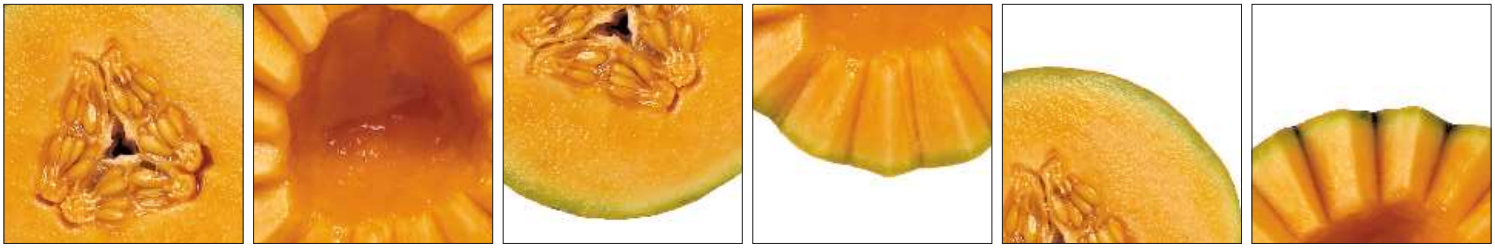
Commodity Specific Food Safety Guidelines for the Melon Supply Chain

1ST EDITION



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COMMODITY SPECIFIC FOOD SAFETY GUIDELINES FOR THE MELON SUPPLY CHAIN • 1ST Edition

This document was prepared by melon industry members from farm to table, via the Produce Industry Food Safety Initiative co-sponsored by the Produce Marketing Association and the United Fresh Fruit and Vegetable Association

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User's Note

This document provides voluntary recommended guidelines on food safety practices that are intended to minimize the microbiological hazards associated with fresh and fresh-cut melon products. The intent of drafting this document is to provide currently available information on food safety and handling in a manner consistent with existing applicable regulations, standards and guidelines. The information provided herein is offered in good faith and believed to be reliable, but is made without warranty, express or implied, as to merchantability, fitness for a particular purpose, or any other matter. These recommended guidelines were not designed to apply to any specific operation. It is the responsibility of the user of this document to verify that these guidelines are appropriate for its operation. The publishing trade associations, their members and contributors do not assume any responsibility for compliance with applicable laws and regulations, and recommend that users consult with their own legal and technical advisors to be sure that their own procedures meet with applicable requirements.

Foreword

The diversity of production and processing methods in the melon industry make a single, universally applicable approach to food safety planning complicated. For example, growers may choose to pack melons in the field or in a packinghouse. Further, they may choose to cool the product using water or air. It is important that each firm assess their operations and implement methods that meet their individual needs. What is most important is that basic food safety program components are implemented by all members of the melon supply chain to assure melon and melon product consumer safety.

Whatever the preferred production and processing method may be for a single producer, the melon industry recognizes the following basic principles that serve as the foundation for all food safety programs found within the industry:

- The melon industry recognizes that once a melon is contaminated, removing or killing pathogens is difficult. Therefore, prevention of microbial contamination at all steps from production to distribution is strongly favored over treatments to eliminate contamination after it has occurred.
- The melon industry supports implementation and documentation of food safety programs that utilize risk assessment techniques that identify true risks and use a preventive approach to ensure safe food products.
- The melon industry also supports and encourages food safety awareness training for all persons who grow, handle, distribute, process, prepare and/or serve melon products.
- The human pathogens most often associated with produce (*Salmonella* and *E. coli* O157:H7) cause infection and illness by the fecal oral route of food contamination and may involve vectors such as human hands, water and soil. Therefore, melon food safety programs should pay special attention to preventing fecal contamination of human hands, water and soil that contact melons.

In the sections that follow, the melon field to fork continuum has been broken down into the following unit operations: production and harvesting, postharvest handling, fresh-cut / value-added processing, distribution and end user handling (retail, foodservice and consumer). Experts from industry and academia were solicited to identify, in the unit operations that they were intimately familiar with, microbial food safety issues that are found to be unique but not necessarily exclusive to melons. For each identified issue, things to consider about the identified issue were developed to raise awareness about each identified issue and allow individuals and companies involved in the field to fork melon continuum to consider what actions are appropriate in their operations. The identified issues in each unit operation section are focused only on melons and may or not apply to other specialty crops. Particular recommendations put forward to address any identified issue are not the only means by which the identified issue may be addressed. Individuals and companies are encouraged to use this document to evaluate and development their own individual company food safety programs.

The document also includes in the required reference documents detailed background information for individuals and companies that are engaged in the various aspects of the melon field to fork continuum. Each company's food safety program and the pre-requisite programs within in it must be developed based upon an analysis of the potential hazards in that specific company's operations. This guidance document, as presented, is not sufficient to serve as an action plan for any specific operation but should be viewed as starting point. This guidance document is intended to supplement, not replace, already established food safety program components such as GAPs, GMPs, HACCP, etc., for the fresh melon industry. Detailed information regarding pre-requisite programs may be found in the required reference documents.

Table of Contents

Required Reference Documents

1 UFFVA Food Safety Auditing Guidelines:
Core Elements of Good Agricultural Practices for Fresh Fruits and Vegetables

2 UFFVA Food Safety Questionnaire for Fresh Fruits and Vegetables

3 National GAPs Program Cornell University:
Food Safety Begins on the Farm: A Grower Self Assessment of Food Safety Risks

4 IFPA Food Safety Guidelines for the Fresh-Cut Produce Industry

5 IFPA/PMA Fresh-cut Produce Handling Guidelines

6 FMI Total Food Safety Management Guide: A Model Program for Raw
Ready-To-Eat Fresh-cut Produce

7 FMI SuperSafeMark: Retail Best Practices and Guide to Food Safety and Sanitation

8 NRA Education Foundation ServSafe Coursebook

Introduction

This document was developed to address food safety issues specific to fresh melons in the entire farm to fork supply chain continuum. Enhancing produce food safety is a high priority for the entire produce handling chain from farm to fork. The produce industry has a long history of supplying consumers with safe and wholesome fruits and vegetables; however, as production agricultural and marketing/distribution practices have become more sophisticated it has also been realized that food safety practices must also become more sophisticated to appropriately address produce food safety.

Development of an integrated approach encompassing safe growing, harvesting, processing and retail/foodservice handling practices from farm to table is the most effective means of enhancing fresh melon food safety. As such, a supply-chain-wide group consisting of members of the industry and produce food safety experts developed the following guidelines. This manual is for melons that are grown and harvested for fresh market or for "valued added/fresh-cut processing," cooled, shipped to retail, wholesale, or processing, and offered for sale to the consumer. Use of the term "melons" in this document includes raw agricultural commodities and value-added fresh-cut products derived from cantaloupe (aka muskmelons), honeydew, watermelon, and variety melons ("Canary", "Crenshaw", "Galia", etc). It should be noted that there are significant differences in morphology and growing conditions between cultivars such as the "Athena" cultivar of cantaloupe melons which are predominantly grown in the southeastern U.S. and "Western Shipper" varieties grown in western U.S.

In recent years numerous safe melon handling practices have been adopted and implemented by growers, processors, and others along the distribution chain and this has significantly enhanced the safety of fresh melons. As part of a supplier's continuous improvement of food safety programs, all suppliers of produce are encouraged to comply with Good Agricultural Practices (GAPs) during the production, harvest and packing of all produce items. The emphasis on food safety continues in the example where the products are transferred to the fresh-cut processors who use Good Manufacturing Practices (GMPs) and commonly employ other food safety programs such as HACCP (Hazard Analysis Critical Control Point). Similar, appropriate programs are also in place all the way to the end user to assure that produce destined for consumers has been cultivated, harvested, packed, processed, received, held, distributed and handled at retail/foodservice operations in a manner that addresses product safety. These guidelines focus on minimizing the microbial food safety hazards by providing suggested potential actions to reduce, control or eliminate microbial contamination of melons in the field to fork distribution continuum. Chemical hazards may also be introduced into the food supply intentionally or unintentionally and this guidance document does not specifically address chemical contamination of melons. It is suggested that all companies involved in the melon farm to table continuum consider the recommendations contained within these guidelines to assure the safe production and handling of melon products from field to fork. Educational outreach is also warranted to assure awareness and use of available melon food safety information by everyone in the melon farm to fork continuum. Together with the commitment of each party along the supply chain to review and implement these guidelines, we will all be doing our part to provide a consistent, safe supply of produce to the market.

Safe production, distribution and handling of fresh produce depends on a myriad of factors and the diligent efforts of many parties throughout the distribution chain. No single resource can provide answers to all questions. These guidelines are recommendations only, and the United Fresh Fruit and Vegetable Association, the Produce Marketing Association and all other contributors and reviewers, do not make any claims or warranties about any specific actions contained herein. It is the responsibility of any purveyor of food to maintain strict compliance with all local, state and federal laws. These guidelines are designed to

direct inquiries and develop information that must be independently evaluated by all parties with regard to compliance with legal and regulatory requirements. The providers of this document do not certify compliance with these guidelines and do not endorse companies or products based upon their use of these guidelines. Differences between products, production processes, distribution and consumption, and the ever-changing state of knowledge regarding food safety make it impossible for any single document to be comprehensive and absolutely authoritative. Users of these guidelines should be aware that scientific and regulatory authorities are constantly revising information regarding best practices in food handling, as well as information regarding potential food safety management issues. Users of this document must bear in mind that as knowledge regarding food safety changes, so will measures to addresses those changes, as will the emphasis on particular issues by regulators, as well as regulations themselves. Neither this document, nor how food producers and distributors should address food safety is set in stone. Users are strongly urged to maintain regular contact and avail themselves of information available through the U.S. Food and Drug Administration, U.S. Department of Agriculture, U.S. Environmental Protection Agency, the Centers for Disease Control and Prevention, as well as state agricultural, environmental, academic, and public health authorities.

FIGURE 1. GENERAL SUPPLY CHAIN FLOW FOR MELONS

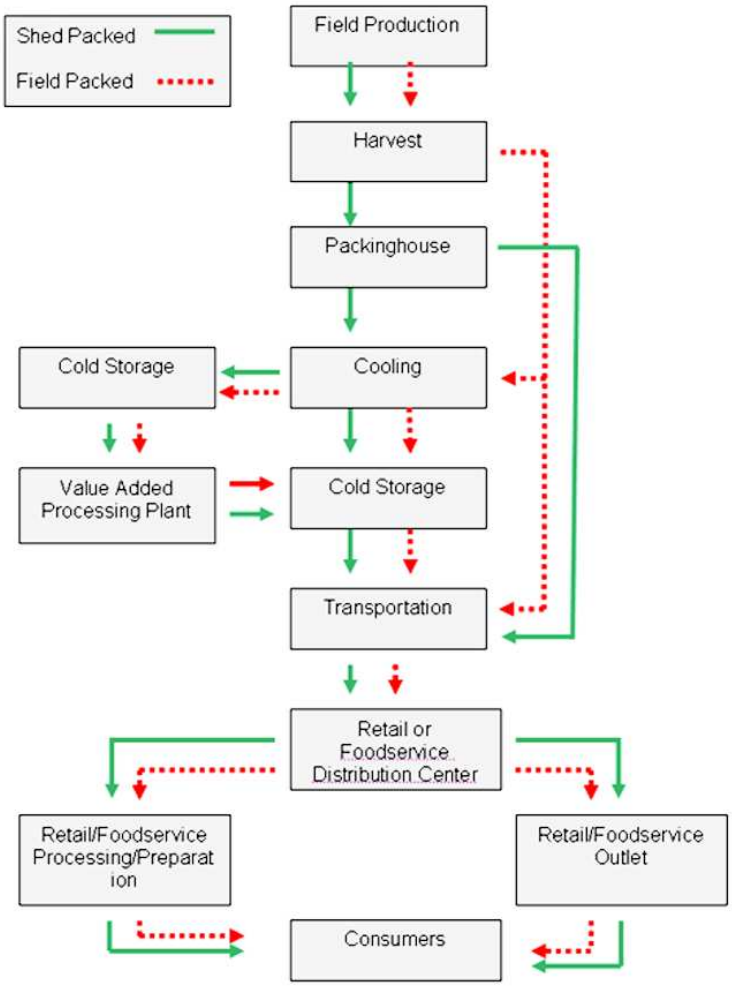
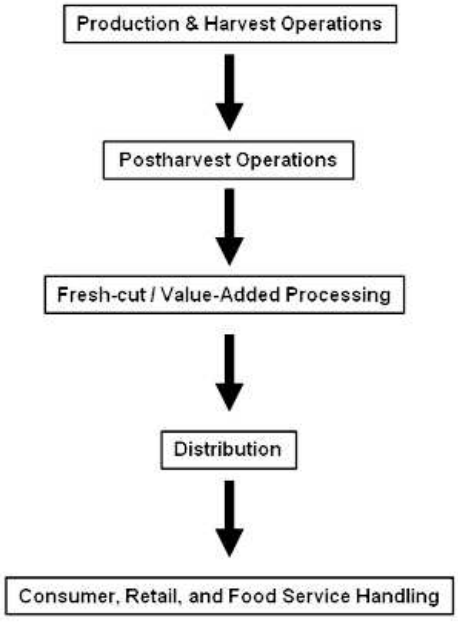


FIGURE 2. MELON UNIT OPERATIONS



Melon Commodity Specific Guidance

I. Production & Harvest Unit Operations

Issue: Climatic Production Conditions and Environment

Melons are chilling injury sensitive fruit that require warm weather growing conditions. Warm humid conditions may favor human pathogen persistence and increase wildlife pest pressure and activity. Many wildlife species (birds, insects, amphibians and snakes) are known to be potential carriers of human pathogens. Heavy rains may also cause melons to be covered with soil due to rain splashing.

Things to Consider:

- Consideration should be given to monitoring and reducing domestic animals, wildlife and insect activity in melon production environs. Domestic animal, wildlife and insect infestations that may contaminate water and soil with human pathogens that directly or indirectly contact melons should be controlled, reduced or eliminated.
- If unusually heavy wildlife pest infestations or evidence of wildlife pest infestations occurs (i.e. presence of wildlife feces), consideration should be given to whether or not to harvest affected portions of a melon field.
- Harvest employees should be trained to recognize and report for appropriate actions the signs of wildlife pest infestations and/or evidence (e.g. feces) of wildlife pest infestations.
- Heavy rains may increase the likelihood of soil-to-melon contamination. Consideration should be given to harvest practices such as delayed harvest, extra washing, etc, when heavy rains have recently occurred.

Issue: Melon Rind Surface Characteristics

Melons may have smooth or netted rind surfaces. Significantly more foodborne illness outbreaks have been associated with melons that have netted rinds. (Harris et al., 2003; MMWR, 1991, Mohle-Boetani et al., 1999) Human pathogens may adhere, survive and be more difficult to eliminate from netted melon rind surfaces (Bradley, et al., 2001; Richards and Beuchat 2004; Parnell, et al., 2005; Ukuku and Fett, 2002).

Things to Consider:

- Special consideration should be given to practices that prevent surface contamination on melons especially those with netted rinds, as once surface contamination occurs elimination of contamination is extraordinarily difficult.

Issue: Stem Scar and Melon Maturity (Cantaloupes)

Cantaloupe harvest is usually based on the melon stage of maturity, as judged by the formation of an abscission zone between the vine and the melon. This characteristic of cantaloupe maturity is commonly called slip and most melons are harvested at between 3/4 and full slip. Cantaloupe stem scars may provide a potential route for entry of human pathogens to the edible flesh of melons. (Richards and Beuchat, 2004). Also as melons mature and ripen they have a greater propensity to allow for the survival and multiplication of human pathogens on their surface (Suslow, 2005).

Things to Consider:

- Careful consideration should be given to postharvest handling practices to minimize stem scar and rind infiltration of human pathogens into the edible portions of melon flesh. (See postharvest handling unit operations section).

Issue: Direct Melon-to-Ground Contact

Melons may directly contact soil during growth and development. Melons may also be placed on cups (i.e. small plastic pads) or plastic covered beds to prevent direct melon to soil contact and thus reduce ground spot development. Melons may also be hand turned multiple times by field employees during the growing season to prevent ground spot development. Melon ground spots have been demonstrated to have significantly greater microbial populations than non ground spot areas of melon rinds (Parnell et al., 2005).

Things to Consider:

- If melons directly contact soil, careful consideration should be given to the use of all soil amendments to reduce or eliminate the potential for human pathogen contamination of soil.
- If melons are turned by hand to reduce ground spot formation, carefully consider employee hygiene practices, especially hand washing and glove use.
- If cups or plastic sheeting are used clean sanitary materials should be used.
- If melons directly contact soil, consideration should be given to irrigation (furrow, drip, etc.) protocols, to minimize soil wetting where melons contact the soil.

Issue: Mechanical Damage

Melons are heavy, making them susceptible to mechanical damage during harvest and postharvest handling operations.

Things to Consider:

- If deceleration padding is used on harvest and postharvest handling equipment, it should be constructed of materials that can be cleaned and sanitized.
- Consideration should be given to minimizing mechanical damage such as rind punctures, cracks and bruising, as these wounds may provide entry points for plant and human pathogens.

Issue: Multiple Harvests

Multiple melon harvests may increase the likelihood of melon contamination due to melons being mechanically damaged during prior harvest operations and increased insect pressures due to damaged melons in the field.

Things to Consider:

- If multiple melon harvests from one field occur, consideration should be given to reduce the potential for contamination within that field of melons that will be harvested in the future.
- Harvest employees should be trained to recognize and not harvest melons that have mechanical damage or possible contamination from previous harvest operations.
- Consider means of reducing flying insect access to animal feces and other likely sources of human pathogens that may contaminate un-harvested melons in the field.
- Consider means of melon cull disposal that reduces the potential for melon culls serving as an animal and insect pest attractant. This will reduce the potential for insect/pest-to-melon fruit contamination.

Detailed Background Guidance Information

Required Reference Documents

1: UFFVA Food Safety Auditing Guidelines: Core Elements of Good Agricultural Practices for Fresh Fruits and Vegetables

2: UFFVA Food Safety Questionnaire for Fresh Fruits and Vegetables

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Melon Commodity Specific Guidance

II. Postharvest Unit Operations

Issue: Packinghouse and Field Packing Equipment Sanitation

Field packing equipment and packinghouse sanitary design and sanitation programs are critical to assuring that melons exiting these unit operations do not experience a net increase in microbial populations (Akins et al., 2005, Castillo et al., 2004, Gagliardi et al., 2003, Leon, 2005). Field packing equipment and packing-house operations may only be used seasonally and be dormant for many months, leaving them susceptible to pest infestations.

Things to Consider:

- Consider validating your packinghouse or field packing/harvest sanitation procedures to assure that melons are not experiencing microbial contamination or build up during this unit operation. Microbial counts should be equal or less than in the previous unit operation.
- Consider validating that melon wetting and brushing operations are not a potential source of melon cross contamination.
- Field packing equipment and packing house operations that may be dormant for many months should be appropriately protected from pest infestations. Appropriate cleaning, sanitation and pest removal/exclusion measures should occur before operations commence.
- Field packing and packinghouse equipment should be designed to facilitate sanitation. Melon contact surfaces, including padding, should be constructed of materials that may be easily cleaned and sanitized.

Issue: Packinghouse Melon Dump Operations

Melons may be unloaded from field bins, open flat bed wagons or gondolas by dry dump or water dump operations. Melons may also be floated out of gondolas by placing gondolas into water filled sumps that allow melons to be floated out of the gondolas. In this unit operation there is the potential for melon to melon, food contact surface to melon, and melon to water to melon cross contamination. (Akins et al., 2005, Castillo et al., 2004, Gagliardi et al., 2003, Leon, 2005)

Things to Consider:

- If dry dump stations are used, melon food contact surfaces, including padding materials, should be constructed of materials that can be cleaned and sanitized.
- If dry dump stations are used, employees should not walk or stand on dry food contact surfaces during operations as this may increase the likelihood of food contact surface contamination.

- Consideration should be given to alternative means of melon removal from harvest vehicles by means other than immersion of the gondolas/trailers/wagons to reduce potential product cross contamination with road debris.

- If wet dump stations are used, water should be of sufficient microbial quality for its intended purpose. Dump tank water should have sufficient water disinfectant present and the levels should be monitored to reduce the potential risk of cross contamination. The primary purpose of the water disinfectant is not to clean the melons but rather to prevent the water from becoming contaminated should pathogens be introduced into the water from melons. The contaminated water could then act as a source of contamination of incoming melons.

Issue: Melon Cooling Medium

Melons are typically cooled by forced-air cooling or by use of a chilled water drench or flume immersion. Melon cooling with water, if done correctly may reduce microbial loads on the outside surface of melons by 2-3 logs CFU. (Park and Beuchat, 1999, Rodgers et al., 2004). Microbial reduction on melon surfaces is dependent on disinfectant concentration and contact time. However, it must be remembered that human pathogens once present on the surface of a melon cannot be completely eliminated by washing (Parnell, et al., 2005). Soaking melons in aqueous solutions containing wash water disinfectants for very long periods of time is not an effective means of eliminating surface microbial contamination of the melon rind and may actually aid in the infiltration of human pathogens into the edible portions by creating an infiltration driving force. Melon cooling water may also be a significant source of microbial cross contamination if there is insufficient water disinfectant present. Also because melon cooling water is colder than the melons, infiltration of small amounts of cooling water may enter melons through the stem scar and rind. (Richards and Beuchat, 2004). Forced-air cooling operations may also spread product contamination if forced air cooling equipment is not cleaned and sanitized regularly.

Things to Consider:

- If cold water is used to cool melons it should be of sufficient microbial quality for its intended purpose.

- If melon cooling water is re-circulated sufficient water disinfectant should be present at sufficient levels and the levels monitored to reduce the potential risk of cross contamination. If melons are fully submerged in water as a means of cooling, they are more likely to have cooling water infiltration into the melons and consideration should be given to cooling water quality variables such as pH, organic load, turbidity, product through put capacity, etc. to assure that the wash water disinfectant of choice is effective in reducing the potential for water-to-melon cross contamination. (See Suslow, 1997 and Suslow, 2001 for details)

- Single pass or one use cooling water of sufficient quality for this intended purpose may also be used to cool product.

- If forced-air cooling is used to cool melons, equipment should be cleaned and sanitized on a regular basis to assure that the potential for cross contamination is minimized.

Issue: Cooling Delays

Delays in melon cooling when melon rinds are wet from cooling operations or from dew may allow for multiplication of human pathogens on the rind surface of melons. (Behrsing et al., 2003).

Things to Consider:

- Consider implementing melon handling operations that minimize the incidence of melon surface free moisture to reduce the potential plant and human pathogen growth.
- If melons are to be cooled, consider cooling and cold storing melons as soon as possible after harvest.
- Cooling, cold storage and refrigerated distribution/marketing of whole melons as raw agricultural commodities is not required to maintain the safety of whole melons.

Issue: Fungicide Treatment

Melons may be treated by aqueous spray or immersion with fungicides to extend their postharvest life. If the water used for postharvest fungicide application is contaminated with human pathogens the melon rind surface may be contaminated with human pathogens.

Things to Consider:

- If water based fungicide solutions are used for postharvest melon treatments, the water should be of sufficient microbial quality for its intended purpose.
- Most crop protection chemicals, including fungicides are not bactericidal or virucidal and do not significantly affect the survival or growth of most human pathogens (Guan et al., 2005; Vlahovich et al., 2004).
- If hot water treatments are used as an alternative to postharvest chemical fungicide treatments, water temperature must be maintained at an appropriate temperature and/or sufficient water disinfectant should be present at sufficient levels and the temperature/ disinfectant levels monitored to reduce the potential risk of cross contamination.

Issue: Flying Insect Control

Melons have very high sugar content and are extremely attractive to flies and other insects that may cross-contaminate melons.

Things to Consider:

- Consider implementing an aggressive melon cull disposal and waste removal program to limit field, packinghouse and cooler culls and thus reduce the potential for insect to melon fruit contamination.
- Consider means of reducing flying insect access to animal feces and other likely sources of human pathogens.

Issue: Top Icing of Melons

Melons in some operations may be top iced after cooling as a means of temperature control during transport and distribution. Ice will melt at refrigeration temperatures during transportation and distribution operations. Melting ice water flowing through boxes of melons may increase the risk of melon cross contamination within and among pallets of melons.

Things to Consider:

- Consider alternative means of keeping melons cool since top icing is not particularly effective in cooling or keeping melons cold.
- Assure that the water used to make ice is of sufficient microbial quality for its intended use.
- Consider use of ice that contains an approved water disinfectant at sufficient concentration to reduce the potential for cross contamination.
- If ice is used, transport, store and use ice under sanitary conditions.
- If ice is used, consider use of plastic pallet shrouds to protect product from potential cross contamination by pallets of melon placed in storage racks above other melon pallets.

Detailed Background Guidance Information:

Required Reference Documents

1: UFFVA Food Safety Auditing Guidelines: Core Elements of Good Agricultural Practices for Fresh Fruits and Vegetables

2: UFFVA Food Safety Questionnaire for Fresh Fruits and Vegetables

3: National GAPs Program Cornell University: Food Safety Begins on the Farm: A Grower Self Assessment of Food Safety Risks

Melon Commodity Specific Guidance

III. Fresh-cut / Value Added Unit Operations

Issue: Pre-Processing Treatments

In recent years there have been foodborne illness outbreaks and product recalls associated with cantaloupe melons due to inadvertent contamination with Salmonella. While not the only route of possible contamination, edible portions of the melon flesh may be contaminated in the cutting or rind removal process because microbial contamination on the outside rind of the melon may be spread by the knife blade. (Lin and Wei,1997, Ukuku and Davis, 2001, Ukuku and Fett, 2002). Melon ground spots due to their possible direct contact with soil have been found to have higher microbial populations associated with them and are typically more susceptible to accelerated decay by plant pathogens. Decayed melon lesions caused by plant pathogens may also act as harborage for human pathogens (Richards and Beuchat, 2005).

Things to Consider

- If whole melons have visible signs of decay or damaged rinds (e.g. mechanical damage, cracking, etc.) consider not using them for fresh-cut melon production due to the possible increased risk of the presence of human pathogens in melons with decay or damage (Richards and Beuchat, 2005). When in doubt about the use of a decayed melon, throw it out.
- Whole melons used for fresh-cut melon products should be washed thoroughly before cutting or peeling operations begin.
- Water used to wash melons before cutting or peeling should be of sufficient microbial quality for its intended purpose.
- If water used to wash melons before cutting or peeling is re-circulated, reused or large quantities of melons are washed/soaked in a single container, sufficient concentration/activity of an approved water disinfectant should be present and monitored to reduce the potential for melon to water to melon cross contamination.
- Melon washing before cutting or peeling, if done appropriately, may reduce microbial populations on the outside surface of melons by 2-3 logs CFU (Park and Beuchat, 1999; Rodgers et al., 2004). Microbial reduction on melon surfaces is dependent on disinfectant concentration and contact time. However, once human pathogens are present on the surface of a melon they cannot be completely eliminated by washing. Soaking melons in aqueous solutions containing wash water disinfectants for very long periods of time is not an effective means of eliminating surface microbial contamination of the melon rind and may actually aid in the infiltration of human pathogens into the edible portions by creating an infiltration driving force.

- If whole melons are to be used for production of fresh-cut melon products, consider using hot water, steam, or other treatments to surface disinfest the melon rind before peeling or cutting operations commence. (Annous et al., 2004; Suslow and Zuniga, 2001) NOTE: if surface heat treatments are used to surface disinfest whole melons, be aware that there may be an increased risk of Clostridium botulinum toxin formation in temperature abused, modified atmosphere packaged fresh-cut melons. (Larson and Johnson, 1999).

- Consider sanitizing cutting knife blades or peeling knife blades on a regular basis to reduce the potential for melon-to-knife blade-to-melon cross contamination during the cutting or peeling process. Knife blade sanitizing solutions should be monitored to assure that the knife blade sanitizer is present at sufficient levels to achieve its intended purpose and not promote the potential for cross contamination.

Issue: Potential for Growth of Human Pathogens on Edible Melon Flesh

Human pathogens may proliferate rapidly under temperature abuse conditions on fresh-cut melon products (Castillo and Escartin,1994; Del Rosario and Beuchat, 1995; Escartin et al., 1989, Golden et al., 1993).

Things to Consider:

- Once melons are processed into fresh-cut products they are not sensitive to chilling injury like whole melons and should be cold stored and distributed at 32-41oF (0-5oC).

Detailed Background Guidance Information

Required Reference Document

4: IFPA Food Safety Guidelines for the Fresh-Cut Produce Industry

Melon Commodity Specific Guidance

IV. Distribution Unit Operations

Issue: Temperature

Some melon varieties are sensitive to chilling injury and their optimal storage temperature to maintain quality varies by melon variety and product form (i.e. raw agricultural commodity versus fresh-cut).

- 0° - 5°C (32°- 41°F) Fresh-cut Melons
- 2.2° - 5°C (36°- 41°F) Cantaloupe
- 7° - 10°C (45°- 50°F) Honeydew
- 10° - 15°C (50° - 59°F) Watermelon

Cooling, cold storage and refrigerated distribution/marketing of whole melons as raw agricultural commodities is not required to maintain the safety of whole melons.

Fresh-cut melons require temperature control for safety and should be stored at 0° - 5°C (32°- 41°F) to prevent the potential rapid and prolific growth of human pathogens. (Castillo and Escartin, 1994, Del Rosario and Beuchat, 1995, Escartin et al., 1989, Golden et al., 1993).

Things to Consider:

- Fresh-cut melon products require temperature control for safety and should be cold stored, distributed and transported at 0° - 5°C (32°- 41°F) to prevent the potentially rapid and prolific growth of human pathogens.

Issue: Transportation Vehicles

Melons and fresh-cut melon products can take many routes to the end user, including direct or indirect shipments through intermediate distributors and warehouses. Each step of each route must be managed to reduce, control or eliminate the risk of contamination.

Things to Consider:

- Melons and fresh-cut melon products should be transported in clean, sanitary shipping containers or trailers.
- Consider implementing inspection/evaluation management programs of shipping containers/trailers to verify that food safety needs are being met. Items that may be evaluated include but are not limited to, the container/trailer condition, overall cleanliness of the walls and floor, good structural condition (free from damage to walls and floor or ceiling, such as exposed insulation and holes,) absence of off-odors or unusual smells and functional chilled air delivery chute.

- Consider addressing food safety requirements for the sanitary transportation of your melon products in your contracts with transportation companies. An example being restrictions on previous cargoes that have been carried to avoid the possibility of cross contamination.

- NOTE: The Sanitary Food Transportation Act of 2005 has amended the Federal Food Drug and Cosmetic Act to define adulterated food to include food transported or offered for transportation under conditions not in compliance with (21 U.S.C. § 342 (i)). The FDA is currently developing regulations requiring shippers, motor and rail carriers, receivers and other persons engaged in the transportation of food to use sanitary transportation practices. These regulations will pertain to but are not limited to: sanitation, packaging, isolation and other protective measures, limitations on the use of vehicles, recordkeeping, nonfood products that the agency determines may, if transported in bulk or non-bulk equipment, adulterate food if simultaneously or subsequently transported in the same vehicle.

Detailed Background Guidance Information:

Required Reference Documents

1: UFFVA Food Safety Auditing Guidelines: Core Elements of Good Agricultural Practices for Fresh Fruits and Vegetables

2: UFFVA Food Safety Questionnaire for Fresh Fruits and Vegetables

3: National GAPs Program Cornell University: Food Safety Begins on the Farm: A Grower Self Assessment of Food Safety Risks

4: IFPA Food Safety Guidelines for the Fresh-Cut Produce Industry

5: IFPA/PMA Fresh-cut Produce Handling Guidelines

6: FMI Total Food Safety Management Guide: A Model Program for Raw Ready-To-Eat Fresh-cut Produce

7: FMI SuperSafeMark: Retail Best Practices and Guide to Food Safety and Sanitation

8: NRA Education Foundation ServSafe Coursebook

Melon Commodity Specific Guidance

V. User Handling (Retail, Foodservice and Consumer) Unit Operations

Issues: In recent years there have been foodborne illness outbreaks and product recalls associated with cantaloupe melons due to inadvertent contamination with *Salmonella*, *E. coli* O157:H7 and rotovirus. While not the only route of contamination, edible portions of the melon flesh may be contaminated in the cutting or rind removal process because microbial contamination on the outside rind of the melon may be spread by the knife blade involved in the cutting and/or peeling process. Six percent of consumers in a recent survey responded that they never or seldom wash fresh produce before consumption and greater than 35% of survey respondents replied that they do not wash melons before consumption (Li-Cohen and Bruhn, 2002). This survey also found that many consumer respondents did not separate produce from raw meat, poultry or fish in their refrigerators. These limited observations clearly indicate the need for educational outreach to consumers that must emphasis safe handling practices of produce from purchase to consumption. Decayed melon lesions caused by plant pathogens may act as harborage for human pathogens (Richards and Beuchat, 2005).

Things to Consider: (Retail and Foodservice)

The U.S. FDA "Produce Safety at Retail: Safe Handling Practices for Melons" issued on May 25, 2001 (www.cfsan.fda.gov/~ear/ret-mln.html) recommends the following steps, as applicable, for retail establishments preparing or selling fresh-cut melons. These recommendations are also applicable to foodservice establishments.

- If whole melons have visible signs of decay or damaged rinds (e.g. mechanical damage, cracking, etc.) consider not using them due to the possible increased risk of the presence of human pathogens in melons with decay or damage (Richards and Beuchat, 2005). When in doubt about the use of decayed product, throw it out.
- Wash hands thoroughly with soap and water before cutting melons.
- Before cutting, wash the outer surface of the melon thoroughly with cool tap water to remove surface dirt. For retail and foodservice establishments, the U.S. FDA 2005 Model Food Code Section 3-302.15 specifies that raw fruits and vegetables shall be thoroughly washed in water to remove soil and other contaminants before being cut, combined with other ingredients, cooked, served, or offered for human consumption in ready-to-eat form. Scrub firm produce, such as melons and cucumbers, with a clean produce brush. Cut away any bruised or damaged areas before eating.
- Wash all food-contact equipment and utensils that contact cut melons (cutting boards, knives, etc.) thoroughly with hot soapy water, rinse, sanitize, and air-dry.
- Use a barrier such as gloves, deli paper, or an appropriate utensil to touch cut melons. Do not touch cut melons with bare hands.

- Maintain the temperature of cut melons at 41°F or below. Cut melons should be displayed in a refrigerated case, not just displayed on top of ice. Uncut melons do not need to be refrigerated.
- Date mark cut melons that are held more than 24 hours to indicate that they must be consumed or discarded within 7 days.
- Mark the time when cut melons are displayed without refrigeration. Cut melons may be displayed for a maximum of 4 hours without temperature control, and, if not eaten, must be thrown away at the end of 4 hours.
- Specific procedures for storing or displaying melons, for washing hands, date marking, and for washing and sanitizing equipment can be found in the FDA Food Code.

Things to Consider: (Consumers)

Information from the Partnership for Food Safety Education - Produce Handling Education Campaign (http://portal.fightbac.org/pfse/toolsyoucanuse/phec/), recommends the following steps to help reduce the risk of foodborne illness from fresh produce.

Check

- Check to be sure that the fresh fruits and vegetables you buy are not bruised or damaged.
- Check that fresh cut fruits and vegetables like packaged salads and precut melons are refrigerated at the store before buying. Do not buy fresh cut items that are not refrigerated.

Clean

- Wash hands with warm water and soap for at least 20 seconds before and after handling fresh fruits and vegetables.
- Clean all surfaces and utensils with hot water and soap, including cutting boards, counter tops, peelers and knives that will touch fresh fruits or vegetables before and after food preparation.
- Rinse fresh fruits and vegetables under running tap water, including those with skins and rinds that are not eaten. Packaged fruits and vegetables labeled “ready-to-eat”, “washed” or “triple washed” need not be washed.
- Rub firm-skin fruits and vegetables under running tap water or scrub with a clean vegetable brush while rinsing with running tap water.
- Dry fruits and vegetables with a clean cloth towel or paper towel.
- Never use detergent or bleach to wash fresh fruits or vegetables. These products are not intended for consumption.

Separate

- When shopping, be sure fresh fruits and vegetables are separated from household chemicals and raw foods such as meat, poultry and seafood in your cart and in bags at checkout.

- Keep fresh fruits and vegetables separate from raw meat, poultry or seafood in your refrigerator.
- Separate fresh fruits and vegetables from raw meat, poultry and seafood. Do not use the same cutting board without cleaning with hot water and soap before and after preparing fresh fruits and vegetables.

Cook

- Cook or throw away fruits or vegetables that have touched raw meat, poultry, seafood or their juices.
- Refrigerate all cut, peeled or cooked fresh fruits and vegetables within two hours.

Throw Away

- Throw away fresh fruits and vegetables that have not been refrigerated within two hours of cutting, peeling or cooking.
- Remove and throw away bruised or damaged portions of fruits and vegetables when preparing to cook them or before eating them raw.
- Throw away any fruit or vegetable that will not be cooked if it has touched raw meat, poultry or seafood.

Detailed Background Guidance Information

Required Reference Documents

5: IFPA/PMA Fresh-cut Produce Handling Guidelines

6: FMI Total Food Safety Management Guide:
A Model Program for Raw Ready-To-Eat Fresh-cut Produce

7: FMI SuperSafeMark: Retail Best Practices and Guide to Food Safety and Sanitation

8: NRA Education Foundation ServSafe Coursebook

Information & Resources

The following references are listed to provide additional information about melon produce safety. This is not intended to be an all-inclusive list; rather it is representative of materials that are currently available.

California Department of Health Services

- Safer Processing of Fresh-cut Produce (www.dhs.ca.gov/ps/fdb/PDF/FreshCutOrderform4.PDF)
- Handling of "Value Added" Produce in Retail Markets (www.dhs.ca.gov/ps/fdb/HTML/food/Fsn9903.htm)
- Reducing Risk of Foodborne Illness Associated With Green Onions and Other Produce – A Guide For The Retail Food Industry (www.dhs.ca.gov/ps/fdb/PDF/Produce%20Handling%2011%202503A.PDF)

Food and Drug Administration (FDA)

- Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables (www.foodsafety.gov/~dms/prodguid.html)
- 2005 U.S. FDA Model Food Code (www.cfsan.fda.gov/~dms/fc05-toc.html)
- 2005 Dietary Guidelines for Americans - Chapter 9 Food Safety (www.health.gov/dietaryguidelines/dga2005/report/PDF/D9_FoodSafety.pdf)
- Produce Safety at Retail: Safe Handling Practices for Melons (www.cfsan.fda.gov/~ear/ret-mln.html)
- FDA Advises Consumers on Fresh Produce Safety (www.cfsan.fda.gov/~lrd/tpproduc.html)

Food Marketing Institute (FMI)

- Total Food Safety Management Guide: A Model Program for Raw Ready-To-Eat Fresh-cut Produce (www.fmi.org/forms/store/ProductFormPublic/search?action=1&Product_productNumber=2014)
- SuperSafeMark: Retail Best Practices and Guide to Food Safety and Sanitation (www.fmi.org/supersafemark/)
- www.fmi.org

International Fresh-cut Produce Association (IFPA)

- Food Safety Guidelines for the Fresh-Cut Produce Industry 4th Edition

- Fresh-Cut Produce Handling Guidelines 3rd Edition
- www.fresh-cuts.org

National GAPs Program at Cornell University

- Food Safety Begins on the Farm - A Grower's Guide: Good Agricultural Practices for Fresh Fruits and Vegetables (www.gaps.cornell.edu/PUBS/FSBF_Bk_Eng.pdf)
- Food Safety Begins on the Farm: A Grower Self Assessment of Food Safety Risks (www.gaps.cornell.edu/pubs_fsbf_ws.html)
- Minimize Pathogen Contamination During Production and Harvest of Fresh Produce (www.gaps.cornell.edu/pubs/risks.pdf)
- www.gaps.cornell.edu

National Restaurant Association (NRA)

- NRA Education Foundation ServSafe Coursebook 3rd Edition (www.nraef.org/servsafe)
- NRA (www.restaurant.org)
- NRA Educational Foundation (www.nraef.org)

Partnership for Food Safety Information Fight BAC!

- Produce Handling Education Campaign (http://portal.fightbac.org/pfse/toolsyoucanuse/phec/)
- BAC Down! (http://portal.fightbac.org/pfse/toolsyoucanuse/BACDown/)

Produce Marketing Association (PMA)

- Fresh-Cut Produce Handling Guidelines
- www.pma.com

United Fresh Fruit and Vegetable Association (UFFVA)

- Food Safety Auditing Guidelines: Core Elements of Good Agricultural Practices for Fresh Fruits and Vegetables (www.uffva.org/training/)
- Food Safety Questionnaire for Fresh Fruits and Vegetables (www.uffva.org/training/)
- www.uffva.org

Websites

California Melon Research Board: Consumer Tips For Handling Fresh Cantaloupe

www.cmrb.org/tips/

Canadian Food Inspection Agency Food Safety Measures for Cantaloupe

www.inspection.gc.ca/english/corpaffr/newcom/2002/20020514e.shtml

Gateway to Government Food Safety Information

www.foodsafety.gov/

Partnership for Food Safety Information Fight BAC!

Produce Education Handling Campaign

http://portal.fightbac.org/pfse/toolsyoucanuse/phec/

BAC Down!

http://portal.fightbac.org/pfse/toolsyoucanuse/BACDown/

University of California DANR: Cantaloupe: Safe Methods to Store, Preserve, and Enjoy

http://anrcatalog.ucdavis.edu/pdf/8095.pdf

University of California Davis: Key Points of Control and Management of Microbial Food Safety: Information for Producers, Handlers, and Processors of Melons.

http://anrcatalog.ucdavis.edu/pdf/8103.pdf

University of California Davis: Overview of Industry Practices: Minimizing the risk of foodborne illness associated with cantaloupe production and handling in California.

http://ucce.ucdavis.edu/files/filelibrary/5622/15931.pdf

University of Florida IFAS: Melon Safe Handling Practices for Consumers

http://edis.ifas.ufl.edu/pdffiles/fy/fy48800.pdf

University of Georgia Agricultural and Environmental Sciences Cooperative Extension Service: Good Agricultural Practices in the Harvest, Handling and Packing of Cantaloupes

http://pubs.caes.uga.edu/caespubs/pubcd/b1179.htm#Practices

U.S. Code of Federal Regulations (CFR) All

www.access.gpo.gov/nara/cfr/cfr-table-search.html#page1

U.S. Code of Federal Regulations (CFR) 21CFR 100-169 cGMPs and other Food Regulations

www.access.gpo.gov/nara/cfr/waisidx_04/21cfrv2_04.html

U.S. Code of Federal Regulations (CFR) Food Labeling

www.access.gpo.gov/nara/cfr/waisidx_00/21cfr101_00.html

USDA, ARS Agriculture Handbook Number 66 The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks: Produce Food Safety

www.ba.ars.usda.gov/hb66/024foodsafety.pdf

U.S. Food and Drug Administration

www.fda.gov

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Glossary

This glossary of definitions have been obtained from Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables, October 1998 (*www.foodsafety.gov/~dms/prodguid.html*) and the definitions describing risk are those adopted on an interim basis at the 22nd Session of the Codex Alimentarius Commission

Agricultural Water: refers to water used in the growing environment (for example, field, vineyard, or orchard) for agronomic reasons. It includes water used for irrigation, transpiration control (cooling), frost protection, or as a carrier for fertilizers and pesticides. Occasionally a more specific term may be used, such as "irrigation water." Typical sources of agricultural water include flowing surface waters from rivers, streams, irrigation ditches, open canals, impoundments (such as ponds, reservoirs, and lakes), wells, and municipal supplies.

Adequate: means that which is needed to accomplish the intended purpose in keeping with good practice.

Clean: means that food or food-contact surfaces are washed and rinsed and are visually free of dust, dirt, food residues, and other debris.

Control: (a) to manage the conditions of an operation in order to be consistent with established criteria, and (b) to follow correct procedures and meet established criteria.

Control Measure: any action or activity that can be used to prevent, reduce, or eliminate a microbiological hazard.

Facility: the buildings and other physical structures used for or in connection with the harvesting, washing, sorting, storage, packaging, labeling, holding, or transport of fresh produce.

Field Packed: means that grading, sorting, sizing, packing, and palletizing are carried out in the field.

Food-contact Surfaces: are those surfaces that contact fresh produce and those surfaces from which drainage onto the produce or onto surfaces that contact the produce may occur during the normal course of operations. "Food-contact surfaces" includes equipment, such as containers and conveyor belts, which contact fresh produce, whether used in harvesting, post-harvesting, or packaging operations. It would not include tractors, forklifts, handtrucks, pallets, etc. that are used for handling or storing large quantities of contained or packed fresh produce and that do not come into actual contact with the food.

Good Agricultural Practices: refer to the guidelines set forth in the "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables," which was published by the U.S. Food and Drug Administration in 1998 (www.foodsafety.gov/~dms/prodguid.html).

cGMPs (current Good Manufacturing Practices): Current Good Manufacturing Practices in Manufacturing, Processing, Packing, or Holding Human Food (21 CFR 110).

Hazard: refers to a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

Human Pathogen: means a microorganism capable of causing disease or injury to people. This is different from a plant pathogen which may cause disease to plants.

Microorganisms: include yeasts, molds, bacteria, protozoa, helminths (worms), and viruses. Occasionally, the term “microbe” or “microbial” is used instead of the term “microorganism.”

Microbial Hazard: means occurrence of a microorganism that has the potential to cause illness or injury.

Operator: means the person or persons who have day-to-day responsibility for the production, harvesting, washing, sorting, cooling, packaging, shipping, or transportation of fresh fruits and vegetables, and responsibility for management of all employees who are involved in each of these activities.

Packing Shed/Packinghouse: means a facility where raw agricultural commodities are washed, trimmed or sorted and packed in commercial containers, e.g. cartons or totes.

Pest: refers to any animal or insect of public health importance including, but not limited to, birds, rodents, cockroaches, flies, and larvae that may carry pathogens that can contaminate food.

Raw Agricultural Commodity: any fruit or vegetable in its raw or natural state, including all fruits and vegetable that are washed, colored, or otherwise treated in the unpeeled natural form prior to marketing.

Risk: is a function of the probability of an adverse health effect and the severity of that effect, consequential to a hazard(s) in food.

Sanitize: means to treat clean produce by a process that is effective in destroying or substantially reducing the numbers of microorganisms of public health concern, as well as other undesirable microorganisms, without adversely affecting the quality of the product or its safety for the consumer.

Sanitize (food contact surfaces): means to adequately treat clean food-contact surfaces by a process that is effective in destroying or substantially reducing the numbers of microorganisms of public health concern, as well as other undesirable microorganisms, without adversely affecting the quality of the involved product or its safety for the consumer. It means the application of cumulative heat or chemicals on cleaned food-contact surfaces that, when evaluated for efficacy, is sufficient to reduce populations of representative microorganisms by 5 log or 99.999%.

Shed Packed: means grading, sorting, sizing, packing, and palletizing are carried out in a packing shed/packinghouse.

Value-Added or Fresh-cut Produce: refers to fruits or vegetables that have been trimmed and/or peeled and/or cut into 100% usable product that is bagged or pre-packaged. These products are very often packed in protective plastic films and often these products are typically ready "ready-to-eat" food products, if they are labeled as "washed", "triple washed" or "ready-to-eat" as they have gone through a vigorous washing process before being packaged and sold. Products which are not labeled as such, are raw agricultural commodities and should be considered raw agricultural commodities even if they packaged in a plastic overwrap or polyfilm.

Acronyms

CCP: This stands for critical control point and is used when referring to the last step in a process where control can be applied to mitigate a food safety risk.

CP: This stands for control point which is a step in a process where control my be applied to manage a food safety risk

FDA: This acronym stands for the U.S. Food and Drug Administration.

GAPs: This acronym stands for Good Agricultural Practices and synonymously refers to the "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables" published by the U.S. Food and Drug Administration. www.foodsafety.gov/~dms/prodguid.html

GMPs: Good Manufacturing Practices in Manufacturing, Processing, Packing, or Holding Human Food (21 CFR 110) www.access.gpo.gov/nara/cfr/waisidx_04/21cfr110_04.html

Required Reference Documents

This guidance is completed by the Required Reference Documents listed below. Every company will not need every document. Choose the documents that are appropriate to your company's function in the supply chain.

1 UFFVA Food Safety Auditing Guidelines:
Core Elements of Good Agricultural Practices for Fresh Fruits and Vegetables

(www.uffva.org/training/)

2 UFFVA Food Safety Questionnaire for Fresh Fruits and Vegetables

(www.uffva.org/training/)

3 National GAPs Program Cornell University:
Food Safety Begins on the Farm: A Grower Self Assessment of Food Safety Risks

(www.gaps.cornell.edu/pubs_fsbf_ws.html)

4 IFPA Food Safety Guidelines for the Fresh-Cut Produce Industry

(www.fresh-cuts.org/index.php?page=37)

5 IFPA/PMA Fresh-cut Produce Handling Guidelines

(www.fresh-cuts.org/index.php?page=37)

6 FMI Total Food Safety Management Guide: A Model Program for Raw Ready-To-Eat Fresh-cut Produce

(www.fmi.org/forms/store/ProductFormPublic/search?action=1&Product_productNumber=2014)

7 FMI SuperSafeMark: Retail Best Practices and Guide to Food Safety and Sanitation

(www.fmi.org/supersafemark/)

8 NRA Education Foundation ServSafe Coursebook

(www.nraef.org/servsafe)