



DRAFT TANZANIA STANDARD

Code of hygienic practices for melons

DRAFT FOR STAKEHOLDERS' COMMENTS

TANZANIA BUREAU OF STANDARDS

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0 Foreword

Melons, such as cantaloupe, watermelon, and honeydew, are often consumed alone, mixed with other foods in salads and other dishes and as garnishes. They are popular in meals and as snacks, and in some countries melons are a regular part of the diet. In recent years there has been a focus on marketing not only whole melons, but pre-cut products, convenience products in packages, or in salad bars to appeal to consumers.

Like other fresh fruits and vegetables that are eaten raw, the safety of melon products depends on maintaining Good Hygienic Practices along the food chain during primary production, packaging, processing, retail, and at the point of consumption. As fresh and pre-cut melon products move through the food chain, there is also the potential for the introduction, growth and survival of foodborne pathogens due to cross contamination (arising from poor hygienic practices for personnel, transport, retail outlets, utensils or consumers). Moreover, morphological characteristics of certain types of melons, for instance netted rind, will be prone to attachments by microbial pathogens and this necessitated preparation of this Tanzania Standard.

This code should be used in conjunction with the TZS 109, *Food processing unit — code of hygienic practices* and TZS 1743, National Standard Good Agricultural Practices and Good Handling Practices for fresh fruits and vegetables.

In the preparation of this code assistance was derived from CAC/RCP 53-2003 published by the Codex Alimentarius Commission.

1 Scope

This code covers specific guidance related to all areas, from primary production to consumption of fresh melons of family *cucurbitaceae* that are intended to be consumed without further microbiocidal steps.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TZS 109, *Food processing unit - code of hygienic practices*

TZS 538, Packaging and labeling of foods

TZS 1003, *Guide to the pre-packaging of fresh fruits and vegetables*

TZS 1743, *National Standard Good Agricultural Practices and Good Handling Practices for fresh fruits and vegetables.*

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3 Terms and definitions

For the purpose of this Tanzania Standard, the following terms and definitions shall apply:

3.1 agricultural inputs

any material (e.g. seeds, fertilizers, water, agricultural chemicals, plant support, etc.) used for the primary production of fresh fruits and vegetables

3.2 agricultural worker

any person who undertakes one or more of the following: cultivation, harvesting and packing of fresh fruits and vegetables

3.3 antimicrobial agents

any substance of natural, synthetic or semi-synthetic origin which at low concentrations kills or inhibits the growth of micro-organisms but causes little or no host damage

3.4 biological control

use of competing agents (such as insects, micro-organisms and/or microbial metabolites) for the control of, pests (such as mites, insects, weeds, plant pathogens and spoilage organisms)

3.5 biosolids

sludge and other residue deposits obtained from treatment of sewage plants; urban and industrial wastes (food industries or other types of industry)

3.6 cleaning

removal of soil, food residue, dirt, grease or other objectionable matter

3.7 clean water

water that does not compromise food safety in the circumstances of its use

3.8 composting

managed process in which organic materials are digested aerobically or anaerobically by microbial action

3.9 contaminant

any biological or chemical agent, foreign matter, or other substances not intentionally added to food which may compromise food safety or suitability

3.10 contamination

introduction or occurrence of a contaminant in food or food environment

3.11 cull

to remove any product that shows signs of physical damage (such as skin breaks or decay)

3.12 cultivation

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any agricultural action or practice used by growers to allow and improve the growing conditions of fresh fruits or vegetables grown in the field (with or without cover) or in protected facilities (hydroponic systems, greenhouses)

3.13 disinfection

reduction, by means of chemical agents and/or physical methods, of the number of micro-organisms in the environment, to a level that does not compromise food safety or suitability

3.14 dish

specific food preparation with cooking finished and ready to eat or be served

3.15 establishment

any building or area in which food is handled and the surroundings under the control of the same management

3.16 farm

any premise or establishment in which fresh fruits and/or vegetables are grown and harvested where the surroundings under are the control of the same management

3.17 food handler

any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements

3.18 food hygiene

all conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain

3.19 food safety

assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use

3.20 food suitability

assurance that food is acceptable for human consumption according to its intended use

3.21 ground spot

point of direct contact where melons sit directly on the soil or on top of mulch

3.22 grower

person directly responsible for the management of the primary production of fresh fruits and vegetables

3.23 harvester

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person directly responsible for the management of the harvesting of fresh fruits and vegetables

3.24 hazard

biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect

3.25 Hazard Analysis Critical Control Points (HACCP)

system which identifies, analyses, and controls hazards which are significant for food safety

3.26 hazardous material

any compound which, at specific levels, has the potential to cause adverse health effects

3.27 hydroponics

growing of plants without soil in a water medium

3.28 manure

animal excrement which may be mixed with litter or other material, and which may be fermented or otherwise treated

3.29 melons

refers to whole and/or pre-cut cantaloupe (also known as muskmelons and rockmelons), honeydew, watermelon and other varieties of melons

3.30 micro-organisms

organisms which are too small to be visible by naked eye. Include yeasts, moulds, bacteria, viruses and parasites. When used as an adjective, the term "microbial" is used

3.31 microbiocidal

agent that kills microscopic organisms (bacteria, fungi and viruses)

3.32 packer

person directly responsible for the management of post-harvest processing and packing of fresh fruits and vegetables

3.33 packing

action of putting fresh fruits and vegetables in a package. This may take place in a field or in an establishment.

3.34 packing establishment

any indoor establishment in which fresh fruits and vegetables receive post-harvest treatment and are packaged.

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3.35 potable water

water that is safe and suitable for human consumption

3.36 primary production

steps involved in the growing and harvesting of fresh fruits and vegetables such as planting, irrigation, application of fertilizers, application of agricultural chemicals, etc.

4 Primary production

Melons are grown either indoors (e.g. greenhouses) or outdoors, harvested, and either field-packed or transported to a packing establishment.

4.1 Environmental hygiene

Potential sources of environmental contamination should be identified prior to production activities. This is important because contamination that occurs during production may not be removed during subsequent steps. In addition, melons grown in warm, humid conditions may favour growth and survival of foodborne pathogens. Growers should take steps to minimize the potential for contamination from any sources identified.

Particular attention should be given to potential sources of faecal contamination in the melon production area and to vectors, which may introduce faecal contamination to the production and handling areas. These vectors include, but are not limited to, humans, domestic and wild animals, or indirectly from contaminated water, insects, or fomites such as dust, tools and equipment. More details of the requirements to be considered are as follows;

4.1.1 Location of the production site

Consideration of production site, location should include an evaluation of the slope and the potential for runoff from nearby fields, the flood risk as well as hydrological features of nearby sites in relation to the production site.

The proximity of high risk production sites, such as animal production facilities, hazardous waste sites and waste treatment facilities, should be evaluated for the potential to contaminate melon production fields or the water sources used with microbial or other environmental hazards via, for example, run-off, faecal material, aerosols or other organic wastes. When the risks are serious, these production sites should not be used for melon production.

When the environmental assessment identifies a potential food safety risk, measures should be implemented to minimize contamination of melons at the production site. Consideration should be given to changing the landscape surrounding melon production fields, such as the construction of a shallow ditch to prevent runoff from entering the fields, to reduce the potential for pathogen contamination of melons in the production site. The effects of some environmental events, such as heavy rains, cannot be controlled. For example, heavy rains may increase melons' exposure to pathogens if soil contaminated with pathogens splashes onto melon surfaces. Consideration could be given to harvesting earlier if the weather forecasts heavy rains or to delaying harvest and performing extra washing when heavy rains have recently occurred.

4.1.2 Wild and domestic animals and human activity

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Many animal species (e.g. birds, amphibians, chickens, feral pigs, livestock and domestic or wild dogs) and humans that may be present in the production environment are known to be potential carriers of foodborne pathogens. Animals are common source of contamination of surface water that may be used for irrigation. The following should be considered:

- a) domestic and wild animals should be excluded from production and handling areas, to the extent possible, using appropriate biological, cultural, physical and chemical pest control methods. Methods selected should comply with national environmental and animal protection regulations;
- b) melon production and handling areas should be properly maintained to reduce the likelihood of vector attraction. Activities to consider include efforts to minimize standing water in fields, restrict access by animals to water sources (may be based on local ordinances for public irrigation systems), and keep production sites and handling areas free of waste and clutter; and
- c) melon production sites and handling areas should be evaluated for evidence of the presence of wildlife or domestic animal activity (e.g. presence of animal faeces, hairs/furs, large areas of animal tracks, burrowing, or decomposing remains). Where such evidences exist, growers should evaluate the risks and whether the affected sections of the melon production sites should be harvested.

4.2 Hygienic primary production of melons

Special consideration should be given to production practices specific to melon production because of the unique characteristics of the melons and the rind of some melons and because melons frequently contact soil directly during growth and development. Melons may have smooth or netted rind surfaces. Netted rind surfaces, in contrast to smooth rind surfaces, provide an environment where microbial pathogens may more easily adhere to, survive on, and become more difficult to eliminate during post-harvest practices. It is recommended that growers use production practices that prevent or minimize contact of melons, particularly those with netted rinds, with soil, soil amendments (including natural fertilizers) or irrigation water.

Some growers place melons on cups (i.e. small plastic pads) or plastic mulch-covered beds (wider and more elevated during the wet season), or halved bamboo segments to minimize direct melon-to-soil contact and thereby reduce ground spot development. Melons also may be hand-turned multiple times by agricultural workers during the growing season to prevent sunburn or ground spot development or covered with biodegradable materials such as rice straw to prevent sunburn. Melon rind ground spots have been demonstrated to have significantly greater microbial populations than non-ground spot areas and, therefore, may be more susceptible to microbial contamination. If cups or biodegradable materials are used underneath melons, the following are recommended:

- a) use plastic mulch under cups to minimize cup and melon contact with the soil;
- b) ensure cups are clean and sanitary before setting them under the melons;
- c) ensure that employees follow good hygienic practices when turning melons on the cups or during harvesting operations; and
- d) use biodegradable materials only once to prevent cross-contamination.

4.2.1 Water for primary production

Growers should identify the sources of water used on the farm (municipality, re-used, irrigation water, reclaimed wastewater, discharge water from aquaculture, well, open canal, reservoir, rivers, lakes, farm ponds, etc.). It is recommended that growers assess and manage the risk posed by these waters as follows:

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- a) Assess the potential for microbial contamination (e.g. from animals, human habitation, sewage treatment, manure and composting operations) and the water's suitability for its intended use. Reassess the potential for microbial contamination if events, environmental conditions (e.g. temperature fluctuations, heavy rainfall, etc.) or other conditions indicate that water quality may have changed.
- b) Identify and implement corrective actions to prevent or minimize contamination. Possible corrective actions may include fencing to prevent large animal contact, proper maintenance of wells, filtering water, not stirring the sediment when drawing water, building settling or holding ponds, and water treatment facilities. Settling or holding ponds that are used for subsequent irrigation may attract animals or in other ways increase the microbial risks associated with water for irrigating melons. If water treatment is needed, consult with water safety experts.
- c) Determine if microbial and chemical testing should be done to evaluate the suitability of water for each intended use. Analytical testing may be necessary after a change in irrigation water source, flooding or a heavy rainfall when water is at a higher risk of contamination. If testing, determine and document;
 - i What tests need to be performed, (e.g. which pathogens and/or sanitary indicators)
 - ii Which parameters should be noted (e.g. temperature of water sample, water source location, and/or weather description),
 - iii How often tests should be conducted,
 - iv What the test outcomes indicate, and
 - v How tests will be used to define corrective actions.
- d) Frequency of testing should depend on the source of the irrigation water (less for adequately maintained deep wells, more for surface waters) and the risks of environmental contamination, including intermittent or temporary contamination (e.g. heavy rain, flooding, etc.).
- e) If water testing is limited to non-pathogenic indicators, frequent water tests may be useful to establish the baseline water quality so that subsequent changes in the levels of contamination can be identified.
- f) If the water source is found to have unacceptable levels of indicator organisms or is contaminated with foodborne pathogens, corrective actions should be taken to ensure that the water is suitable for its intended use. Testing frequency should be increased until consecutive results are within the acceptable range.

4.2.1.1 *Water for irrigation*

Netted melon rind surfaces, in contrast to smooth rind surfaces, may foster greater attachment and survival of foodborne pathogens. For this reason, the quality of irrigation water and type of irrigation method used is an important consideration. Growers should consider the following:

- a) avoid overhead irrigation methods, particularly with netted rind melons, because wetting the outer rind of melons increases the risk of pathogen contamination. Overhead irrigation also enhances downy mildew infection in melons.
- b) subsurface or drip irrigation presents the least risk of contaminating melon surfaces. For drip irrigation, care should be taken to avoid creating pools of water on the soil surface or in furrows that may come into contact with melon rinds.

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4.2.1.2 *Water for fertilizers, pest control and other agricultural chemicals*

Clean water should be used in the application of aqueous fertilizers, pesticides and other agricultural chemicals that are directly applied to the surface of melons, especially close to harvest. Foodborne pathogens can survive and grow in many agricultural solutions, including pesticides.

4.2.1.3 *Water for harvesting and other agricultural uses*

Clean water should be used for other agricultural purposes, such as dust abatement, hydration, use as a lubricant, and to maintain roads, yards, and parking lots in areas where melons are grown. This would include water used to minimize dust on roads within or near melon production sites.

4.2.2 *Manure, biosolids and other natural fertilizers*

Manure, biosolids and other natural fertilizers may contain human or animal waste, animal parts or products, or be composed primarily of plant materials. Because of this, foodborne pathogens may be present and may persist for weeks or even months, particularly if treatment of these materials is inadequate. Growers should consider the following when using any of these materials:

- a) use proper treatment by physical, chemical or biological methods to reduce the risk of potential human pathogen survival.
- b) composting, if done properly, can be a practical and efficient method to inactivate foodborne pathogens in manure. In general, only fully decomposed animal waste or plant material should be applied to melon fields.
- c) when using aerobic composting methods, regularly and thoroughly turn compost heaps to ensure that all of the material will be exposed to elevated temperatures because pathogens can survive for months on the heap surface.
- d) when using anaerobic methods, special consideration should be given to determine the length of time needed to inactivate pathogens that may be present.
- e) use of untreated and/or partially treated manure, biosolids, and other natural fertilizers should not be used after plant emergence or after a transplant is put into the soil, unless it can be demonstrated that product contamination will not occur.

4.2.3 *Personnel health, hygiene and sanitary facilities*

The following should be considered:

- a) where appropriate, each business operating primary production operations should have written Standard Operating Procedures (SOPs) that relate to health, hygiene and sanitary facilities. The SOPs should address worker training, facilities and supplies to enable agricultural workers to practice proper hygiene, and company policies relating to expectations for worker hygiene as well as illness reporting. The procedures for health, hygiene, and accident & emergency handling should be visibly displayed
- b) all agricultural workers should properly wash their hands using soap and clean running water before handling melons, particularly during harvesting and post-harvest handling. Agricultural workers should be trained in proper techniques for hand washing and drying.
- c) if gloves are used, a procedure for glove use in the field should be documented and followed. If the gloves are reusable, they should be made of materials that are easily cleaned and disinfected, and they should be cleaned regularly and stored in a clean area. If disposable gloves are used, they should be discarded when they become torn, soiled, or otherwise contaminated.

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- d) non-essential persons, casual visitors and, to the extent possible, children, should not be allowed in the harvest area as they may present an increased risk of contamination.

4.2.3.1 Personnel hygiene and sanitary facilities

Growers should consider providing areas away from the field and packing lines for agricultural workers to take breaks and eat. For worker convenience, these areas should provide access to toilet and hand-washing facilities so that agricultural workers can practice proper hygiene.

As far as possible, sanitary facilities should be located close to the field and readily accessible to the work area.

- a) Sanitary facilities should be located in a manner to encourage their use and reduce the likelihood that agricultural workers will relieve themselves in the field. Facilities should be present in sufficient number to accommodate all personnel.
- b) Portable facilities should not be located or cleaned in cultivation areas or near irrigation water sources or conveyance systems. Growers should identify the areas where it is safe to put portable facilities.
- c) Facilities should include clean running water, soap, toilet paper or equivalent, and single use paper towels or equivalent. Multiple use cloth drying towels should not be used. Hand sanitizers should not replace hand washing and should be used only after hands have been washed.
- d) If clean running water is not available, an acceptable alternative hand washing method should be recommended by the relevant competent authority.

4.2.3.2 Health status

The following should be considered:

- a) growers should be encouraged to note symptoms of diarrhoea or food-transmissible, communicable diseases, and reassign agricultural workers as appropriate;
- b) agricultural workers should be encouraged and, where feasible, be motivated with appropriate incentives to report symptoms of diarrhoea or food-transmissible, communicable diseases; and
- c) medical examination of agricultural workers should be carried out if clinically or epidemiologically indicated.

4.2.3.3 Personal cleanliness

When personnel are permitted to continue working with cuts and wounds covered by water proof dressings, they should wear gloves to cover the bandages thereby providing a secondary barrier between them and the melons they handle.

4.2.4 Equipment associated with growing and harvesting

Standard operating procedures should be developed for the maintenance, cleaning and disinfecting operations of growing and harvesting equipment. In addition:

- a) agricultural workers should be trained to follow the SOPs; and
- b) cutting equipment used to harvest melons should be thoroughly cleaned and disinfected before use and cutting edges should be kept smooth and sharp.

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4.3 Handling, storage and transport

Melons are harvested based on different maturity indices such as stage of maturity which is judged by the formation of an abscission zone between the vine and the melon. After the vine is separated from the melon, a stem scar is left on the fruit. Melon stem scars may provide a potential route for entry of foodborne pathogens, if present, to the edible portion of the melons. It is recommended that post-harvest handling practices be implemented to minimize stem scar and rind infiltration, such as during washing operations, of foodborne pathogens into the edible portions of melon flesh. Where appropriate, written SOPs should be developed and implemented for safe handling, storage and transport of melons. It should be considered that the length of storage for melons at a recommended temperature depends on the stage of maturity when melons are harvested.

4.3.1 Prevention of cross-contamination

Specific control methods should be implemented to minimize the risk of cross-contamination from microorganisms associated with manual harvesting methods. The following should be considered:

- a) the field should be evaluated for the presence of hazards or contamination prior to harvest to determine safety procedures during harvesting
- b) particularly with manual harvesting, as well as field packing operations, good personal hygiene should be implemented to prevent surface contamination of melons.
- c) proper cleaning and disinfection of equipment should be done since knives, if improperly used, can wound melon rinds and provide a point of entry for contaminants that may be in soil and water.
- d) avoid setting melons directly on soil after removal from the vine and before loading into transport vehicle to avoid contaminating the melon with contaminants in the soil.
- e) harvest containers that come into contact with melons should not be used for purposes other than holding product (e.g. should not hold personal items, waste, etc.).

Melons are susceptible to damage during harvest and post-harvest handling operations. The following should be considered:

- a) when padding is used with post-harvest handling equipment to prevent damage to melons, it should be constructed of material that can be cleaned and disinfected. Ensure that padding is cleaned and disinfected before and during use;
- b) minimize mechanical damage such as rind punctures, cracks, and bruising, as these wounds may provide entry points for pathogens and sites for microbial survival and multiplication;
- c) train agricultural workers to recognize and not harvest damaged melons; and
- d) dispose of culled melons in a way that melon culls will not attract animal and insect pests. This will reduce the potential for contaminating melons still on the vine.

4.3.2 Storage and transport from the production site to the packing/processing facility

Melons may become contaminated, or may not reach its destination in a suitable condition for consumption, unless effective control measures are taken during transportation, even where adequate hygiene control measures have been taken earlier in the food chain. Measures should be taken where necessary to:

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- a) protect melon from potential sources of contamination;
- b) protect melon from damage likely to render the melon unsuitable for consumption; and
- c) provide an environment which effectively controls the growth of pathogenic or spoilage micro-organisms and the production of toxins in melons.

The design of the melon transportation unit should be such as to avoid cross contamination due to simultaneous or consecutive transport. There should be appropriate facilities conveniently available for cleaning and, where appropriate disinfecting of the melons transportation unit.

Transportation of fresh melons should be managed to reduce or control the risk of contamination. Each transporter should have its own SOP for shipping containers/trailers to confirm that they are clean, sanitary and in good structural condition.

Fresh melons should not be transported in vehicles used previously to carry animals, animal manure or biosolids and pesticides unless they are adequately cleaned and disinfected. Receptacles and vehicles and/or containers, when being used to transport melons, are not to be used for transporting anything which may result in contamination of melons.

Where conveyances and/or containers are used for transporting anything in addition to foodstuffs or for transporting different foodstuffs at the same time, there should, where necessary, be effective separation of products.

When not in use, cleaned harvest containers and transport trailers should be covered and kept in a location and in a manner to prevent possible contamination (such as from pests, birds, rodents, dust, water, etc.).

4.4 Cleaning, maintenance and sanitation

During cleaning, maintenance and sanitation the following should be adhered;

4.4.1 *Cleaning programmes*

The following should be considered:

- a) harvesting equipment, including knives, pruners, machetes, that come into direct contact with melons should be cleaned and disinfected before and after use or as the situation warrants; and
- b) clean water should be used to clean all equipment directly contacting melons, including farm machinery, harvesting and transportation equipment, containers and knives.

4.4.2 *Cleaning procedures and methods*

Cleaning and disinfection programmes should not be carried out in a location where the rinse water might contaminate melons.

Where appropriate or necessary, cleaning and disinfecting procedures should be validated to ensure their effectiveness.

5 Establishment: Design and facilities

5.1 Premises and rooms

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Design and layout

It is important to consider the sanitary design and layout for packing/processing equipment and the establishment because of the seasonal nature of the melon harvest. Packing/processing establishment may be used only for few months of the year and thus be dormant for many months, leaving them susceptible to pest infestations. When dormant, packing/processing establishment should be appropriately protected from pest infestations. Their design should allow thorough cleaning and disinfection of food contact surfaces to ensure microbial pathogens do not become established in the facility or on the equipment.

5.2 Drainage and waste disposal facilities

Adequate drainage is critical to packing, cooling and processing facilities to avoid the risk of contaminating melons. To ensure adequate drainage of standing water, consider the following:

- a) drainage in the facility should be designed with sloped floors to effectively drain standing water;
- b) floors should be kept as dry as possible using appropriate methods;
- c) standing water should be removed or pushed to the drains;
- d) drains should be cleaned periodically to prevent build-up of biofilms that may contain organisms of concern (e.g. *Listeria monocytogenes*);
- e) areas for garbage recyclables and compostable waste should be identified and all waste should be stored and disposed off in a manner to minimize contamination; and
- f) waste should be disposed of on a frequent basis to avoid attracting pests (e.g. flies, rodents).

6 Establishment: Control of operations

6.1 Control of food hazards

Prevention of contamination is a key control point for all produce operations, including melon operations. Establishments should pay special attention to product flow and segregation of incoming soiled and outgoing washed product to avoid cross-contamination. If melons pass over brushes during the operations, care should be taken to ensure they do not damage or cross-contaminate the melons. They should be routinely inspected, cleaned and adjusted as needed. Melons should also be packed in accordance with TZS 1003.

6.2 Key aspects of hygiene control systems

6.2.1 Specific process

6.2.1.1 Post-harvest water use

Water is often used in dump tanks to transport melons from field containers into the packing or processing establishment. If the temperature of the water in the dump tank is cold and the internal temperature of the melons is hot from field heat, a temperature differential is created that may aid in the infiltration of microbial pathogens into the rind and/or the edible portion of the fruit. The following should be considered when using post-harvest water:

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- a) clean water should be used in dump tanks. Disinfectants may reduce, but will not eliminate microbial pathogens if present, as they are primarily used to disinfect the water.
- b) it is recommended that the time melons remain in dump tank water should be minimized.
- c) minimize or avoid fully submerging melons in colder dump tank water. When submerged, water is more likely to infiltrate into the melons.
- d) where appropriate, the pH, soil (including organic) load, turbidity, water hardness, product through-put capacity should be controlled and monitored to ensure the efficacy of the antimicrobial treatment.
- e) water temperatures should be higher than the internal temperatures of melons, so as to minimize the risk of water infiltration.

6.2.1.2 Chemical treatments

Fungicides may be applied to melons by use of an aqueous spray or immersion to extend the post-harvest life of the fruit. The following are recommended:

- a) clean or preferably potable water should be used in water-based chemical treatments to ensure that the water used is of sufficient microbial quality for the intended use and does not contaminate the melons with foodborne pathogens.
- b) if hot water treatments are used as an alternative to post-harvest chemical treatments, it is recommended that the water temperature and time be evaluated and monitored to ensure that the water temperature and time is maintained and that antimicrobial agents are present in the water at sufficient levels for the temperature used.

6.2.1.3 Cooling melons

- a) Forced air cooling operations can avoid the risk of melon infiltration with cooling water, but also may spread product contamination if forced-air cooling equipment is not cleaned and disinfected regularly.
- b) Water that is used in hydro-coolers should be potable. Water that is used only once and not recirculated is preferable.
- c) If water is used for cooling and is recirculated, it should be evaluated and monitored to ensure that disinfectant levels are sufficient to reduce the potential risk of cross-contaminating melons.
- d) Cooling and cold storing melons as soon as possible after harvest is recommended to prevent multiplication of foodborne pathogens, if present, on or from the rind surface of melons.
- e) Cooling equipment should be cleaned and disinfected on a regular basis according to written procedures to ensure that the potential for cross-contamination is minimized.

6.2.1.4 *Cutting, slicing and peeling melons*

- a) melons should be washed with potable water before cutting or peeling.
- b) Before cutting or other processing, a further reduction in microbial contamination may be achieved by scrubbing in the presence of a sanitizer or application of an alternative surface decontamination process such as hot water, steam or other treatments.

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- c) cutting or peeling knife blades should be cleaned and disinfected on a regular basis according to written procedures to reduce the potential for cross-contaminating melons during the cutting or peeling process.
- d) knife blade disinfecting solutions should be monitored to ensure that the disinfectant is present at sufficient levels to achieve its intended purpose and does not promote the potential for cross-contamination.
- e) it is recommended that pre-cut melons should be wrapped/packageged and refrigerated as soon as possible and distributed under refrigeration temperatures (i.e. 4 °C or less).

6.2.2 Microbiological and other specifications

Microbiological testing can be a useful tool to evaluate and verify the effectiveness of safety and sanitation practices, provide information about an environment, a process, and even a specific product lot, when sampling plans and methodology are properly designed and performed. The intended use of information obtained (e.g., evaluating the effectiveness of a sanitation practice, evaluating the risk posed by a particular hazard, etc.) can aid in determining what micro-organisms are most appropriate to test for. Test methods should be selected that are validated for the intended use. Consideration should be given to ensure proper design of a microbiological testing programme. Trend analysis of testing data should be undertaken to evaluate the effectiveness of food safety control systems.

6.2.3 Microbiological cross-contamination

- a) Where dry dump stations are used for unloading field containers (e.g. bins, trailers, or wagons), melon contact surfaces (including padding materials to protect melons from physical damage) should be constructed of material that can be cleaned and disinfected.
- b) Where wet dump stations are used for unloading field containers, the containers should not be directly immersed into dump tanks, where they have been in direct contact with the soil, to reduce the potential for product cross-contamination with field or road debris.

6.3 Incoming material requirements

Avoid using whole melons that have visible signs of decay or damaged rinds (e.g. mechanical damage or cracking) due to the increased risk for microbial contamination in melons. Damaged or decayed melons should be discarded in a manner that does not serve to attract pests.

6.4 Documentation and records

Where practicable, a written food safety control plan that includes a written description of each of the hazards identified in assessing environmental hygiene, as well as the steps that will be implemented to address each hazard, should be prepared by the business operating the primary production. The description should include, but is not limited to, the following: an evaluation of the production site, water and distribution system, manure use and composting procedures, personnel illness reporting policy, sanitation procedures and training programmes.

The following are examples of the types of records that should be retained:

- a) microbiological testing results and trend analyses;
- b) water monitoring and test results;
- c) employee training records;
- d) pest control records;

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- e) cleaning and sanitation reports;
- f) equipment monitoring and maintenance records;
- g) inspection/audit records; and
- h) employee health check up records.

6.5 Traceability

The traceability should be designed and implemented to enable the withdrawal of the products, where necessary.

- a) Detailed records should be kept that link each supplier of the product with the immediate subsequent recipient of the melons throughout the food chain. The information needed to link each supplier should include, if available, the packer name, address, and phone number, date packed, date released, type of melon (e.g. cantaloupe, watermelon, etc.) including brand name, lot identification and number of lots, and transporter.
- b) The following are examples of the types of records that should be retained to facilitate traceability:
 - i shipping documents;
 - ii invoices;
 - iii other records maintained by the firm that identifies the supplier and the buyer; and
 - iv operators such as growers and producers and, in cases where contract harvesters are used, harvesters should keep current all relevant information on agricultural activities such as information concerning each lot, date harvested, grower contact information, harvest practices, if water used in harvesting, water quality.
- c) In fresh-cut, pre-cut or ready-to-eat melon operations, multiple ingredients from different sources may be combined in a single package. This practice can complicate efforts to trace melons to their source. The processors should consider establishing and maintaining records to identify the source of each ingredient in the product.

6.6 Product recall

In the event of a foodborne illness outbreak associated with melons, maintaining appropriate records of production, processing, packaging and distribution may help to identify the source of contamination in the melon food chain and facilitate product recalls. Growers/packers/processors/distributors should consider developing and maintaining a recall procedures. Recall procedures should be designed and implemented accordingly to enable the withdrawal of the products, where necessary.

7 Establishment: Maintenance and sanitation

7.1 Maintenance and cleaning

Food contact surfaces should be cleaned and disinfected before the start of the season and throughout the melon season to ensure microbial pathogens do not become established in the facility or on the equipment.

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7.2 Pest control systems

Melons have a very high sugar content and are extremely attractive to insects (e.g flies, ants) and other pests (e.g rodents) and other insects that may cross-contaminate melons. It is recommended that an aggressive melon cull disposal and waste removal programme be implemented to reduce the potential for insect-to-melon contamination.

8 Transportation

Melons should be transported as described in Clause 3.3.2 of this standard.

9 Product information and consumer awareness

9.1 Product information

Insufficient product information, and/or inadequate knowledge of general food hygiene, can lead to products being mishandled at later stages in the food chain. Such mishandling can result in consumer illnesses, or products becoming unsuitable for consumption, even where adequate hygiene control measures have been taken earlier in the food chain.

Products should bear appropriate information to ensure that:

- a) is adequate and accessible information is available to the next person in the food chain to enable them to handle, store, process, prepare and display the product safely and correctly; and
- b) the lot or batch can be easily identified and recalled if necessary.

9.2 Marking and labelling

Prepackaged melons should be labelled with clear instructions. In addition to TZS 538 each package should bear the following particulars legibly and indelibly marked:

- a) name and address of the packer and/or dispatcher;
- b) name of the produce by common name; including variety/cultivar;
- c) origin of the produce – name of the producing country, region and district where grown;
- d) commercial specification, i.e. type, class, size expressed as minimum and maximum diameter;
- e) net weight; and
- f) brand or trade mark, if any.

9.3 Consumer education

Health education programmes should cover general food hygiene. Such programmes should enable consumers to understand the importance of any product information and to follow any instructions accompanying products, and make informed choices. In particular consumers should be informed of the relationship between time/temperature control and foodborne illnesses. Consumer should prevent contamination and growth or survival of food borne pathogens by storing, preparing and using it correctly.

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All stakeholders in the melon value chain including government, industry, consumer organizations and the media should work together to communicate clear consistent messages on handling melons safely to avoid giving contradictory advice and causing confusion.

Consumer information on handling melons safely should cover:

- a) Avoiding the selection of melons with damaged rinds or rotten areas.
- b) Transportation to home: Increase in product temperature during transportation can be considerable. Time in transit for pre-cut melons between retail/market and the home should be kept as short as possible.
- c) Storage/ refrigeration of whole and pre-cut melons: Whole melons should preferably be stored in a cool environment. All prepackaged and pre-cut melons should be refrigerated as soon as possible.
- d) Once removed from the refrigerator, pre-cut fruit should be consumed as soon as possible.
- e) Washing and/or scrubbing whole melons, particularly the netted varieties, (i.e. cantaloupes) using potable running water and where appropriate, disinfectant solutions. Pre-cut products should not be rewashed.
- f) Correct hand washing methods.
- g) Cross-contamination. Consumers need to handle, prepare, and store melons safely to avoid cross-contamination with pathogens from various sources (e.g., hands, sinks, cutting boards, utensils, raw meats).

10 Training programmes

Personnel involved in primary production, packing, processing or transport operations of melons should receive training appropriate to their tasks and should be periodically assessed while performing their duties to ensure tasks are being completed correctly. Training should be delivered in a language and manner to facilitate understanding of what is expected of them and why, and should emphasize the importance of using hygienic practices. A well-designed training programme considers the barriers to learning of the trainees and develops training methods and materials to overcome those barriers.

All agricultural workers should be trained in proper use of hygiene facilities. Training could include, for example, toilet use, proper disposal of toilet paper or equivalent, and proper hand washing and drying procedures.

The following training considerations should be addressed:

- a) Longstanding entrenched trainee behaviors, attitudes or personal beliefs
- b) Transient nature of workforce with no prior training in food safety and hygiene
- c) Concerns about children/infants who may accompany parents working in the production site with the potential for transfer of pathogens with a human reservoir
- d) Diverse cultural, social and traditional practices
- e) Literacy and education level

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- f) Language and dialect of trainees
- g) Need to make food safety practices realistic and easy to implement (identify enabling factors, motivators and incentives)
- h) Raising awareness among trainees of the symptoms and signs of disease and encourage them to act upon it (taking personal responsibility for health)

Training programmes should be repeated periodically, and updated whenever there is a change in the product, process or staff and monitored for effectiveness and modified when necessary.

Increased emphasis on training in cold chain logistics and management is recommended, in line with advancing knowledge and technologies for both refrigeration and temperature monitoring and expanding international trade.

DRAFT FOR STAKEHOLDERS' COMMENTS