

*Special thanks to all of the trade associations, agencies, universities and individuals who helped in developing the 1<sup>st</sup> edition of the "Commodity Specific Food Safety Guidelines for the Fresh Watermelon Supply Chain."*

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## **User's Note:**

These guidelines provide voluntary recommended guidelines on food safety practices that are intended to minimize the microbiological hazards that could be associated with fresh watermelons. 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 association, their members, reviewers 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 growing and packing methods in the watermelon industry make a single, universally applicable approach to food safety planning complicated. For example, growers may choose to pack watermelons in the field or in a packinghouse. Further, they may choose to cool the product or keep at room temperature. 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 watermelon supply chain to assure watermelon product consumer safety.

Whatever the preferred growing and packing method may be for a single handler, the watermelon industry recognizes the following basic principles that serve as the foundation for all food safety programs found within the industry:

- The watermelon industry recognizes that once a watermelon 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 watermelon industry supports implementation and documentation of food safety programs that utilize risk assessment techniques that identify true risks and use a preventative approach to ensure safe food products.
- The watermelon industry also supports and encourages food safety awareness training for all persons who grow, handle, distribute, merchandise and sell watermelon.
- 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, wild animals, water and soil. Therefore, watermelon food safety programs should pay special attention to preventing fecal contamination of human hands, wild animals, water and soil that contact watermelons.

Experts from industry, government and academia were solicited to identify microbial food safety issues that are found to be unique but not necessarily exclusive to watermelons. 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 continuum to consider what actions are appropriate in their operations. The identified issues in each unit operation section are focused only on watermelons 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 develop 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 watermelon field-to-fork continuum. Each company's food safety program and the prerequisite programs within 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 a starting point. This guidance document is intended to supplement, not replace, already established food safety program components such as GAPs, GMPs, etc., for the fresh watermelon industry. Detailed information regarding prerequisite programs may be found in the required reference documents.

Significant efforts were made to involve as many associations, agencies, companies and individuals with expertise in food safety practices for one or more steps in the fresh watermelon supply chain as possible. All perspectives were considered. Under the leadership of the editors identified in the acknowledgments, over twenty contributors collaborated to develop the guidelines presented in this first edition.

# Commodity Specific Food Safety Guidelines for the Fresh Watermelon Supply Chain

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# **WATERMELON GOOD AGRICULTURAL PRACTICES & GOOD HANDLING PRACTICES**

**National Watermelon Association  
2009**

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## **Introduction and Purpose**

Food safety is important for everyone. It is the goal of the entire watermelon industry to enhance the safety of watermelons to the consuming public by the implementation of safe production, handling, and packing practices that will prevent or minimize contamination and will provide the necessary education and training on food safety practices for all levels of the industry.

The purpose of the practices that are outlined in this watermelon food safety plan is to enhance the safety of fresh watermelon produced, packed, repacked, distributed and sold. This document is a compilation of basic food safety programs on the farm and in packing facilities, recent research on watermelon, based on Good Agricultural Practices (GAP) and Good Handling Practices (GHP), recommendations of food safety professionals and in anticipation of federal legislation that will require very similar food safety practices for all fresh produce.

For watermelon and other fruits and vegetables to be safely consumed many practices to prevent and reduce microbial or chemical contamination must be followed in the production, handling, packing, distributing, transporting, selling and serving of product. The watermelon industry provides consumers with a nutritious, abundant and safe harvest of fresh watermelons. Watermelons are recognized as an important component of a healthy diet because of the rich content of nutrients such as lycopene and vitamins. Yet, food borne illnesses continue to be associated with many fresh produce foods. The Center for Disease Control and Prevention (CDC) has estimated that in the 1990s an estimated 12% of food borne outbreak associated illnesses have involved fresh produce.

The primary purposes of these practices are to: 1) enhance the safety of watermelon to the consuming public by the implementation of safe handling, production and packing practices; 2) prevent or minimize contamination of watermelon either in the natural environment in which they are grown or in the handling, packing, repacking or selling of watermelon once harvested since once contaminated, removing or killing pathogens is difficult; and 3) provide the necessary education and training on food safety practices to workers at all levels.

Furthermore, it is the goal of these practices to meet the objectives of the U.S. Food and Drug Administration Produce Safety Action Plan. These practices will be modified as science and knowledge provide additional data to improve handling and enhance safety further.

Over the past year, the National Watermelon Association has been working with the industry, the United States Department of Agriculture (USDA), United Fresh Produce Association, Georgia Fruit & Vegetable Growers Association (GFVGA), Food & Drug Administration (FDA), Cornell University, the Traceability Steering Committee, and numerous research and food safety experts from other areas to capture the food safety practices that many are performing daily in an effort to work toward having consistent food safety practices for all. The documents listing these food safety enhancement practices are included in this edition, and will be a living document that will change as more knowledge becomes available.

Although the food safety practices for the watermelon industry are "voluntary", it should be understood that the federal government is considering legislation that will make the majority of the practices "mandatory" once the legislation becomes federal law. The Board of Directors of the National Watermelon Association voted to support, recommend and promote Good Agricultural Practices & Good Handling Practices for the fresh watermelon industry immediately following the program's completion and provision to the industry.

This action by the NWA is critical in light of the long-term objective of protecting human health and the subsequent events of food borne outbreaks involving spinach, lettuce and cantaloupes that have raised significant concerns amongst our federal legislators about food safety practices, and a declining confidence amongst consumers in produce safety. Federal legislation and food safety mandates are on the horizon. Therefore, it behooves all of us to incorporate the standards developed for our industry, and be ahead of the wave.

The National Watermelon Association stands at the ready to provide support and guidance to help implement GAP and/or GHP into your operations. By working together as an industry, we can continue to provide the safest fresh food supply in the world, minimize food safety issues related to watermelons, and build consumer confidence while protecting your business and the industry-at-large.

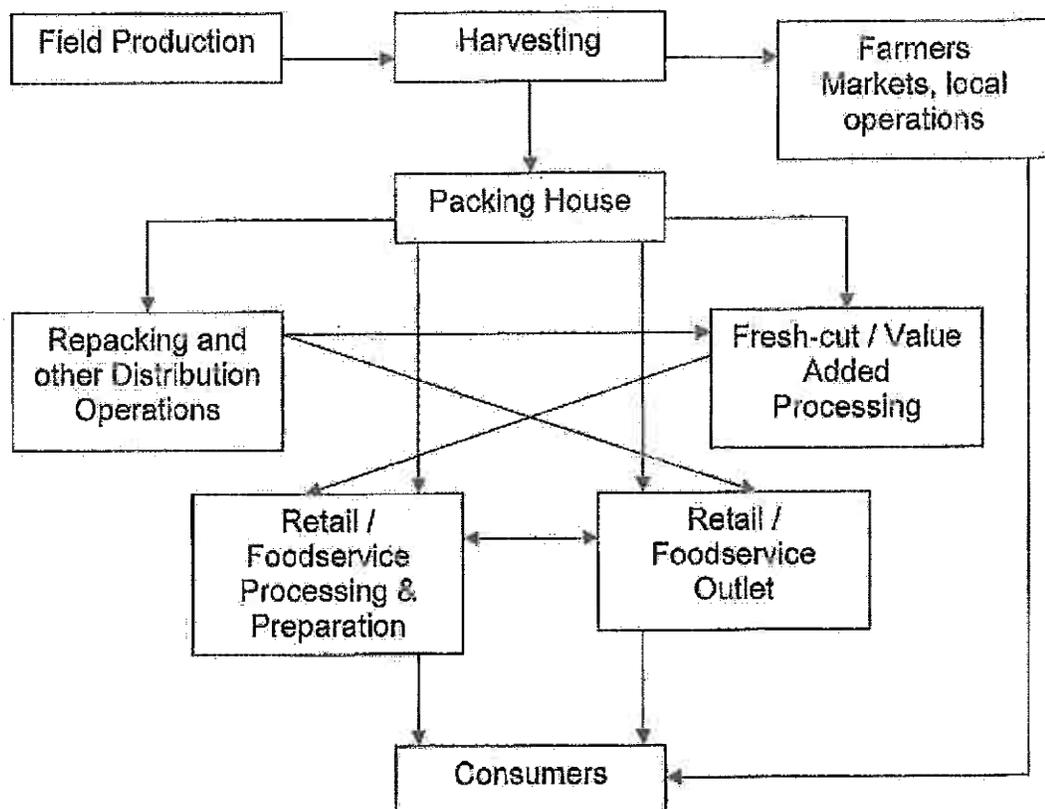
The National Watermelon Promotions Board (NWPB) stands at the ready in case a crisis should arise. The Crisis Management Program was designed with the industry's best interests in mind, and works in concert with the NWA's farm and packer-based food safety program (GAP and GHP). Together, we can all contribute to a quality, safe food supply, and protect the watermelon industry.

## Commodity Specific Food Safety Guidelines for the Watermelon Supply Chain

The scope of this document pertains only to the fresh watermelon food chain. Other watermelon products and by-products such as fresh cut watermelon, watermelon juice or watermelons intended to be processed for other uses fall under HACCP guidelines for processing operations, and should comply with those regulations. This document does not include considerations for products commingled with non-produce ingredients (e.g. salad kits which may contain meat, cheese, other fruits and/or vegetables). However, the watermelons used in such products should be produced, harvested and otherwise handled in a manner consistent with the recommendations in this document.

The distribution chain for watermelons can be complex, in that watermelons may be sold direct or indirect to the buyer; watermelons are subject to repacking for size and/or quality. As a result, there is no single distribution chain. The distribution chain may be simple or very complex, with watermelons being handled by a number of entities prior to being offered for sale to the consumer. The model distribution chain for the purpose of this document provides an overview of only a few of the many paths a watermelon can take prior to the end user. It is the intent of this document to cover all significant aspects of the watermelon supply chain, from production to delivery to the consumer.

### General Supply Chain Flow for Fresh Watermelons



Safe production, packing, processing, distribution and handling of watermelons depend upon a myriad of factors and the diligent efforts and food safety commitment of all parties throughout the distribution chain. No single resource document can anticipate every food safety issue or provide answers to all food safety questions. These guidelines are not intended to replace other food safety programs, but are meant to be used in conjunction with them to address food safety hazards potentially known to affect the watermelon supply chain.

These guidelines focus on minimizing the microbial food safety hazards by providing actions, based on the best available science, that have been shown to be effective to reduce, control or eliminate microbial contamination in the field to fork supply chain. Because of sub-commodity, regional and operational practice differences, not all of these actions will be applicable to all watermelon handling operations. However, it is suggested that all companies involved in the watermelon farm to table supply chain consider the recommendations contained within these guidelines in developing their company-specific food safety program. Every effort to provide food safety education to supply chain partners should be made as well, to ensure that opportunities to prevent contamination are not lost as watermelons pass from one point of the supply chain to the next. Together with the commitment of each party along the supply chain to review and implement these guidelines, the watermelon industry is doing its part to provide a consistent, safe supply of watermelons to the market.

Multiple modules will apply to many users of these guidelines. Users should not assume that a single module will cover their entire watermelon operation. Each of these modules contains key considerations for potential sources of pathogen contamination that may be reasonably likely to occur in the absence of control. While the primary focus of this document is on microbial hazards, chemical, physical and other food safety hazards are also addressed.

## **A. Field Production**

The development of good agricultural practices for field production must consider all the elements of the field production system; field site, land use, adjacent land use; agricultural inputs (e.g., irrigation water, fertilizers), workers and production practices. Microbial contamination can occur from a number of sources; evaluation of these risks and their management, are essential to proper food safety procedures in the production of watermelons.

### **1. Preventing/Minimizing Risks in the Field – Field Management**

Field producers must give consideration to the control of microbial contamination in the selection and management of production sites.

- a) Watermelon growers should determine previous usage of land if at all possible and should assess and mitigate conditions that may pose a food safety risk in and near production fields.
- b) Conduct an environmental assessment including topography, land history, risk of flooding, adjacent land use and domestic animal and wildlife presence.
  - i. Routinely review field environments and maintain records of assessments and any corrective actions
  - ii. Consider the potential for flooding to create conditions that may pose a food safety risk. Flooding is the uncontrolled introduction of large amounts of water into the production area.
- c) Fields should not be located in any area that can receive runoff or drainage from an animal operation or any other source of contamination.
- d) Steps should be taken to avoid, prevent or mitigate runoff into the field from any animal operation or other conditions that may pose a food safety risk.
- e) Areas of fields that have been contaminated by run-off from an animal operation should not be harvested for consumption.
- f) Procedures used to mitigate risks should be documented.

### **2. Animal Exclusion**

- a) Measures should be taken to exclude domestic animals and livestock from fields.
- b) Measures should be taken to minimize wildlife presence. These measures may include the use of barriers or other deterrents, minimizing wildlife attractants and opportunities for harborage, redirecting wildlife to non-sensitive areas and/or by other methods identified by wildlife experts.

- c) If animal intrusion is detected, measures should be taken to remove or prevent the harvest of any potentially contaminated watermelons.

### **3. Adjacent Land Use**

- a) Assess adjacent land for activities or conditions that may pose a risk to watermelon safety. Hazards may include, but not be limited to: livestock, wildlife, landfills, sewage treatment, chemical plants or other conditions that pose a food safety risk.
- b) Appropriate measures should be taken to mitigate any identified food safety hazards. These measures may include berms, fences, ditches, buffer zones or other strategies to effectively mitigate any hazards.

### **4. Water Use in the Field**

- a) Water Source
  - i. Document the source(s) of water for each field and agricultural use (e.g., irrigation, crop protection spray).
  - ii. Identify potential sources of contamination of agricultural water and its source and during distribution and holding.
  - iii. Ensure that any well used is properly designed, located, constructed and maintained in such a way as to prevent contamination.
  - iv. Allow for appropriate water treatment methods and/or identify alternate water sources to ensure water quality is consistent with appropriate standards.
  - v. Consider the potential for facilities and equipment used for holding and/or distribution of agricultural water to be a source of contamination.
- b) Microbial Monitoring
  - i. Maintain records of testing of agricultural waters.
  - ii. Any application of water to watermelons should meet the microbial standards for potable water.
  - iii. Ensure any water being utilized for irrigation is not contaminated with animal or human feces.
  - iv. Corrective actions should be established and taken if standards are not met. (i.e. locating other water sources for irrigation, treatment of water, etc.)
  - v. Establish a monitoring frequency (i.e. monthly) for water appropriate to the source and other relevant factors.
  - vi. Well and surface water tests should be completed on an established basis, documented, and include any corrective actions.

## **5. Hygienic Practices in Fields**

Ensure that production crews, visitors or other field personnel are aware of food safety risk reduction principles and that they agree to adhere to the firm's practices and policies.

- a) **Written Policies and Employee Training**
  - i. Operations should develop and implement written GAP and employee hygiene practices.
  - ii. All employees should receive mandatory safe product handling and personal hygiene education at time of hire, with periodic reinforcements, at least seasonally.
  - iii. Training sessions should be documented, with records kept of topics covered, date, names and signatures of those in attendance.
  - iv. Routine oversight and periodic self audits should be used to verify and document compliance with worker hygiene and sanitation policies and practices.
- b) **Cleanliness/Sanitation**
  - i. Sanitary facilities should be provided for all field workers and visitors during planting, harvesting or other field activities. Toilet facilities should be provided with a minimum of one per twenty employees and be readily accessible, located not more than  $\frac{1}{4}$  (0.25) mile of all employees.
  - ii. Toilet facilities should be designed, located, operated and serviced in a manner that does not pose a source of contamination of the field.
  - iii. Toilet facilities should have appropriate hand washing stations, including collection of gray water.
  - iv. Toilet facilities should be maintained in a clean and sanitary condition and properly stocked with soap, water for hand washing that meets the microbial standard for potable water, single use towels, toilet paper, etc. and a written record of cleaning should be kept.
  - v. Signage (and training) of workers is necessary in or at every toilet facility to enforce the disposal of used toilet paper in the holding tank, not on the floor or in a box / receptacle.
  - vi. Restroom cleaning equipment should be labeled and segregated so as not to pose a risk of contamination.
  - vii. Policies should require hand washing with soap and water at the appropriate time such as before starting work, after breaks, using the restrooms, sneezing or coughing.
  - viii. Soap used for hand washing should be fragrant-free.

- ix. Hand washing stations must be located outside of the toilet facility. This allows the farmer to observe the hand washing practice by employees.
  - x. Water used for hand washing needs to be fresh and not re-circulated.
- c) Health
- i. Employees, visitors and other field personnel with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses should be restricted from working with or in the vicinity of watermelons or watermelon contact surfaces.
  - ii. Employees, visitors and other field personnel with open sores, cuts, burns, boils, etc., should report to a supervisor before working or entering the field. The supervisor should determine if the employee will be allowed to work with or in the vicinity of watermelons or watermelon contact surfaces.
- d) Hygiene
- i. Employees, visitors and other field personnel should have designated areas for eating, drinking, smoking, breaks, personal effects, etc.
  - ii. There should be a written policy prohibiting eating, drinking, chewing gum, and using tobacco in fields except in clearly designated areas.
  - iii. Drinking water should be provided with either fountains or single use containers. Drinking water containers should be handled in a manner that prevents them from becoming sources of contamination.
  - iv. There should be a written policy restricting jewelry in the field.
  - v. Employees, visitors and other field personnel should wear clean and suitable outer garments. Consider, as appropriate to the operation, hair restraints, plastic aprons and sleeves, restricting nail polish or false nails, and empty pockets above the waist.
  - vi. Other good food handling techniques should be developed as appropriate to the specific operation to prevent cross contamination.

## **6. Gloves**

There continues to be scientific debate as to whether the handling of fresh foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If watermelons are handled with bare hands, documentation of hand washing procedures must be made as indicated above.

a) Disposable Gloves

- i. The use of single use disposable gloves for hand contact with watermelons is recommended.
- ii. Hands should be washed before putting on gloves.
- iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands
- iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than watermelons or when the gloves have become torn, soiled or otherwise contaminated.
- v. Vinyl gloves should be used if any gloves are used at all. Latex gloves are considered an allergen risk and should not be used.

b) Reusable Gloves

- i. Reusable gloves are not recommended for hand contact with watermelons. If gloves are used, the following requirements should apply.
- ii. The gloves should be made of materials that can be readily cleaned and sanitized.
- iii. It is the responsibility of the operation to ensure that gloves are washed in hot water ( $\geq 140^{\circ}\text{F}$ ) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves should not be permitted to be taken home by workers for cleaning and sanitizing.
- iv. Appropriately cleaned and sanitized gloves should be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than watermelons or when the gloves have become torn, soiled or otherwise contaminated.
- v. Gloves not in use should be stored appropriately.
- vi. Gloves that have come in contact with the ground or other non-food contact surfaces should be changed.

**7. Crop Production Practices**

Assess Risk of all production inputs to reduce contamination risk.

a) Chemical Fertilizers

- i. Follow manufacturer's instructions for usage and storage.

b) Fertilizers Containing Manures, Composts or Biosolids

- i. Only properly treated manures and biosolids are allowed for use in watermelon fields.

- ii. If treated manures or biosolids are used, records of composition, dates of treatment, methods utilized, application dates and any test results or process verification data demonstrating compliance with microbial standards must be documented.
- c) Pesticides (Crop Protection Treatments)
  - i. Pesticide chemicals used must comply with all requirements of EPA registration and any federal, state or local regulations.
  - ii. Pesticides must be appropriately registered for such use and must be used in accordance with label directions. Pesticide uses should be documented.
  - iii. Pesticides should be applied by trained, licensed or certified pesticide personnel, as required by regulation.
  - iv. Pesticides for foliar application should only be mixed with water that meets microbial standard for potable water. Recommendation is 126 MPN/100 ml.
- d) Chemicals Used on Product
  - i. Chemicals used on product that are not registered pesticides may be permitted for food contact use if allowed under regulations of the U.S. Food and Drug Administration (FDA).

#### **8. Equipment and Containers**

- a) Any surface or equipment intended to touch watermelons is a food contact surface and should be cleaned and sanitized at a frequency sufficient to prevent the surface from becoming a source of contamination.
- b) Reusable containers and food contact equipment and utensils should be constructed of materials that can be easily cleaned and sanitized.
- c) Clean and sanitize containers, bins, food contact equipment and utensils at least daily during use, or more often as needed, to remove sand, grit, dirt, and other residue.
- d) Establish routine cleaning and sanitizing procedures and maintain these sanitation standard operating procedures in writing.
- e) Maintain all equipment and surfaces in such a way as to minimize contamination of and injury to watermelons.
- f) All containers should be marked for their intended use (trash, etc.).
- g) A disinfectant bath for reusable gloves and knives should be available in close proximity to field toilets. None of

these utensils should be allowed into the field toilet, and should only be retrieved after washing hands.

#### **9. Record Keeping**

Appropriate record keeping provides evidence of operating conditions and practices and facilitates periodic review and evaluation of those practices.

- a) Records documenting adherence to these practices, such as those addressing environmental assessments, employee training, water usage, pest control, crop production practices, and any needed corrective actions, for the operation should be maintained and producible in a reasonable amount of time.
- b) The source of all agricultural inputs used in the production of crop (e.g., seeds, transplants, fertilizers, pesticides) should be recorded.
- c) Records must be retained for at least two years, or longer if required.

## **B. Harvest Practices**

Watermelons for harvest should have been produced according to Good Agricultural Practices and the recommendations described in the prior section on field production.

### **1. Pre-harvest Assessment**

A pre-harvest assessment provides a last opportunity to evaluate any safety risks that may impact the potential for watermelons to be contaminated. The field man, ranch manager or other responsible person should ensure that an assessment is performed prior to the beginning of harvest.

- a) Domestic animals and livestock have been excluded from fields.
- b) Wildlife presence has been minimized.
- c) If animal intrusion is detected, measures should be taken to remove or prevent the harvest of any potentially contaminated product
- d) Run-off from any animal operation has been prevented.
- e) The source of water for irrigation for each crop has been documented and criteria have been met.
- f) Procedures used to identify risks and mitigate those risks have been documented, followed and are reviewed.
- g) If watermelons are harvested at multiple times, fields should be assessed sufficiently to assure that new risk factors have not emerged.

### **2. Hygienic Practices in Fields**

Ensure that harvest contractors and crews have been trained in food safety risk reduction principles and that they agree to adhere to the firm's practices.

- a) Written Policies and Employee Training
  - i. Operations should develop and implement written GAP and Employee Hygiene Practices.
  - ii. All employees should receive mandatory safe product handling and personal hygiene education at time of hire, with periodic reinforcements, at least seasonally.
  - iii. Training sessions should be documented, with records kept of topics covered, date, names and signatures of those in attendance.
  - iv. Periodic (e.g., daily, weekly, monthly, quarterly, as appropriate) self audits should be used to verify and document compliance with worker hygiene and sanitation policies and practices.
  - v. The use of signs as training tools is recommended to support written policies and expectations.
- b) Cleanliness/Sanitation

- i. Sanitation facilities (i.e., toilet and hand washing facilities) should be provided for all field workers and visitors during harvest. Toilet facilities should be provided with a minimum of one per twenty employees and readily accessible, located not more than  $\frac{1}{4}$  (0.25) mile of all employees.
- ii. Toilet facilities should be located and serviced in a manner to not be a source of contamination to the field.
- iii. Toilet facilities should have appropriate hand washing stations.
- iv. Toilet facilities should be maintained in a clean and sanitary condition and properly stocked with soap, water for hand washing that meets the microbial standard for potable water, single use towels, toilet paper, etc. and a written record of cleaning should be kept.
- v. Restroom cleaning equipment should be labeled and segregated so as not to pose a risk of contamination.
- vi. Toilet facilities should have appropriate hand washing stations, including collection of gray water.
- vii. Policies should require hand washing with soap and water at the appropriate time such as before starting work, after breaks, using the restrooms, sneezing or coughing.
- viii. Soap for hand washing should be fragrant-free.
- ix. Hand washing stations must be located outside of the toilet facility. This allows the farmer to observe the hand washing practice by employees.
- x. Water used for hand washing needs to be fresh and not re-circulated.

c) Health

- i. Worker health policies should restrict employees with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses from working with or in the vicinity of watermelons or contact surfaces.
- ii. Employees with open sores, cuts, burns, boils, etc., should report to a supervisor before working. The supervisor should determine if the employee will be allowed to work with or in the vicinity of watermelons or contact surfaces.

d) Hygiene

- i. Employees should have designated areas for eating, drinking, smoking, breaks, personal effects, etc.

- ii. There should be a written policy prohibiting eating, drinking, chewing gum, and using tobacco in fields except in clearly designated areas.
  - iii. Drinking water should be provided with either fountains or single use containers.
  - iv. There should be a written policy restricting jewelry in the field.
  - v. Employees should wear clean and suitable outer garments. Consider, as appropriate to the operation, hair restraints, plastic aprons and sleeves, restricting nail polish or false nails, and empty pockets above the waist.
  - vi. Other good food handling techniques should be developed as appropriate to the specific operation to prevent cross contamination.
- e) Harvest crews should be trained to recognize and report any food safety risks or hazards observed during the harvest operation.

### 3. Gloves

There continues to be scientific debate as to whether the handling of fresh foods with bare hands, washed frequently, with proper hand washing procedures, is safer than the use of gloves. If watermelons are handled with bare hands, documentation of hand washing and procedures should be made as indicated above. If gloves are utilized, a procedure for glove use should be documented and followed. The following applies to all harvest operators who handle watermelons.

#### a) Disposable Gloves

- i. The use of single use disposable gloves for harvesting of watermelons is recommended
- ii. Hands should be washed before putting on gloves.
- iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
- iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than watermelons or when the gloves have become torn, soiled or otherwise contaminated.
- v. Vinyl gloves should be used if any gloves are used at all. Latex gloves are considered an allergen risk and should not be used.

#### b) Reusable Gloves

- i. Reusable gloves are not recommended for harvesting but, if used, the following requirements should apply.

- ii. The gloves must be made of materials that can be readily cleaned and sanitized.
- iii. It is the responsibility of the harvest company to ensure that gloves are washed in hot water ( $\geq 140^{\circ}\text{F}$ ) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves should not be permitted to be taken home by workers for cleaning and sanitizing.
- iv. Appropriately cleaned and sanitized gloves should be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than watermelons or when the gloves have become torn, soiled or otherwise contaminated.
- v. Gloves that have come in contact with the ground or other non-food contact surfaces must be changed.

#### 4. Equipment and Containers

- a) Any surface or equipment intended to contact watermelons is a food contact surface and should be cleaned and sanitized at a frequency sufficient to prevent the surface from becoming a source of contamination.
- b) Reusable containers and food contact equipment and utensils should be constructed of impervious materials that can be cleaned and sanitized.
- c) Any containers used to hold watermelons that are received back from a packinghouse must be checked for cleanliness prior to use.
- d) Clean and sanitize harvest containers, bins, food contact equipment and utensils at least daily during use, or more often as needed, to remove sand, grit, dirt and other residue.
- e) Establish routine cleaning and sanitizing procedures and maintain these standard operating procedures in writing.
- f) Maintain all equipment and surfaces in such a way as to minimize contamination of an injury to watermelons.
- g) Records should be maintained of cleaning procedures and their implementation, including log sheets to track inspections and program compliance.
- h) Wagons, trailers or buses used to transport watermelons from the field should be inspected for cleanliness, odors, dirt or debris daily.
- i) Discard any damaged containers that can no longer be cleaned, sanitized or used for transport or packing.

- j) A disinfectant bath for reusable gloves and knives should be available in close proximity to field toilets. None of these utensils should be allowed into the field toilet, and should only be retrieved after washing hands.

#### **5. Equipment Sanitizing Agents Used During Harvest**

- a) EPA considers any chemical making an antimicrobial claim, including those used to sanitize equipment and watermelons to be a pesticide.
- b) Sanitizing chemicals used must comply with all requirements of EPA registration and any federal, state or local regulations.
- c) Sanitizing chemicals must be appropriately registered for such use and must be used in accordance with label directions. Sanitizing chemicals uses should be documented.
- d) Chemicals used on product that are not registered pesticides may be permitted for food contact use if allowed under regulations of the U.S. Food and Drug Administration (FDA).

#### **6. Debris Removal**

Dirt, stems and leaves should be removed from watermelons to the degree practical in the field, in a manner that does not pose a risk of contamination.

#### **7. Exclusion from Harvest**

- a) Watermelons contacted by any fecal material should not be harvested.
- b) If animal intrusion is detected, measures should be taken to remove or prevent the harvest of any potentially contaminated product.
- c) Damaged, soft or decayed watermelons should be excluded to minimize microbial contamination.

#### **8. Culling, Sorting and Removal of Damaged Watermelons**

Damaged or decayed watermelons provide a potential source of contamination.

- a) Damaged, soft or decayed watermelons should be removed to minimize microbial contamination.
- b) Maintain adequate separation from market-quality harvest.
- c) Until final disposition of culls, keep cull storage and area clean and sanitary to minimize/avoid pest and rodent intrusion.

#### **9. Direct Melon-to-Ground Contact**

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

- a) If watermelons directly contact soil, careful consideration should be given to the use of soil amendments to reduce or eliminate the potential for human pathogen contamination of soil.
- b) If watermelons are turned by hand to reduce ground spot formation, carefully consider employee hygiene practices; especially hand washing and/or glove use.
- c) If watermelons directly contact soil, consideration should be given to irrigation (furrow, drip, etc.) protocols, to minimize soil wetting where watermelons contact the soil.
- d) A written plan of practices used to minimize ground spot contamination must be maintained, and all associated field activities must be documented during the growing season.
- e) If using a manure-based fertilizer application, consult specific guidelines of allowable time, etc.

#### 10. Fungicide Treatment

- a) Watermelons may be treated by aqueous spray or fungicides to extend their postharvest life. If the water used for postharvest fungicide application is contaminated with human pathogens, the watermelon surface may be contaminated with human pathogens. 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).
- b) If water based fungicides solutions are used for postharvest treatments, the water should be of sufficient microbial quality for its intended purpose.
- c) If hot water treatments are used as an alternative to postharvest chemical fungicide treatments, water temperature must be monitored and recorded, and any dip or dump tank treatments must use water at least 10 degrees F greater than the fruit pulp to prevent potential infiltration.
- d) The concentration of chemicals used to treat recycled water must be monitored and recorded, and the chemical

maintained at a level sufficient to minimize potential cross contamination in the recycled dip water.

- e) Records of fungicide applications should be kept on file and include the product, mix ratio, date and time of applications.
- f) Any fungicide product used must be EPA registered for use on Watermelons.

#### **11. Flying Insect Control**

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

- a) Consider implementing an aggressing cull disposal and waste removal program to limit field, packinghouse and cooler culls and thus reduce the potential for insect to watermelon contamination.
- b) Consider means of reducing flying insect access to animal feces and other likely sources of human pathogens. (i.e. Locate culls and refuse containers away from market-quality product storage, packaging storage and staging areas to minimize potential cross contamination from insects attracted to damaged product.

#### **12. Multiple Harvests**

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

- a) If multiple watermelon harvests from one field occur, consideration should be given to reduce the potential for contamination within the field that will be harvested in the future.
- b) Harvest employees should be trained to recognize and not harvest watermelons that have damage or possible contamination from previous harvest operations.
- c) Dispose of cull watermelons promptly in a manner to minimize potential contamination of sound product either directly or via cross contamination from pests or rodents.

#### **13. Record Keeping and Traceability**

Record keeping provides evidence of reviews and evaluations to document those practices. Records should also be kept to assure traceability of harvested watermelons.

- a) Records documenting adherence to these practices, such as those addressing pre-harvest assessments, employee training, for the operation should be

maintained and producible in a reasonable amount of time

- b) Traceability practices should be utilized and ensure that all watermelons are traceable to their origin at least one step forward and one step back
- c) Records must be retained for at least two years, or as required by regulation

### **G. Packinghouse**

Whatever was done to keep watermelons safe during harvesting and transportation to the packing house can be undone in the packing house. A well designed and managed packinghouse and food safety program can greatly reduce the risk of chemical, physical and microbial contamination but the risk can never be totally eliminated. Poor or inconsistent food safety practices can greatly increase the risk. Sanitary conditions and proper food safety practices are critical to product safety.

The needs of each packinghouse may vary due to location, environment, the volume of watermelons handled, the type of watermelons handled, local regulations and many other variables but the overall goal of any effective packinghouse food safety program is to minimize risk of contamination. There may be multiple strategies for effectively dealing with individual hazards.

The general requirements for the packing of watermelons are that facilities should meet the requirements for packinghouse and grounds, processing, packing, holding and retailing of foods, equipment and utensils, sanitary facilities and controls, sanitary operations and processes and controls as appropriate to the facility. This should extend to all aspects of the packinghouse.

#### **1. Grounds**

- a) The grounds about a packinghouse under the control of the operator should be kept in a condition that will protect against contamination of watermelons. The methods for adequate maintenance of grounds include, but are not limited to:
  - i. Properly storing equipment, removing litter and waste, and cutting weeds or grass within the immediate vicinity of the plant buildings or structures that may constitute an attractant, breeding place, or harborage for pests.
  - ii. Maintaining roads, yards, and parking lots so that they do not constitute a source of contamination in areas where watermelons are exposed.
  - iii. Adequately draining areas that may contribute contamination to food by seepage, foot-borne filth, or providing a breeding place for pests.
  - iv. Operating systems for waste treatment and disposal in an adequate manner so that they do not constitute a source of contamination in areas where watermelons are exposed.

- b) If the packinghouse grounds are bordered by grounds not under the operator's control and not maintained in the manner described in paragraph (a) (i) through (iii) of this section, care should be exercised in the packinghouse by inspection, extermination, or other means to exclude pests, dirt, and filth that may be a source of food contamination.
- c) It is recommended that the land adjacent to the packinghouse should not be a significant source of contamination. Hazards may include but not be limited to livestock, wildlife, landfills, chemical plants, etc.
- d) Appropriate measures should be taken to minimize any food safety hazards from surrounding land use or environment. These measures may include berms, fences, ditches, buffer zones or other strategies to effectively mitigate any hazards. Records should be kept of the measures used.

## **2. General Maintenance**

- a) Buildings, fixtures and other physical facilities of the packinghouse should be maintained in a clean and sanitary condition and should be kept in repair sufficient to prevent food from becoming adulterated. Cleaning and sanitizing of utensils and equipment should be conducted in a manner that protects against contamination of food, food contact surfaces or packaging materials.
- b) Establish Sanitation Standard Operating Procedures (SSOPs) related to the general cleaning and sanitation of the facility, including maintenance of dump tanks, bump pads, rollers and other equipment to minimize damage to watermelons. While a cleaning schedule is part of SSOPs, the volume of watermelons handled may require more frequent attention to cleaning. Minor surface injuries such as abrasions that might not result in the culling of watermelon could promote survival of pathogens.
- c) Cleaning compounds, sanitizers, pesticides and all other chemicals should be labeled, handled and stored in a manner that does not pose a risk of contamination to food, food-contact surfaces, or food packaging materials. Food-grade and non-food grade chemicals should be kept separate in order to minimize the risk of accidentally substituting one for the other. These products should be used in accordance with manufacturers' label instructions

and all federal, state and local regulations must be followed.

d) Pest control

Rodents, birds, amphibians (e.g., tree frogs), reptiles and other facility pests.

- i. A written and implemented pest control program should be in place to protect the packinghouse from pests.
- ii. The use of insecticides or rodenticides is permitted only under precautions and restrictions that will protect against the contamination of food, food-contact surfaces, and food packaging materials.
- iii. No domestic animals or other animals are permitted in areas where watermelons are packed, handled or stored.
- iv. Standards for the number of bait stations or traps varies by third party audit companies and by the individual payout and size of your packing shed. Please consult with your auditor to determine your needs. The performance standard (rule of thumb) should be to have enough traps and stations to effectively prevent intrusion.
- v. Detailed pesticide storage policies, MSDS records, copies of chemical labels, a copy of the PCO's license, and records of specific pesticide uses are all typical requirements in the food industry, and should be kept up to date.

e) Sanitation of food-contact surfaces

- i. All food-contact surfaces, including utensils and food-contact surfaces of equipment should be cleaned and sanitized in keeping with an established, documented sanitation standard operating procedure (SSOP) to protect against contamination of watermelons.
- ii. Non-food-contact surfaces should be cleaned and sanitized in accordance to the facility's SSOP or more frequently if necessary to protect watermelons from contamination.
- iii. Single-service articles (such as utensils intended for one-time use, paper cups, and paper towels) should be stored in appropriate containers and should be handled, dispensed, used and disposed of in a manner that protects against contamination of food or food-contact surfaces.
- iv. Sanitizing products should be registered for their intended use and cleaning and sanitizing products used according to manufacturers' label instructions.

- f) Cleaned and sanitized portable equipment with food-contact surfaces and utensils should be stored in a location and manner that protects food-contact surfaces from contamination.

### **3. Water Supply and Plumbing**

- a) The water supply should be sufficient for the operations intended and should be derived from an adequate source. Any water that contacts food or food-contact surfaces, intended or unintended, should meet the microbial standards as set forth by the U.S. Environmental Protection Agency for drinking water.
- b) Running water should be available at suitable temperature and volume where it is needed for packing, cleaning, sanitation, and employee hygiene.
- c) Reusing wash water may result in the build-up of microbial loads, including pathogens. Consider practices that will ensure and maintain potable water quality.
- d) Plumbing should be of adequate size and design and adequately installed and maintained to:
  - i. Supply sufficient quantities of water to required locations throughout the packinghouse.
  - ii. Properly convey sewage and liquid disposable waste from the packinghouse in a manner that does not pose a risk of contamination to food, water supplies, equipment, or utensils or create an unsanitary condition.
  - iii. Provide adequate floor drainage in all areas where floors are subject to flooding-type cleaning or where normal operations release or discharge water or other liquid waste on the floor.
  - iv. Protect against backflow from, or cross-connection between, piping systems that discharge wastewater or sewage and piping systems that carry water for food or food manufacturing. Appropriate backflow prevention devices (e.g., air gaps, backflow valves) should be used to protect water quality at the source and during distribution and use.
- e) Sewage should be properly disposed into appropriate sewer, septic or alternative systems that do not pose a risk of contamination.

### **4. Trash and Watermelon Waste Disposal**

Trash and watermelon waste should be handled, stored and disposed in a manner that minimizes odors, minimizes the potential for attracting or harboring pests and minimizes the risk of

contamination of watermelons contact surfaces, and water supplies.

#### 5. Receiving

- a) Ensure watermelons are from suppliers following Good Agricultural Practices or other recognized, similar food safety requirements and these guidelines.
- b) Establish a written procedure for inspecting, accepting or rejecting incoming loads.
- c) Ensure that incoming documentation provides sufficient information to facilitate traceability to the source.
- d) Records of incoming inspections should be maintained.

#### 6. Packinghouse Melon Operations

Melons may be unloaded from field bins, open flat bed wagons, busses or gondolas by hand-to-belt or water dump operations. Watermelons may also be unloaded out of gondolas by placing gondolas into water filled sumps that allow watermelons to float out of the gondolas. In this operation there is the potential for watermelon to watermelon food contact surface to watermelon and watermelon to water to watermelon cross contamination.

- a) If hand-to-belt is used, watermelon food contact surfaces, including padding materials, should be constructed of materials that can be cleaned and sanitized.
- b) If hand-to-belt is 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.
- c) Handling equipment should be cleaned and sanitized regularly with documentation to support those activities.
- d) Consideration should be given to alternative means of watermelon removal from harvest vehicles by means other than immersion of the gondolas/trailers/wagons to reduce potential product cross contamination with road debris.
- e) 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 watermelons but rather to prevent the water from becoming contaminated should pathogens be introduced into the water from watermelons. The contaminated water could then act as a source of contamination of incoming watermelons.

- f) Water temperature in the dump tank must be at least 10 degrees F greater than the temperature of the watermelon pulp coming into the tank.
- g) Chemical sanitizers used in the dump tank must be EPA registered and used according to the label.
- h) Dump tank water temperatures and parameters impacting sanitizer efficacy (such as concentration and pH) must be monitored and documented.

#### **7. Packaging Materials**

- a) Packaging material should be inspected upon arrival. The goal is to ensure that packaging material is free from contamination upon arrival and that materials are stored in a means as to prevent contamination.
- b) The packinghouse should minimize the risk of contamination by adopting written plans that address each of the following issues;
  - i. All packaging material is inspected upon arrival, stored in a clean manner.
  - ii. Pallets used to keep finished product off the floor are visually clean.
  - iii. Bins, trays, and pallets are maintained in clean operational condition according to SSOPs.
  - iv. Bins, cartons and pallets are stored in a secure, clean location
  - v. Finished produce containers are distinguished from those serving other purposes.
  - vi. There is no evidence of rodent, bird or insect infestations in the storage locations.

#### **8. Postharvest Washing of Watermelons**

Water quality, both in the field and at the packinghouse, is a critical issue for achieving and maintaining safety. When watermelons are washed, the quality of post harvest water that contacts fresh produce during postharvest flume transport, cleaning, grading and surface treatment application is widely recognized as an essential pathogen control point for fresh produce.

##### **a) Water Quality**

Packinghouses should follow Good Manufacturing Practices (GMPs) to ensure that all water is of adequate quality throughout all packing operations from start-up to the last packed unit. Water used in post-harvest operations must be changed as necessary for the given operation.

- i. Follow GMPs to ensure that all water is of adequate quality at start-up and throughout all packing operations.
  - ii. Documentation of microbial test results for the source water should be maintained available for inspection within a reasonable amount of time.
  - iii. The dump tank should be cleaned and the water changed daily and more often as needed.
  - iv. Untreated surface waters are not permitted for any uses in packinghouses or other postharvest contact.
- b) Water Quality Requirements

- i. The water used for washing watermelons should be of microbial quality equivalent to potable water and have sufficient sanitizer to prevent cross contamination. The water antimicrobial should be monitored at a frequency sufficient to maintain sanitary conditions.

c) Temperature and Disinfection of Water Supplies Used in Postharvest Applications

Internalization of bacteria into the stem has been suggested with watermelons submerged in water that is cooler in temperature than the pulp of the watermelon. When the watermelon cools, a vacuum is created causing water, and potentially pathogens, to be drawn into pores on the watermelon. Therefore, water temperature relative to pulp temperature, and water quality, are critical considerations for maintaining the safety of the product.

- i. Dump tank or dip tank water temperature should be maintained at least 10°F warmer than the temperature of the watermelon pulp. Water temperature should be monitored at least hourly.
- ii. If water quality maintenance is based on manually monitoring chlorine levels, then free chlorine and pH must be monitored at least at start-up and every hour thereafter and recorded. Total chlorine measurements do not accurately represent antimicrobial effectiveness. It is critical that pH be maintained in the range of 6.5 – 7.5 to ensure that chlorine is effective. Measuring devices must have sufficient precision to ensure levels are within established limits and accuracy should be verified periodically.
- iii. Other water disinfectants may be used, but must be registered with EPA for its intended purposes. If water quality maintenance is based on other water

disinfectant treatments, follow manufacturer recommendations for monitoring and limits.

- iv. When monitoring oxidant concentrations electronically, the monitoring should be verified against a chemical test that measures disinfectant levels (and pH where applicable) at start-up and at least every 2 hours thereafter, and recorded. If water quality maintenance is based on Oxidation Reduction Potential (ORP), maintain an ORP of at least 650 mV.
- v. If water quality maintenance is based on Oxidation Reduction Potential (ORP), maintain an ORP of at least 650 mV.
- vi. Electronic monitoring devices should be calibrated at a frequency sufficient to ensure continuous accuracy.
- d) No report observing this phenomena in watermelons has been published to date. However, it has been in other commodities and is hypothesized in watermelons.
- e) **Removal of Injured/Damaged Watermelons**  
Establish procedures to identify and remove injured and damaged watermelons to reduce microbial contamination. To the degree possible, damaged, soft or decayed watermelons should be removed whenever detected in order to minimize microbial contamination.

#### **9. Employee Hygiene, Written Policies and Employee Training**

- a) Facilities should develop and implement written GMP and Employee Hygiene Practices
- b) All employees should receive mandatory safe product handling and personal hygiene education at time of hire and at least annually.
- c) Training sessions should be documented, with records kept of topics covered, date, names and signatures of those in attendance.
- d) Periodic (e.g., daily, weekly, monthly, quarterly, as appropriate) self audits should be used to verify and document compliance with worker hygiene and sanitation policies and practices.

#### **10. Hand washing and Toilet Facilities**

- a) Restrooms should be available to all personnel (at least one toilet for every 20 employees) and located in proximity to food handling areas, but not so close that they could be a source of contamination. Restrooms should not open directly into food handling areas. Restrooms that do open directly into food handling areas

- should be equipped with self-closing mechanisms or have a maze-type entrance/exit.
- b) Toilet facilities should be maintained in a clean and sanitary condition and adequately stocked with soap, water for hand washing that meets the microbial standard for potable water (including hot water where available), single use towels, toilet paper, etc.
  - c) A written record of cleaning should be kept.
  - d) Restroom cleaning equipment should be labeled and segregated so as not to pose a risk of contamination.
  - e) Hand washing signs should be posted in restrooms. Signs should be multi-lingual or pictorial, as appropriate to the workforce.
  - f) Other hand washing facilities should be adequate in number and location, and be furnished with running water at a suitable temperature. Compliance with this requirement may be accomplished by providing:
    - i. Hand washing and, where appropriate, hand sanitizing facilities at each location where good sanitary practices require their use
    - ii. Soap and water for hand washing that meets the microbial standard for potable water (including hot water where available).
    - iii. Single use towels or air drying devices.
    - iv. Hand washing signs should be posted at all stations. Signs should be multi-lingual or pictorial, as appropriate to the workforce.
    - v. Refuse receptacles that are constructed and maintained in a manner that protects against contamination of food.
    - vi. Sanitizers may not be used in lieu of proper hand washing.
    - vii. Provisions should be in place for capture, disposal or drainage of gray water in a manner that prevents contamination of the environment.
    - viii. Soap for hand washing should be fragrant-free.
    - ix. Hand washing stations must be located outside of the packing area, regularly inspected and observed by management for compliance with established hand washing practices.
    - x. Water used for hand washing must be fresh and not re-circulated.

#### 11. Hand washing Practices

- a) Written policies should require hand washing with soap and water at the appropriate time such as before starting

work, after breaks, visiting the locker rooms, using the restrooms, sneezing, coughing, touching any unsanitary surface or material or anytime hands become soiled.

- b) If gloves are used when contacting watermelons or food contact surfaces, polices should clearly communicate that gloves are not a replacement for good hand washing practices, and that single use gloves must be replaced and reusable gloves must be washed and sanitized whenever they become soiled.
- c) The use of signs as training tools is recommended to support written policies and expectations.
- d) Management should observe worker practices for compliance on a continuous basis.

## **12. Health Policies**

- a) Worker health policies should restrict employees with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses from working with or in the vicinity of watermelons or watermelon contact surfaces.
- b) Employees with open sores, cuts, burns, boils, etc., should report to a supervisor before working. The supervisor should determine if the employee will be allowed to work with or in the vicinity of watermelons or watermelon contact surfaces.
- c) Establish and communicate a clear policy that prohibits workers who report or are observed to have diarrhea or symptoms of illness from activities that may contact watermelons or watermelon contact surfaces.
- d) If at all possible, and to discourage the concealment of illness or injury, employers should try to offer alternate means of employ during illness or injury.

## **13. Other Hygienic Practices**

- a) Employees should have designated areas for eating, drinking, smoking, breaks, personal effects, etc.
- b) There should be a written policy prohibiting eating, drinking, chewing gum and using tobacco in fields or facilities except in clearly designated areas.
- c) Drinking water should be provided with either fountains or single use containers. Drinking water containers should be handled in a manner that prevents them from becoming sources of contamination.
- d) There should be a written policy restricting jewelry in the workplace.
- e) Employees should wear clean and suitable outer garments. Consider, as appropriate to the operation, hair

- restraints, plastic aprons and sleeves, restricting nail polish or false nails, and empty pockets above the waist.
- f) Outer garments and gloves should be changed after cleaning drains, restrooms or other activities that may result in contamination.
  - g) Other good food handling techniques should be developed as appropriate to the specific operation to prevent cross contamination.

#### 14. Gloves

There continues to be scientific debate as to whether the handling of fresh foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If watermelons are handled with bare hands, documentation of hand washing procedures must be made as indicated above. If gloves are utilized, a procedure for glove use should be documented and followed. The following applies to all operators who handle watermelons in the packinghouse.

##### a) Disposable Gloves

- i. The use of single use disposable gloves for hand contact with watermelons is recommended.
- ii. Hands should be washed before putting on gloves.
- iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
- iv. Disposable gloves should be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than watermelons or when the gloves have become torn, soiled or otherwise contaminated.
- v. Vinyl gloves should be used if any gloves are used at all. Latex gloves are considered an allergen risk and should not be used.

##### b) Reusable Gloves

- i. Reusable gloves are not recommended for hand contact with watermelons but, if used, the following requirements should apply.
- ii. The gloves must be made of materials that can be readily cleaned and sanitized.
- iii. It is the responsibility of the production company to ensure that gloves are washed in hot water ( $\geq 140^{\circ}\text{F}$ ) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves should not be permitted to be taken home by workers for cleaning and sanitizing.
- iv. Appropriately cleaned and sanitized gloves should be issued each day and at such times as needed during

the day. Reusable gloves should be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than watermelons or when the gloves have become torn, soiled or otherwise contaminated.

- v. Gloves that have come in contact with the ground or other non-food contact surfaces should be changed.

#### **15. Storage and Distribution Facilities**

- a) Storage and distribution facilities should be kept clean and sanitary, with debris minimized. All walls, floors, ceilings and other surfaces should be systematically and periodically cleaned and sanitized to avoid the build-up of mold or other potential contaminants.
- b) Product should be palletized to avoid direct contact with the floor.
- c) A perimeter between pallets and walls should be maintained to facilitate visual inspection of pest control and sanitation
- d) Product on hold or rejected, should be clearly identified and segregated from other product.
- e) There should be no storage of trash or waste in the storage areas, staging areas or cooler.

#### **16. Packinghouse Sanitation**

Packinghouse sanitation programs are critical to assuring that watermelons being shipped out are handled with the best possible safe handling practices available. Field equipment and packinghouse operations may only be used seasonally and be dormant for many months, leaving them susceptible to pest infestations.

- a) Reusable Gloves
  - i. Reusable gloves are not recommended for hand contact with watermelons but, if used, the following requirements should apply.
  - ii. The gloves must be made of materials that can be readily cleaned and sanitized.
- b) Operators should develop a written cleaning and sanitization program as part of the facility's Standard Sanitation Operating Procedure (SSOP). The plan should include a master cleaning schedule that details procedures and frequency of those activities. The SSOP should include the entire facility. Operators should maintain written records (i.e. log sheets) that verify the cleaning and sanitation procedures are

being followed and completed in compliance with the written plan.

- i. Equipment that comes in direct contact with watermelons must be cleaned and sanitized prior to its first use of the season.
- ii. Removal of all physical debris from equipment and surrounding area. This includes and fruit, vines or other debris that may be in the equipment.
- iii. Equipment should be rinsed while belts, rollers, and brushes are operational to aid in physical removal of small loose debris and soil.
- iv. If cleaning compounds are used, they should be applied to all food contact surfaces according to manufacturer instructions for contact time and concentration. Cleaning products must not be allowed to dry on to equipment, and should be rinsed thoroughly from equipment surfaces after the desired contact time, in accordance with manufacturer instructions. Any items used to manually scrub equipment and surfaces should be dedicated to that activity and stored appropriately so they are not mixed with cleaning supplies and materials used for floors, bathrooms, etc.
- v. A final sanitizing spray should be applied to equipment while equipment is operational to ensure adequate contact with all surfaces. Equipment sanitizers must be registered with the EPA and the state in which they are used. Use products according to label instructions.
- vi. Be certain to note whether the sanitizer does or does not require a rinse when applied to food contact equipment surfaces. Verify sanitizer concentration after mixing and prior to use.

#### **17. Transportation**

- a) Transportation vehicles should be sufficiently clean so as not to be a source of contamination.
- b) Inspect transportation vehicles for cleanliness, odors, visible dirt and debris before loading. If needed, the vehicle should be cleaned and sanitized by a documented procedure prior to loading.
- c) If non-dedicated vehicles are used for transportation, verify records of prior loads. Should there be any doubt as to previous loads transported or a potential risk from microbial contamination, such as from raw animal proteins, garbage or other refuse, then the vehicle should

be cleaned and sanitized by a documented procedure prior to use.

#### **18. Temperature**

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

- a) 10° – 15°C (50° – 59°F) Watermelon

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

#### **19. Packinghouse General Housekeeping**

- a) Food-grade approved lubricants should be used in areas where lubricating agents may come into contact with the watermelons. In some cases, operators will use food-grade lubricants on motors that are located over the flow zone and non-food-grade lubricants in other areas. Lubricants such as WD-40, Liquid Wrench, etc. used in other parts of the packing area are not acceptable in areas that come in contact with the watermelons.
- b) Food-grade and non-food-grade lubricants/chemicals should be stored separately either in separate rooms or clearly segregated within the same room. The intent is that the two are sufficiently separated and prominently marked in order to prevent misuse or cross contamination.

#### **20. Microbial Reduction**

The best way to reduce pathogens is to keep them off the watermelons in the first place. Once a watermelon is contaminated, it is very easy for this contamination to be transferred to other produce during the packing process. This makes it critical that the water used to wash, move or disinfect is monitored closely. There are several antimicrobial chemicals labeled to treat water in the packing operation. The effectiveness of these agents depends on the chemical, physical state, treatment conditions (water temperature, pH and contact time), resistance of the pathogen and watermelon surface. Some of the products used are chlorine dioxide, ozone, peracetic acid and hydrogen dioxide. There are other products under investigation which will be available in the future. Select the product which will fit best for the packinghouse operation.

- a) No matter which method is used to disinfect water, the system must be monitored manually. Growers who have an automated system think there is no need to check it on a regular basis. This is not true. For example, chlorine levels, pH and contact time should be checked manually each hour. The procedure used to disinfect the water along with logs should be included in the Grower's Standard Operating Procedures Manual. If an outside firm is employed to handle the disinfection system, their logs should be available for review.
- b) The use of antimicrobial chemicals must be documented, and the level of these compounds used in the treatment of watermelons or equipment must be monitored and verified through written records. Any product used for reducing microorganisms on produce or equipment surfaces must be registered with the EPA and state, and labeled for the intended use.

#### **21. Cleaning Materials Including Cloths**

If materials, such as cloths, are used repeatedly for cleaning watermelons, special steps should be taken to ensure they do not become a source of direct or cross contamination.

- a) Firms repacking must have a written policy for the use and sanitization of cloths used for cleaning watermelons.
- b) If cloths are moistened to facilitate cleaning, only single use, potable water should be used. Cloths should not be moistened by repeated immersion in a bucket.
- c) Cleaning cloths should be replaced after each box packed.
- d) Cloths should be washed in hot water ( $\geq 140^{\circ}\text{F}$ ) and sanitized by the firm before reuse following a procedure validated to eliminate any potential contamination of public health concern. Cloths should not be permitted to be taken home by workers for cleaning and sanitizing.
- e) Documentation of the training of workers in appropriate use of cloths for cleaning should be available.

#### **22. Record Keeping, Product Labeling and Traceability**

All levels of the watermelon supply chain should maintain adequate traceability to a minimum of one step forward (immediate next recipient) and one step back (immediate previous supplier).

- a) Documentation maintained by the packinghouse should include sufficient information about the source (i.e., production location, lot identification, personnel/crew involved in the harvesting) as well as the customer

receiving the product to allow for the appropriate tracing of product

- b) The packer should have established procedures to ensure that traceability information about the source is retained with product as it moves through the packinghouse process to shipping.
- c) Corrugated containers should be new and accurately labeled with commodity name, packinghouse firm name and lot identification sufficient to allow for accurate traceability.
- d) Only containers able to be cleaned and sanitized (e.g., reusable plastic containers, "RPCs") may be reused. If using reusable containers, they should be cleaned and sanitized before reuse. Ensure that labels are accurate prior to reusing for packing.
- e) A documented recall program, including a traceability system to track watermelons forward to customers, should be developed and tested at least annually. A record of this test should be kept on file.
- f) All records recommended in this section should be maintained for at least two years and be readily available.

#### **D. Repacking and Other Distribution Operations**

Everyone in the supply chain that handles watermelons, including repackers, terminal markets and other facilities, has a responsibility to ensure and maintain the safety and traceability of the product.

##### **1. Prerequisites for Repacking of Watermelons**

- a) Repacking of watermelons should meet all requirements included in this document in Section C – Packinghouse, including receiving, water supply and plumbing, trash and watermelon waste disposal, general maintenance, packaging material requirements, postharvest handling of fresh watermelons, employee hygiene, written policies and employee training, hand washing and toilet facilities, hand washing practices, health policies, other hygienic practices, gloves, storage, product labeling/traceability and transportation, in addition to the requirements further detailed in this section on repacking.

##### **2. Traceability, Lot Identification**

All levels of the watermelon supply chain should maintain adequate traceability to a minimum of one step forward (immediate next recipient) and one step back (immediate previous supplier). In addition to requirements described in Section C – Packinghouse, repacking operations should:

- a) Establish procedures to maintain lot identify of watermelons throughout the repacking process
  - i. Documentation maintained by the re-packer for each lot received should include sufficient information about the source (i.e., production location supplier identification, lot identification) as well as the customer receiving the product to allow for the appropriate tracing of product.
  - ii. Ensure that the information is retained with product as it moves through the packinghouse process to shipping.
  - iii. It is preferred that incoming lots are not mixed/comingled during repacking. However, if incoming lots are mixed/comingled, then documentation should be maintained to identify all included sources.
  - iv. Traceability records should be readily available.
  - v. Effectiveness of these procedures should be tested at least annually. A record of this test should be kept on file.

- b) If watermelon lots are not mixed/commingled, then watermelons may be repacked into their original boxes. When original containers of a packinghouse supplier are to be reused, and the watermelons are removed and resorted, and returned to that clean and sanitary container the re-packer must label the container as being repacked, the commodity, re-packer name and provide lot identification.
- c) If watermelon lots are commingled, then watermelons should be repacked into new boxes that are clean and sanitary and accurately labeled with the re-packer's information and lot identification that maintains the integrity of traceability information to the included sources. In the event of a recall, all lots in the commingled lot are affected.
- d) Used boxes may only be used as secondary shipping containers, provided that the original identification information on the box has been obliterated or otherwise made clear that it is no longer accurate. Used boxes may only be used as primary containers for mixed/commingled lots if they are clean, sanitary and the original identification information on the box is still accurate to the original source of all of the watermelons in the box or bin.

### **3. Cross-docking and Terminal Markets**

- a) Watermelon handling at facilities that primarily redistribute watermelons, whether or not they repack, sort or otherwise change the contents in the container, are also required to follow the recommendations in these guidelines, as appropriate to their specific operation.

### **4. Receiving Whole Watermelons**

- a) Establish written procedures for inspecting, accepting or rejecting incoming loads. Procedures should include the condition of transportation vehicles as well as incoming product requirements.
- b) Ensure that incoming documentation provides sufficient information to facilitate traceability to the immediate prior supplier.
- c) Records of incoming inspections should be maintained.

## **E. Foodservice and Retail**

### **1. Purchasing**

- a) Ensure watermelons are from suppliers following Good Agricultural Practices and/or Good Handling Practices, as appropriate, or other recognized, similar food safety requirements, and these guidelines. Practices can be verified through documented self-inspections, audits done by qualified government or private sector food safety auditors and/or other appropriate mechanism of assurance.

### **2. Receiving Whole Watermelons**

- d) Establish written procedures for inspecting, accepting or rejecting incoming loads. Procedures should include the condition of transportation vehicles as well as incoming product requirements.
- e) Ensure that incoming documentation provides sufficient information to facilitate traceability to the immediate prior supplier.
- f) Records of incoming inspections should be maintained.

### **3. Storage – Whole Watermelons**

- a) Whole watermelons should be maintained at the temperature recommended for the variety and the particular stage of ripening.
- b) Watermelons should be raised off the floor and stored in a manner to prevent cross contamination from other products, chemicals or unsanitary conditions.

### **4. Facility Sanitation**

- a) Sanitation of retail and foodservice facilities should be in compliance with the current edition of the pertinent federal, state or local Food Code.

### **5. Employee Health and Hygiene**

- a) Employee health and hygiene policies and practices at retail and foodservice facilities should be in compliance with the current edition of the pertinent federal, state or local Food Code.

### **6. Preparation within Foodservice/Retail Establishments**

- a) Facility
  - i. A facility processing watermelons should be designed consistent with the current edition of the Food Code

and appropriate state and local regulations, including but not limited to:

- a. Floors, walls and ceilings that can be effectively cleaned and sanitized.
  - b. Closing external doors and windows.
  - c. Water that is adequate and suitable for product and product contact surfaces
  - d. Sufficient hot water for intended use.
  - e. Adequate storing of cleaning and sanitizing chemicals and supplies to prevent cross contamination.
  - f. Adequate hand wash facilities
  - g. Adequate provisions to wash, sanitize and dry equipment and utensils.
  - h. Maintain an effective pest control program with no signs of insect or rodent activity.
- b) Equipment
- i. When preparing or further handling watermelons at retail, or food-service operations, follow the Food Code or state/local requirements regarding facilities and equipment, temperature control, cleaning and sanitizing, and personal Hygiene.
  - ii. Equipment and utensils used to process watermelons should be designed for that purpose. Equipment should be easily cleaned, free from damage that prevents proper cleaning, and stored in a manner that will not contribute to product contamination. Examples of equipment include but are not limited to:
    - a. Cutting boards
    - b. Thermometers
    - c. Utensils
    - d. Disposable gloves
    - e. Safety gloves
    - f. Finished product containers
- c) Employees preparing cut watermelons should adhere to safe food handling practices as directed by the most current edition of the Food Code. Employees should:
- i. Be adequately trained in safe food handling procedures.
  - ii. Be free from symptoms or diagnosed transmissible diseases as defined within the most current edition of the Food Code.
  - iii. Implement and practice good hand washing procedures, such as at the start of the shift, after breaks, visiting restrooms, sneezing, coughing,

- handling trash or money, or anytime hands become soiled.
- iv. Do not allow food, drink or tobacco products in the food preparation, cleaning or storage areas except as permitted by the Food Code or state/local requirements.
  - v. Wear clean uniform and / or outer clothing.
  - vi. Minimize bare hand contact with watermelon to be sold as ready-to-eat. Options may include clean and sanitary utensils or disposable gloves.
  - vii. Utilize hair and beard nets when appropriate.
  - viii. Practice good retail practices and food handling techniques to prevent cross contamination.

## **7. Gloves**

There continues to be scientific debate as to whether the handling of fresh foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If watermelons are handled with bare hands, documentation of hand washing procedures should be made as indicated above. If gloves are utilized, a procedure for glove use should be documented and followed. The following applies to all food service/retail operators who handle watermelons.

### **a) Disposable Gloves**

- i. The use of single use disposable gloves for hand contact with watermelons is recommended.
- ii. Hands should be washed before putting on gloves.
- iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
- iv. Disposable gloves should be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than watermelons or when the gloves have become torn, soiled or otherwise contaminated.
- v. Vinyl gloves should be used if any gloves are used at all. Latex gloves are considered an allergen risk and should not be used.

### **b) Reusable Gloves**

- i. Reusable gloves are not authorized for hand contact of ready-to-eat watermelons at food service / retail operations. When gloves are utilized, only single use, disposable gloves should be worn.

## **8. Washing and Culling**

To prevent exterior microorganisms from infiltrating the interior of the watermelon during washing in a dunk or dip tank, ensure the

wash temperature is at least 10°F warmer than the internal watermelon temperature.

- a) To prevent the growth of bacteria during the cutting, slicing or dicing operation, the following precautions should be taken:
  - ii. Whole watermelons should be free of obvious signs of filth, and skin damage such as punctures, cuts or breaks.
- b) Washing watermelons before cutting should be performed by either:
  - i. Continuous running water or
  - ii. If chemicals are used to wash watermelons, they must be used according to the manufacturer's label instructions for recommended concentration and contact time.
  - iii. Soaking watermelons or storing them in standing water is not recommended.

#### **9. Storing Cut/Sliced/Diced or Repackaged Watermelons**

- a) After cutting, watermelons should be chilled to and maintained at  $\leq 41^{\circ}\text{F}$  as recommended in the Food Code.
- b) Cut watermelons must be stored in a covered container and above other items that may cause contamination.
- c) Watermelons must be stored off the floor in a manner to prevent cross contamination from raw food products or unsanitary conditions.
- d) Cut watermelons that are held longer than 24 hours must indicate the date or day by which the food should be consumed on the premises, sold or discarded.

#### **10. Displaying Cut Watermelons for the End Consumer**

- a) Maintain cut watermelons at  $\leq 41^{\circ}\text{F}$  during display.
- b) If time only is used as a public health control and allowed by your licensing regulatory authority, written procedures should be prepared in advance, maintained in the food establishment and made available to the regulatory authority upon request. Refer to the current edition of the Food Code for details of displaying cut/sliced watermelon without temperature control.

#### **11. Displaying Whole Watermelons for the End Consumer**

- a) Whole watermelons should be free of obvious signs of filth and skin damage such as punctures, cuts or breaks.

#### **12. Traceability and Record Keeping**

- a) All levels of the watermelon supply chain should maintain traceability consistent with at least one step forward and one step backward, and follow record keeping requirements. Distributors to direct-to-consumer retail and foodservice operations should maintain purchase records that will facilitate traceability.
- b) Each facility's ability to comply with the above (12.a) should be verified at least annually. A record of this verification should be kept on file.
- c) All records recommended in this section should be maintained for at least two years and be readily available.
- d) Recognizing that watermelons may be commingled in a display, in the event of a recall, all lots in the commingled lot could be affected.

# Wild Animal Management

Growers should be aware that many human pathogens are also carried by wild animals. Transmission of E.coli o157:H7 has been documented in several wild animals, including rodents, deer, geese and even flies. While it is unreasonable to expect complete wild animal exclusion in the field and packinghouse, active controls and deterrents should be used wherever possible. Farm ponds can be a particular draw to these animals, requiring extra diligence, especially if you are using this water for irrigation. In packinghouses and produce wash areas, implement active animal monitoring and control practices. All good agricultural practices used in the field can be quickly reversed by poor animal control and lack of sanitation programs in the packinghouse.

This section is meant to highlight good agricultural practices that can be used to limit the risks created by wild animals. For example, screen doors and windows, seal cracks and trap rodents and other pests in the packing house. Keep garbage cans covered at all times. In addition, deter birds from roosting on overhead beams or structures in packing areas. Protect packing material from animals that might be looking for nesting, roosting or hiding places. Avoid storing boxes and finished products against the walls. Allow at least 18 inches of clearance between pallets and the wall, as well as between every other pallet to maintain rodent control programs. In the field, remove brush that provides cover for wild animals and attempt to prevent irrigation ponds from becoming home to flocks of birds. By developing a regular schedule for monitoring and recording your efforts to reduce wild animals in your fields and packing areas, you will be able to determine which strategies are most effective at controlling wild animals and reducing microbial risks. An active and monitored pest control program will help reduce the likelihood of pest infestations.