - Wash hands prior to putting gloves on.
  - Avoid touching hair, face, skin, etc. with gloves.
  - Change gloves after meals, smoking, using the bathroom, or any time gloves become soiled, torn or otherwise damaged.
- Take measures to keep birds and other pests out of packing and storage areas. (This may include the use of screens, doors, traps or physical deterrents.)
- Train workers to avoid harvesting dropped fruits or vegetables, produce from areas where animal feces is present and produce that shows signs of damage such as cuts or feeding marks.
- Establish an area for discarding produce waste that is located away from the harvesting and packing work areas and train workers on what to do with produce waste. Many workers compost produce waste. Following proper composting guidelines will prevent contamination.

Steps to take during harvest

- Exclude employees who have diarrhea, vomiting or nausea from working until they have been free of symptoms for 24 hours. Employees who have had jaundice should have a signed release from a doctor to return to work. Employees who have other illnesses such as a sore throat with fever should be reassigned to tasks that do not require handling produce or containers.

- Provide toilet facilities that are clean and well stocked and maintained no more than 1/4 mile walk from each worker in the fields and packing areas.
- Provide handwashing facilities that are no more than 1/4 mile walk from each worker in the fields and packing areas. Provide clean water that is suitable for drinking, liquid soap with pump dispensers and single use paper towels. Hand sanitizers may be provided for use in addition to handwashing but not to replace handwashing. (For more information on proper handwashing technique, see *Enhancing the Safety of Locally Grown Produce: Farm Worker Hygiene*.)
- Remind workers to wash hands after using the toilet, before and after eating and always before working with produce.
- Label growing plots, harvest bins and packaging in such a way that products can be traced. Keep records.

Courtesy of Coastal Georgia Small Farmers Cooperative, Inc.

▲ Labeling growing plots, bins and packaging and keeping records allows products to be traced.

Steps to take during postharvest handling

- Exclude pets, domestic animals and wild animals from the packing area.
- Clean and sanitize surfaces and equipment on a regular schedule – at least at the beginning and end of the day.
- Clean soil off of bins before leaving the field and do not place these bins on food contact surfaces.
- Use clean water suitable for drinking to rinse produce. Water temperature should be no more than 10˚F cooler than the produce being washed. Rinsing produce that may be warm from the field with cold water may cause water to be sucked inside through openings such as stem scars of certain produce such as tomatoes, peppers, apples or potatoes. If pathogens are in the rinse water, then they will also be taken into the produce.

Courtesy of Jay Payne, Cedar Grove Farm

▲ Produce can be cooled in refrigerators, coolers with ice and in rooms where temperature is regulated.

- Cool fruits and vegetables quickly to minimize growth of harmful bacteria and to preserve quality of the product. Proper storage temperatures will help maintain freshness and quality. Most fruits and vegetables can be stored at 41˚F. However, some produce may be susceptible to chilling injury. For a detailed list of storage conditions for specific whole fruits and vegetables, visit http://www.caes.uga.edu/applications/publications/files/pdf/FS%20100_2.PDF. Cut fruits and vegetables must be kept at 41˚F or colder to be safe. Keeping produce like shelled peas, greens, etc. on ice or at 41˚F or colder will help maintain quality and safety.
- If ice is used for cooling, keep bins clean and use water suitable for drinking to make ice. Use scoops and store them outside the ice bin so there is no bare hand contact with the ice.
- Use different boxes, bins or containers from the ones used in the field to pack the clean produce. Keep sets of containers separate from each other.
- Inspect storage areas daily to be sure sanitary conditions are met and temperature controls are working properly.
- Storage areas should be cleaned and sanitized regularly, at least weekly.

Cleaning and sanitizing

It is critical to clean and sanitize surfaces that come in contact with food. For sanitizing to be effective, cleaning **must** be done before sanitizers are used. Sanitizers are not as effective on dirty surfaces. The selection of cleaning and sanitizing agents can vary depending on the specific needs within a facility. Cleaning and sanitizing solutions should be made with potable water (water that is suitable for drinking). Keep in mind water hardness can also influence the effectiveness of cleaners. The following sequence should be followed: rinse, clean, rinse, sanitize.

Courtesy of Robert Tate, UGA Horticulture Farm

▲ Rinse produce with water safe for drinking. Setting up a screen table allows the removal of soil before taking the produce into the packing shed.

Cleaners: Some cleaning agents classified as detergents contain surfactants that reduce surface tensions between the soil and the surface so the soil is more easily removed. Examples include dishwashing detergent. These agents may be used to clean most lightly soiled surfaces. If surfaces are more heavily soiled or if there is an accumulation of food residues that are difficult to clean, stronger cleaning agents like alkaline cleaners may be needed. If mineral deposits need to be removed, then acid cleaners may be needed. Regardless of the category of cleaner, cleaning agents approved for use with food contact surfaces should be used. In some situations, mechanical force may be needed to efficiently clean surfaces.

Sanitizing: Chemical disinfectants in water are used to reduce the number of microorganisms on surfaces to a level where they should pose no threat to public health. There are a number of sanitizing agents available for use in food handling areas after surfaces have been cleaned. Generally "broad-spectrum" sanitizers are used because they are effective against a wide range of microorganisms. Some things to consider in choosing a sanitizer include the type of surfaces to be sanitized (some sanitizers may be corrosive to stainless steel), water hardness, sanitizer application equipment that is available, effectiveness of the sanitizer on certain microorganisms, and the costs of the sanitizer and its application.

Courtesy of Robert Tate, UGA Horticulture Farm

▲ Have different sets of containers for use in the fields and for taking produce to market. Labeling or color-coding can make separation of field and packing containers easier to identify.

Sanitizers typically need a few minutes of contact time on the surface to be effective. Chlorine-based sanitizers are the most commonly used, are effective against a wide variety of microorganisms and are relatively inexpensive. To sanitize work surfaces that may come in contact with food, a solution of 200 parts per million of plain, household chlorine bleach is typically used (1 tablespoon bleach per gallon of water) and should contact the surface for one minute or be allowed to air-dry. To sanitize other surfaces that will not come in contact with food, a solution of 400 parts per million is commonly used (2 tablespoons bleach per gallon of water). Bleach solutions should be made fresh at least daily. Use test strips to check sanitizer strength. Sanitizers can be applied as a wash, a dip, or a spray. For small areas, a hand pump sprayer can be used. There are maximum concentrations of sanitizers that can be legally applied to food contact surfaces. If chlorine is used in organic production, surfaces should be rinsed with clean water suitable for drinking after sanitizing to reduce chlorine levels to that of treated drinking water, about two parts per million.

Courtesy of Jay Payne, Cedar Grove Farm

▲ Walk-in stainless steel-lined coolers are ideal for food use with washable walls that can be cleaned and sanitized.

Comparison of commonly used sanitizer types

	Chlorine	Iodophors	Quarternary ammonium compounds	Acid anionic	Peroxyacetic acid
Corrosive	Corrosive	Slightly corrosive	Noncorrosive	Slightly corrosive	Slightly corrosive
Irritating to skin	Irritating	Not irritating	Not irritating	Slightly irritating	Not irritating
Effective at neutral pH	Yes	Depends on type	In most cases	No	Yes
Effective at acid pH	Yes, but unstable	Yes	In some cases	Yes, below 3.0-3.5	Yes
Effective at alkaline pH	Yes, less than at neutral pH	No	In most cases	No	Less effective
Loss of effectiveness in presence organic material	Yes	Moderately	Moderately	Moderately	Partially
Loss of effectiveness in water hardness	No	Slightly	Yes	Slightly	Slightly
Residual antimicrobial activity	None	Moderate	Yes	Yes	None
Stability of use solution	Rapidly dissipates	Slowly dissipates	Stable	Stable	Slowly dissipates
Maximum level permitted by FDA on food contact surfaces without rinse	200 ppm	25 ppm	200 ppm	Varied	100-200 ppm

To find cleaners and sanitizers most appropriate for your situation, contact a company that sells "food-grade cleaners" and "food-grade sanitizers" or check with a restaurant supply store.

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