ANIMAL EXCLUSION AND PEST CONTROL

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"PEST" APPLIES TO ALL ORGANISMS THAT NEGATIVELY IMPACT THE QUALITY AND SAFETY OR PRODUCE, DIRECTLY OR INDIRECTLY.

All animals are considered potential sources for contamination.

- Mammals
- Birds
- Reptiles
- Amphibians
- Invertebrates

INVERTEBRATES

- Insects
- Slugs
- Snails

Their surfaces can harbor large numbers of pathogens.

- Hair
- Feathers
- Skin
- Mouthparts

- Exclusion of animals from production areas is the only effective means of eliminating these hazards but this is not a realistic expectation!
- Minimizing risk by limiting intrusion is a **practical goal** but still difficult to achieve consistently.
- Non-crop vegetation and dense weeds are aslo a hazard since they likely harbor insects, birds, and vermin.

HAZARDS

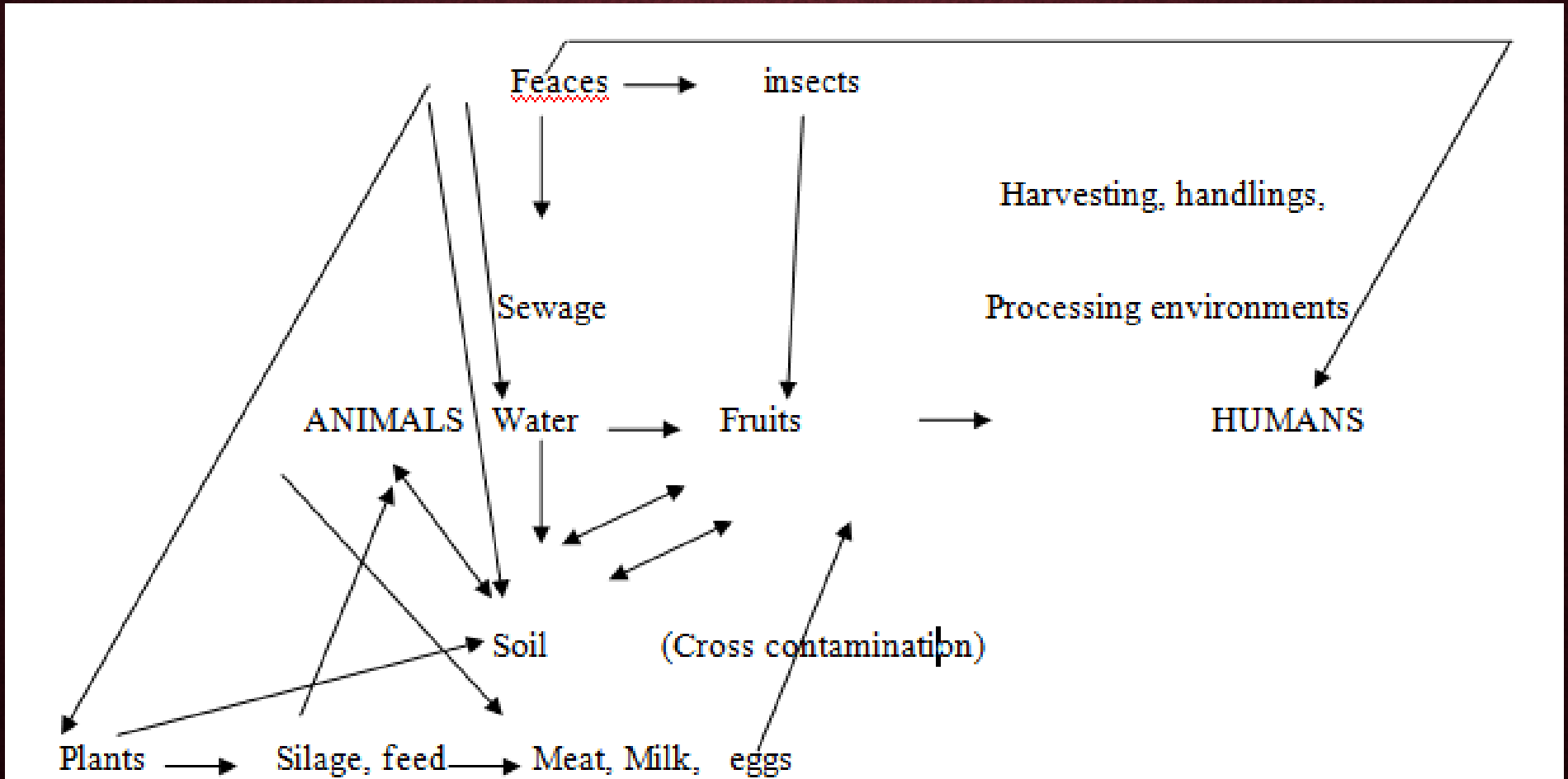
Feces

Bacteria

Workers

Physical Damage

ENTRY & DISTRIBUTION OF PATHOGENS



MOST CRITICAL PRINCIPLE OF GAP

- If contaminated produce is eaten by humans, an outbreak of illness can be the result.
- Prevention of contamination is essential for the assurance of food safety.
- Once pathogens have entered the food handling chain there is little that can be done to **eliminate** the risk.

CLASSIFICATION OF ANIMAL HAZARDS

PRIMARY RESERVOIRS

SECONDARY RESERVOIRS

Horses

Goats

Sheep

Cats

Dogs

Rabbits

Birds

TRANSIENT CARRIERS

- Animals that do not have resident populations of a pathogen and are not commonly infected.
  - Humans

MECHANICAL VECTORS

Animals that are seldom infected but can move contamination to another host.

- Slugs
- Nematodes
- Insects
- Canada geese

ANIMAL CONTROL AND EXCLUSION

DIRECT CONTROL

- Depredation
- Chemical Controls

CLEANLINESS

- Fields and surrounding areas should be kept clean and free of garbage that will attract any type of animal pest.
- Workers who eat near fields must be provided a means for disposal of food garbage.

PHYSICAL BARRIERS

WATER

- Animals are attracted to water and water is needed for bacterial pathogen growth.
- Limit presence of water not needed for agricultural purposes.

DETERRENT DEVICES

DOGS

- Although effective, most third-party auditing services will consider this an immediate food safety risk.
- Could result in an audit **failure**!

FIELD INSPECTIONS

- Check condition of fences, traps, and bait stations.
- Non-poison bait (feeding) stations may be used to monitor rodent presence.
- Test deterrent devices to make sure they are working properly.
- Look for the presence of feces and/or crop injury caused by feeding animals.
- Record the time and date of inspections.

- Animal exclusion is one of the most difficult tasks of a GAP program.
- All control measures are temporary.
- Some measures create other concerns (bait stations).

All animal control methods employed should be stated in the Sanitation Standard Operating Procedure for the farm's food safety program and must be documented.

SUMMARY

- ALL animals are considered sources or vehicles for contamination.
- Feces are considered the major source of pathogens associated with animals.
- Worker hygiene is important!
- Physical injury of products caused by animals is a point of entry for spoilage microorganisms.

ONCE MICROBIOLOGICAL CONTAMINATION HAS ENTERED THE FOOD PRODUCTION OR HANDLING ENVIRONMENT, IT CAN BE TRANSMITTED TO HUMANS IN MANY DIFFERENT WAYS.

PREVENTION OF CONTAMINATION IS THE KEY TO AN EFFECTIVE GAP/GHP PROGRAM.

REFERENCES

- Joint Institute for Food Safety and Applied Nutrition. 2010. Improving the safety and quality of fresh fruits and vegetables: a training manual for trainers. University of Maryland.
- **Lawrence, Oluwasegun. 2013.** The effect of pathogenic micro-organism on fresh food produce – mechanism of contaminationhttp://afrisphere.com/the-effect-of-pathogenic-micro-organism-on-fresh-food-produce-mechanism-of-contamination/

COOLING

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- Proper cooling ensures the safety and quality of fresh produce.

- Cooling is essential for almost all fruits and vegetables unless they are marketed directly from the field to local markets.

BENEFITS OF COOLING

- Improves shelf life
- Limits growth of some human pathogens
- Preserves quality
  - Reducing respiration rates
  - Reducing ethylene production
  - Reducing water loss and spoilage caused by plant pathogens

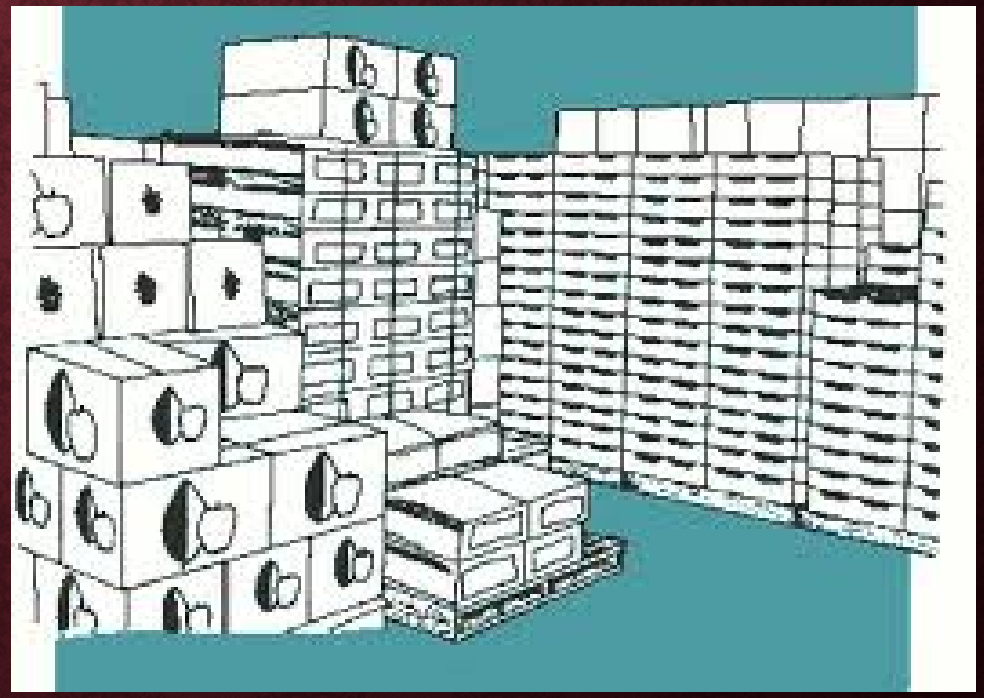
PRE-COOLING

- Pre-cooling is the rapid removal of field heat from produce soon after harvest.
- Rapid cooling usually enhances the quality and safety of produce.

COOLING METHODS

ROOM COOLING

- Simplest and slowest method.
- Produce is placed in a cold chamber. The rate of cooling can be increased by increasing air flow with fans and air jets



- Drawback:
  - Because this method is slow, product may not have time to cool sufficiently during busy shipping times.

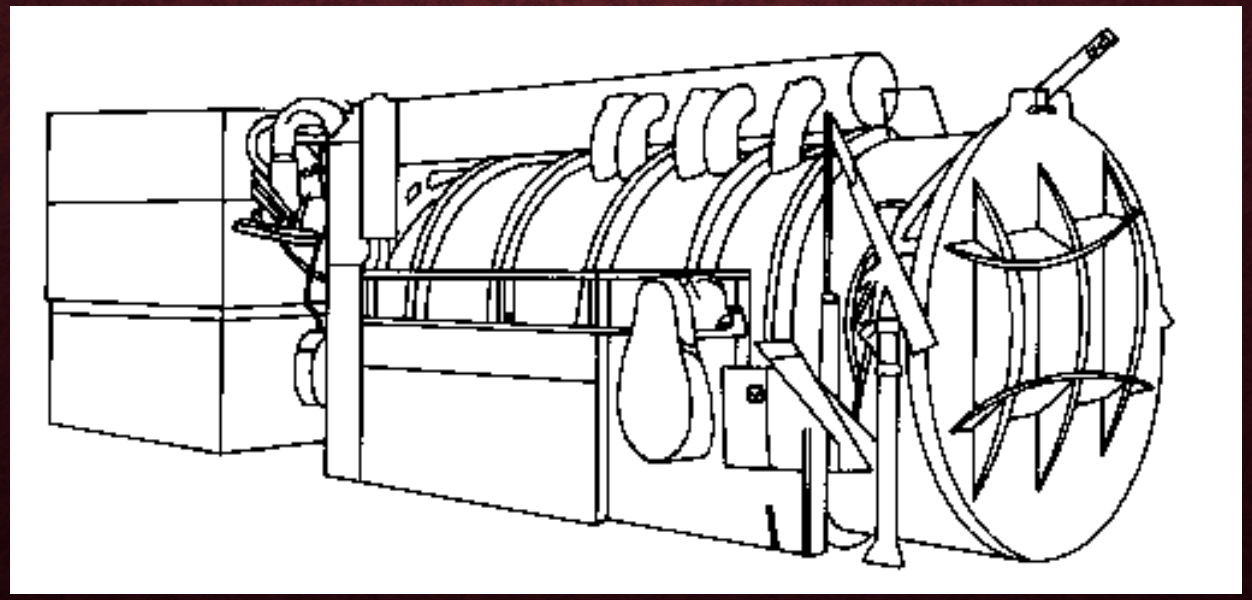
FORCED-AIR COOLING

- This method also requires a cold chamber, but also uses fans, tarps, and a system of air ducts to force cold air directly through produce containers.

- Forced-air cooling is especially suitable for produce which should not get wet, such as berries or grapes.

VACUUM COOLING

- Vacuum cooling involves an airtight chamber to hold the product.
- The atmospheric pressure within the chamber is reduced by vacuum pumps, which causes the water inside the product to vaporize.
- Loss of water vapor = surface evaporative cooling
- Drawback:
  - With each 5° C decrease in temperature there is approximately 1% decrease in product weight.



HYDRO-COOLING

- Water is used to rapidly absorb heat from produce.
- May use a flow-through system or a batch-type chamber.
- A given weight of water can absorb more heat than an equal weight of air.
- Useful method for:
  - Peaches
  - Nectarines
  - Asparagus
  - Sweet corn

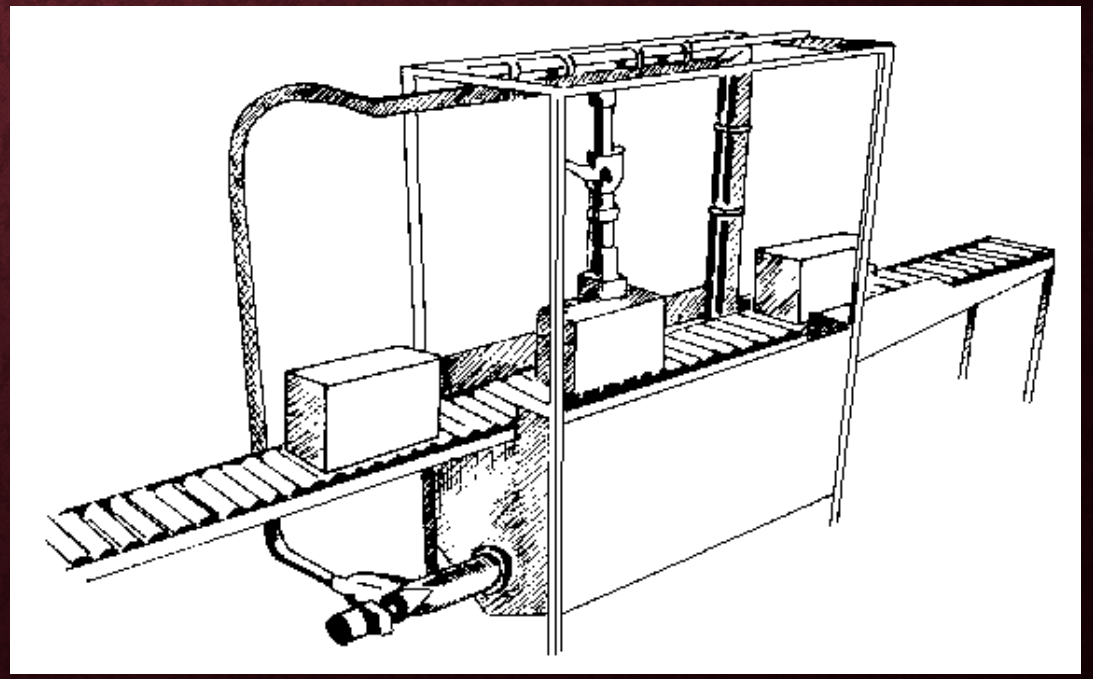
HYDRO-VAC COOLING

- A standard vacuum cooling chamber is equipped with a mist system.
- Advantages:
  - The mist on the product surface aids the evaporative cooling effect.
  - The amount of water lost from the product itself is reduced.

ICING

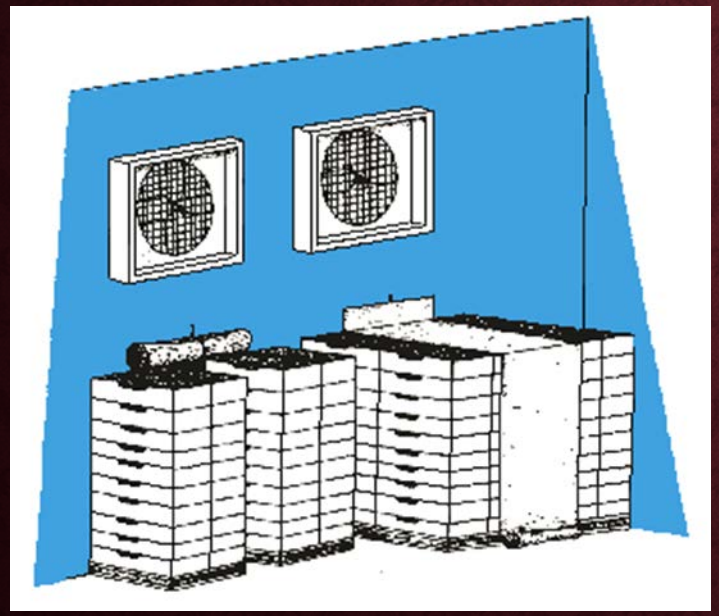
- Package-icing
  - Ice or ice and water slurry pumped directly into wax-coated cartons
- Top-icing
  - Ice is blown onto the top of pallets after loading onto truck.

  Ice should be made from potable water.



RISK FACTORS

AIR COOLING



- Room Cooling and Forced-Air Cooling
- Risk of microbiological contamination are low.
- Animals, compost storage and, potential chemicals contaminates should not be located near air intakes.
- Air chambers should be subjected to rigorous cleaning and sanitizing programs.

WATER COOLING

Water represents the single critical point capable of amplifying an error in sanitation practices that may have occurred during production, harvesting, or in subsequent handling.

A small microbiological risk introduced into recirculated water can become a very large problem!

REDUCE RISKS

- Subject equipment to thorough cleaning and sanitizing.
- Use potable water to fill reservoirs.
- Use water sanitizers properly.
- Use potable water for ice.
- Store and handle ice properly to prevent contamination.
- Monitor water quality, pH, temperature, and sanitizer concentration.

WATER DISINFECTION

- Water disinfection prevents cross contamination of produce, especially in systems where water is recirculated.

Water sanitizers are not for disinfecting produce!

SUMMARY

- Cooling is the primary tool for extending the quality shelf life of produce and reducing the rate of growth of plant and human pathogens.
- Several cooling methods are available and each has its own set of pros and cons.
- The use of water in any form (liquid or ice) presents overriding concerns for food safety.
- Postharvest managers need a clear understanding of water quality management.
  - Water temperature
  - pH
  - Sanitizer levels
- A Sanitation Standard Operating Procedure must be developed for every aspect of cooling.
- Appropriate record keeping must be implemented.

REFERENCES

- Joint Institute for Food Safety and Applied Nutrition. 2010. Improving the safety and quality of fresh fruits and vegetables: a training manual for trainers. University of Maryland.
- Bio and Ag Engineering. North Carolina State University. http://bae.ncsu.edu

DEVELOPMENT OF SANITATION STANDARD OPERATING PROCEDURES

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WHAT ARE SANITATION STANDARD OPERATING PROCEDURES (SSOP)?

- A written procedure that explains exactly how a certain cleaning task is completed.

- Any procedure with potential impact on the safety of fresh produce should be covered by a SSOP.

PURPOSE OF THE SSOP

- Describe basic sanitary practices.
- Provide a schedule for key activities.
- Serve as the basis for training all employees in food safety principles.
- Provide the foundation to support a routine testing or monitoring program.

- Most importantly….
  - The SSOP provides enough detail so employees can perform the task correctly by reading the procedure without any additional instruction.

DEVELOPMENT OF THE SSOP

- Identify individuals (by name or title) responsible for procedures.
- Maintain records that demonstrate the SSOP is being followed and that corrective actions are taken when there is a deficiency in the process.

FORMAT

- SSOPs may be paper copies or computerized.
- Any functional format is acceptable as long as it accurately describes the process in a **clear and concise** manner.

THERE IS NOT A RIGHT OR WRONG WAY TO WRITE A SSOP!

PARTS OF A SSOP

- Title
- Statement of Purpose
- Objective
- Scope of Work
  - Individual responsible
  - List of materials, tools, and equipment
  - Procedures for storing, mixing, and measuring the concentration of chemicals
  - Frequency of activities

Include record sheets with a signature line for the person performing the tasks to sign when the work is completed.

EXAMPLES

CLEANING (WITHOUT CHEMICALS)

1. Use the black hose in the packing shed to rinse the grading table.
2. Use the purple scrub brush to scrub the surface of the table.
3. Use the hose again to rinse grading table a second time.
4. Allow the table to dry before use.
5. This procedure should be performed every time before use of the grading table.
6. Record that you performed this activity , report the date and time performed on the sheet and sign it once completed.

CLEANING (WITH CHEMICALS)

1. Connect the pressure washer to the tap in the packing shed closest to the grading line.
2. Use the pressure washer to wash down the entire grading line. Start at the top of the machine and work your way down.
3. Ensure that all visible organic matter, including leaves, dirt, and other debris are removed from all parts of the grading line.
4. Fill the bucket with water from any tap in the packing shed.
5. Add two teaspoons bleach to the bucket.

EXAMPLE (CONTINUED)

7. Use the bleach solution and a clean cloth to wash down the stainless steel grading tables. Ensure that the solution is in contact with the table for a least two minutes.

8. Allow to air dry.

9. This procedure should be performed every time before use of the grading line. Record that you performed this activity , report the date and time performed on the sheet and sign it once completed.

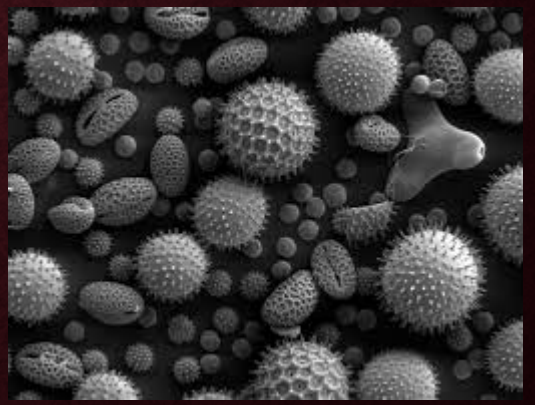
NOTE

SSOPs apply to farming operations as well as packing facilities. On farms, a SSOP should also be developed to address potential field hazards such as contaminated irrigation water, inadequate toilet facilities, and poor worker hygiene.

VERIFICATION

Verification that a SSOP is effective is critical!

- Ways to verify your SSOP:
  - Use a flashlight and scraper to help see and smell a surface.
  - Lab tests of samples for microbiological analysis
  - Use of records
    - Purchase orders for cleaners and sanitizers
    - Well-maintained inventory



SUMMARY

The purpose of a SSOP is to describe procedures that prevent direct contamination or adulteration of food products.

A SSOP is a written plan. Employee training is a critical part of the plan.

Each risk area at every step of harvesting and subsequent handling of fruit and vegetables should have a SSOP that addresses a method for risk reduction.

Keep records of all activities specified in the SSOP.

REFERENCES

- Joint Institute for Food Safety and Applied Nutrition. 2010. Improving the safety and quality of fresh fruits and vegetables: a training manual for trainers. University of Maryland.
- Canadian Horticultural Council. 2010. Appendices to on-farm food safety manual, Appendix N, page 63. Version 4.1.