

Grower's guide to reducing microbial contamination of fresh cranberries



Consumption of fruits and vegetables on a per capita basis is up slightly over a decade ago. However, the incidence of food-borne illness related to consuming fresh produce is also higher. Several factors account for this increase.

With the cranberry industry exploring the use of a food safety program such as Good Agricultural Practices (GAP) in fresh fruit production, now is the time to start planning for your farm. This guide should help clarify what role GAPs will have in your fresh fruit operation.

Why are we seeing more food-borne illness related to fresh produce?

The reasons for more outbreaks of food-borne illness with fresh produce are many and varied. Americans are eating more fresh produce and a broader array of fresh produce is available in the grocery store year round. In order to supply this year-round bounty, produce is regularly shipped long distances before reaching the consumer. More produce is imported from foreign countries than a decade ago. Americans are eating more meals away from home so an outbreak in one commercial kitchen can affect many people. Sanitation in our own kitchens in many cases is not up to minimal standards.

What microbes are affecting produce? Are these new microbes or are we just looking harder for them?

Food-borne illness has usually been related to bacteria like *Salmonella* spp, *Shigella* spp, *Vibrio cholerae*, and *Giardia lamblia* and Norwalk and Hepatitis A viruses. More recently outbreaks have been associated with *Cyclospora cayatanensis*, *Cryptosporidium parvum* and *E. coli* O157:H7. Most of these species have been around for a long time, but perhaps were not common in our locale. *E. coli* O157:H7 is a new strain (serotype) of a very common environmental bacterium. The problem with this strain of *E. coli* is that it is so virulent. Very few cells are required to cause illness and the illness it causes (bloody diarrhea and kidney failure) is life threatening, especially for the weakest among us. While *Salmonella* may give otherwise healthy people an intestinal upset for a day or two, *E. coli* O157:H7 can land you in the hospital.

What can I do to make sure my produce won't make my customers sick?

Most of the practices that will reduce microbial contamination are common sense steps that you may already have in place on your farm. There is no single step that will assure the safety of fresh produce, but a series of steps taken in concert are effective at minimizing the risk. This bulletin will go through the steps that are common to production of fresh fruit cranberries. Since each operation and the details of each bog are slightly different, you will need to adapt practices to your local conditions and needs.



The chain from field to table

Produce can become contaminated at any point in production, harvest, sorting & packing, storage, transportation, marketing or meal preparation process. Think of GAP as an insurance policy. By following the guidelines of a sound food safety management program, in the event of a recall, you will be able to trace the product to the exact location it came from. This will go a long way in isolating which fruit is being recalled and which is safe, all of which means insuring more product goes to market for sale.

Two factors are critical in reducing the risk of microbial contamination. The first is to have a written plan outlining how each activity will be done and what steps will be taken to reduce risk and preserve quality. The second step is to document that the plan was followed. The checklists in this document may help you assemble your plan.



Field preparation and production checklist

- Know the history of the field.
- The fields have not been used for industrial dumping.
- Fields are upwind and upstream from animal containments.
- Can contaminated water or livestock waste access the site?
- The well has been tested for coliform bacteria.
- Upstream uses of surface waters are known and appropriate.
- Domestic animals are excluded from fields.
- Only pesticides registered for both the crop and pest are used.
- Water used for pesticide mixing and application is clean.

The Role of Good Agricultural Practices

As a result of food-borne illnesses linked to fresh fruit and vegetables in the mid-1990s, the Food and Drug Administration assembled a guidance document for reducing the possibility of microbial contamination of food. Through the Center for Food Safety and Applied Nutrition (CFSAN) and, in accordance with the USDA and the Department of Health and Human Services, a document was created that serves all of agriculture. It is these guidelines - these Good Agricultural Practices, or GAP - that form the basis of the USDA's audit for food safety.

One of the main components to any GAP or Food Safety Management Program (FSMP) is to document all manner of day-to-day tasks that we take for granted around a cranberry bed. Inspecting flumes, checking the bogs, maintenance on machines; all are items that should be documented when implementing a GAP program on your farm. Not only will the audit process go more smoothly, but by doing this you will be able to recognize what areas need improvement on your farm. Such documentation does not need to be rigorous; a simple chart with the date, time of action, and the initials or signature of the person who does the job is should suffice. The true task is being consistent with these records and getting into the routine that may be the most difficult.

Keeping all of your records in a central location is also necessary. Growers who have gone through GAP audits have found it beneficial to keep everything - all documentation, charts, application records - together in one area. We would recommend somewhere secure, like an office, and not the dashboard of your pickup! Keeping all your files together will help to make an audit a success.

Why Now?

GAP is being explored for the entire fresh fruit cranberry industry by the major handlers because their buyers are requesting that fresh fruit, and in fact, all fresh produce, carry a third-party GAP certification. The goal is to achieve compliance for all fresh fruit cranberries by the 2010 harvest.

Many of the standards that have been developed are written to apply generically to agricultural operations and in some cases, this may not be applicable to growing cranberries. Manure, for instance, while likely to be

spread on a row crop, is much less likely to be used on a cranberry bed. But being a likely culprit for microbial contamination in other fresh fruits and vegetables, it is included in most food safety management audits.

Wildlife is another concern that will raise questions in a food safety management program. It will be beneficial for fresh fruit growers to implement a wildlife pest reduction strategy and to document that the beds are regularly checked for evidence of wildlife.

Field preparation and production

Bogs that will be used to produce fresh fruit should be prepared and sited properly. It is important to know the conditions that may affect the bed. Where is it in relation to animal operations such as stables, corrals or feedlots? Is it possible for fresh manure to be blown or washed to the field? Will manure be stockpiled near the field? Will irrigation water come from ground water or surface water? If from surface water, what is upstream from the operation? Do domestic animals have access to the farm pond? If manure is stockpiled on the farm keep it distant from fresh fruit bogs and downwind and downslope from the fields as appropriate.

Water that is used for irrigation and pesticide application needs to be of appropriate quality. It is recommended that irrigation water be tested at a minimum of once per year to ensure safety from microbial contamination as well as checking the mineral makeup of the water. This is a minimal expense and is an important step to preserve the safety of your crop.

Water that is used for irrigation can come from surface or ground sources. Provided wells are in good shape and properly sited relative to septic systems and livestock yards, ground water should be free of microbes. Check well water periodically for coliform bacteria just as you would your home well. Check the casing annually to make sure it is intact and that surface runoff cannot enter the wellhead. Restrict access of livestock and wildlife to the wellhead. Abandoned wells should be properly sealed to prevent aquifer contamination from the surface and for personal safety. Your local county Extension office can provide information about proper well sealing.

Surface waters pose different issues. Because they are open to the surrounding environment, surface waters are vulnerable to contamination. There is little that can be done to assure the cleanliness and safety of surface waters, but growers can be aware of potential problems and use surface waters appropriately. Know the source of rivers and streams. Do animals upstream have access to the stream? How is the water used before it gets to your farm? Know the condition of ponds and impoundments on your farm. If fish and other plant and animal life abound in the pond the water should be acceptable for irrigation. Try to limit domestic animal access to on-farm ponds.

Be sure to scrupulously follow pre-harvest intervals for pesticides. Only use pesticides that are registered for your crop in your state. This is not only for the safety of your customers, but for the safety of you and your workers.

Worker hygiene

checklist

- Field workers have been trained in proper hygiene and handwashing techniques.
- Workers are required to wash hands at the beginning of each shift, after using the toilet, and before and after eating.
- Owners & managers set a good example of hygiene.
- Toilet and handwashing facilities are provided in the field. Paper products are replenished often.
- Workers who are ill are encouraged to not come to work or are assigned jobs with no direct contact to foodstuffs.



Harvest preparation checklist

- Storage rooms are cleaned and sanitized.
- Openings have been stopped or filled.
- Containers have been repaired and sanitized.
- Clean and/or sanitize harvest equipment.
- Harvest employees have been trained in proper hygiene.
- Toilet and handwashing facilities are available in the field. Paper products are restocked often and documented.
- Wash water is “safe and sanitary.”
- Field containers are cleaned as needed to remove mud & debris and are in good repair.



Worker hygiene

Another known source of microbial contamination to food is from field workers who have poor personal hygiene. Improving hygiene will provide perhaps the greatest benefit in reducing microbe load. The education required to improve hygiene can be difficult or socially awkward. Entrenched habits are hard to change. But the potential benefits justify the expenditure of time and effort, not only for produce, but for the long term maintenance of workers' health. Don't assume that workers know sanitation or hygiene principles or practices.

You must provide toilet and handwashing facilities in the field for field workers. Paper products must be replenished often. Potable drinking water is also required.

The single most effective and important hygiene habit is handwashing. Hands should be washed at the beginning of the work day, after using the toilet, before and after eating and after smoking. Don't assume that employees know how to wash their hands properly. Include this as part of their training. Proper handwashing requires water (warm water when possible) and soap. Proper handwashing will take at least a full minute and should

include rubbing the hands together, using a scrub brush if deeply soiled, cleaning under the fingernails and between fingers. Hands should be scrubbed or rubbed with soap for a full 20 seconds before rinsing. Hands should be fully rinsed and dried with single use towels. Handwashing facilities should be provided adjacent to field toilets. Rinsing hands briefly under water is insufficient to remove microbes. “An ounce of handwashing is worth a pound of antibiotics.” Make a schedule for worker handwashing and set an example with your own hygiene.

Some advocate wearing gloves as a precaution against spreading infection. Gloves are certainly an option to cover open wounds or lesions in addition to the required waterproof bandages. However, gloves have the same problems of spreading contamination as bare hands do unless similar handwashing practices are followed. Gloves primarily protect the worker. However, gloves do protect workers from produce equally well as they protect produce from workers. Cleanable aprons and hairnets may also be appropriate in some situations.

Sick workers, particularly those with diarrheal illness, are a prime source of contamination. Workers (and owners) should be encouraged to NOT report to work if they are ill. Since many human pathogens are fecally transmitted, people sick with diarrhea are at particular risk of passing on a pathogen. These people should not handle fresh produce until they are healthy. They may work at other non-food contact jobs.

If you contract for labor with a third party make sure your contract specifies that contracted workers will be taught and use appropriate sanitary and hygiene procedures. If you have written what the procedures are and provide it to the contractor it will facilitate adjusting the contract.

Instructions for making a 200 ppm bleach solution

To make a 200 ppm chlorine solution using water and household bleach (5.25% hypochlorite) mix ½ ounce of bleach to one gallon of hot water. Hot water 75-110°F allows the chlorine to be more active. Be sure to check the concentration of hypochlorite in the bleach. Some store brands contain only 3% hypochlorite.

Preparation for harvest

Planning and preparing is vital to a successful harvest. Prior to harvest all containers and equipment that will be used should be thoroughly cleaned and sanitized. Storage rooms, if applicable, should also be cleaned and inspected for openings that would allow rodents or birds to enter the storage. The evaporator coils should be cleaned. In addition to cleanliness, this will also improve their efficiency.

Harvest containers such as bins or boxes should be individually inspected prior to harvest. When picking up bins from your handler, make sure the bins are already clean. Loose or missing boards should be replaced and loose nails or brackets should be repaired. Heavy mud, soil or grease should be scraped off. A power washer is an easy way to remove most surface grime. The bottoms of bins should also be cleaned. A final dipping or rinse with a 200 ppm active chlorine solution will sanitize the containers (see sidebar on page 4).

Packing containers (boxes, bags, clamshells, cups) should be stored so that they do not become contaminated by bird droppings, rodents, manures or pesticides. Leave sealed boxes sealed and reseal partially used cases.

Harvest

Harvest workers should be trained in personal hygiene practices to avoid contaminating produce. Harvest workers should wash their hands as they report to work at the beginning of the day. Toilet and handwashing facilities must be provided in the field. Federal regulations require one field toilet per 20 employees or less (OSHA 1928.110). Field toilets must be within ¼ mile of the work site (or a 5-minute walk). You should have a procedure in place to document that the toilets are clean and sanitary and that paper products are replenished.

Some larger farms have put field toilets on a small trailer with a water tank containing drinking and washing water and a receiving tank for waste water. These facilities can be easily moved along with crews.

Harvest crews should be trained to harvest carefully. Produce quality is maintained by careful harvest, but cranberries that are undamaged with the skin and cuticle intact are also less prone to microbial contamination as their natural barriers are still in place. Moving produce from the field to the packing/storage/shipping area should be done carefully to avoid bruising. If field bins or boxes are stacked for transport be careful that the soil or debris on the underside of upper bins doesn't damage or contaminate lower containers. Dry harvest machines will need to be regularly cleaned and/or sanitized during the course of the harvest (see sidebar on page 4). Records should be kept of this maintenance.

Consider providing packing workers who directly contact fresh produce with hair nets and cleanable aprons.





Transport

Make sure that your clean produce is shipped to market in a clean vehicle. If you ship using your own truck make sure that the box or bed is clean. If using a “third party” shipper, inspect the inside of the truck before loading. Ask the driver what his previous load was and if the truck was cleaned before arriving at your farm. You have the right to reject dirty trucks.

Small growers need to consider what they hauled in their pickup truck prior to loading up fruit or vegetables. Did you haul pesticides, oily equipment or manure in the truck in the morning and then load up produce in the afternoon or the following morning? Were household pets in the back of the truck? Hosing out the truck before transporting produce is always a good idea.

Reusable shipping containers should be inspected to be sure they are intact and that they won't damage the produce during shipment. Open top boxes should be filled below the top of the container if they are to be stacked during shipment. This is important both for preventing bruising and keeping the outer skin intact.

Transport checklist

- Know what the previous load was.
- Check the interior of each vehicle for cleanliness before loading.
- Pre-cool vehicles prior to loading.
- Shipping containers are not overfilled and will protect, not damage, produce.

Traceback

In the event your farm is implicated in a food safety incident it will be important that your products are separated into lots. If you can separate produce by field or block and the date harvested or packed then if a recall is ordered it can be limited to produce from certain fields or specific days. **If you can't segregate your produce by lots then you face the possibility of a recall or quarantine of all your produce, not just a subset of your products.** The identifying code should be provided on each shipping container, not just to individual bins or pallets.

A simple code system could be developed by giving each block or field a letter designation and then assigning packing dates a serial number beginning with “1” or “10” on the first packing date of the season. By not directly listing the date on the package you don't disclose the amount of storage time after packing.

Traceback checklist

- Each package leaving your farm can be traced to the field of origin or date of packing.
- Records of lot numbers are maintained.

Summary

Reducing the risk of microbial contamination of fresh cranberries is everyone's job. Producers can reduce the risk of fruit becoming contaminated by knowing how the land was used before growing fresh fruit, assuring that water is appropriately clean for its intended use, using proper personal hygiene and then teaching and supporting good employee hygiene, and by maintaining proper temperatures in storage and transportation. Being careful to prevent contamination is not only good for the public, it is good business for your farm. You don't want your farm or your industry to become the “poster child” for preventing microbial contamination.

As you develop your standard operating procedures and document that these procedures were followed you may find areas where improvement is needed and can adjust your procedures. Having a plan, following the plan and documenting that the plan was followed are critical steps in ensuring the continued safety of our food supply.

In Review:

Steps for Good Agricultural Practices/Food Safety Management Program

- 1) Establish your GAP or Food Safety Management Program first.
- 2) Create a Standard Operating Procedure for your company and put in Employee Handbook.
- 3) Create a Schedule for cleaning, maintenance, inspections, etc.
- 4) Train your employees in GAP/FSMP and in proper hygiene.
- 5) Keep records of training and maintenance for audit.



Additional resources:

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- Hardenberg, R.E. and A.E. Watada. 1986. The commercial storage of fruits, vegetables and florist and nursery stocks. USDA, Agriculture handbook No. 66. 136 p.
- Jackson, G. and B. Webendorfer. 1991. How safe drinking water standards are established. University of Wisconsin-Extension. Bulletin G3338. 4 p.
- James, S. 1991. Reducing the risk of groundwater contamination by improving drinking water well conditions. University of Wisconsin-Extension. Bulletin G3536-1F.
- Kader, A. 1992. Postharvest technology of horticultural crops. University of California, Division of Agriculture and Natural Resources. Publication 3311. 296 p.
- Madison, F., K. Kelling, L. Massie and L.W. Good. 1995. Guidelines for applying manure to pasture and cropland in Wisconsin. University of Wisconsin-Extension. Bulletin A3392. 22 p.
- Mechenich, C and E. Andrews. 1997. Evaluating the condition of your private water supply. University of Wisconsin-Extension. Bulletin G3558-2. 8 p.
- U.S. FDA. 1998. "Guide to minimize microbial food safety hazards for fresh fruits and vegetables." 40 pp.
- U.S. OSHA Agricultural industry standards, Title 29 CFR 1928.
- Webendorfer, B. and G. Jackson. 1992. Drinking water contamination: Understanding the risks. University of Wisconsin-Extension. Bulletin G3339. 4 p. (The Farm*A*Syst program has a series of 10 fact sheets on maintaining water quality.)



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