



# Food safety for citrus growers and packers: an overview of good agricultural practices

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**G**ood agricultural practices (GAPs) and good handling practices (GHPs) encompass the general procedures that producers and packers of fresh fruits and vegetables should follow to ensure the food safety of their product. GAPs usually deal with preharvest practices (i.e., in the field), while GHPs cover postharvest practices, including packing and shipping. The citrus industry has adopted the term Best Management Practices (BMPs) to cover activities occurring during packinghouse operations, but it is the principles, not program names, that are of most importance. We will use the term GAPs to cover pre- and postharvest practices associated with the safe handling of produce, both fresh and minimally processed.

This article is intended to review the generally recognized principles of GAPs as they relate to citrus production, primarily at the grove level and for product that is destined for the fresh fruit market. While it is recommended that citrus for processing streams is produced under a strong GAPs program, we will focus on practices that can enhance the safety of fruit in the fresh market segment.

## ARE GAPs REQUIRED?

From a regulatory standpoint, GAPs are considered guidelines, and are therefore not mandatory for the citrus industry. However, recent produce-related foodborne illness outbreaks have encouraged several industries — notably the tomato and leafy greens sector — to adopt mandatory programs which utilize GAPs in one form or another. Some states, such as Florida and California, operating under specific Marketing Orders, may have specific requirements related to GAPs or GAPs-like programs. From a commercial standpoint, purchasing requirements and approved vendor programs may require that a particular grower or packer have a formal, documented GAPs program in place. This is often true for large, national customers, as well as for product that is intended for export to other countries. For example, GLOBALGAP is a set of food safety standards utilized by most EU countries to help ensure the food safety of produce items.

## BACKGROUND

In 1998, the U.S. Food and Drug Administration (FDA) published the Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables (also referred to as the Guide, and available at <http://www.cfsan.fda.gov/~dms/prodguid.html>).

This document was intended to assist domestic and foreign producers, packers and shippers of unprocessed or minimally processed (raw) fresh fruits and vegetables by

increasing awareness of potential foodborne hazards and providing suggestions for individual operations. The FDA stated that these guidelines were broad-based and voluntary. The topics outlined in the Guide form the basis for GAPs, as outlined below.

Concurrently, Cornell University launched a major program called the National GAPs Program (<http://www.gaps.cornell.edu/>) with the objective of serving as the main university-based clearinghouse for GAPs research and extension data. This program's Web site serves as a valuable resource about GAPs for producers, packers and trainers. Another resource for growers that is based on the Guide also can be found at the site. The document, "Food Safety Begins on the Farm – A Grower's Guide," can be downloaded from [http://www.gaps.cornell.edu/PUBS/FSBF\\_Bk\\_Eng.pdf](http://www.gaps.cornell.edu/PUBS/FSBF_Bk_Eng.pdf). This pamphlet is written in easily understood language and is available in both English and Spanish.

## GAPs TOPICS

The following GAPs statements and explanatory comments should be considered in any comprehensive produce food-safety program. Compliance with the checklist can be used as a preliminary assessment tool for individual operators. Some citrus-specific comments have been added to assist operations personnel in their assessment. These are not a formal part of the published GAPs guidelines, but represent the authors' observations in citrus groves and packinghouses.

### Water

The quality of the water used in any operation directly impacts the potential for risk of foodborne illness from the product, and must be considered in detail.

- This consideration should include flume water, processing water and water used for irrigation, mixing pesticides and other foliar-applied products, frost protection, equipment sanitation, product sanitation and cooling operations.
- The operator should be aware of the source, distribution and quality of all water utilized.
- In citrus agricultural operations, water used for makeup purposes for any spray must be of sufficient quality to not pose a food safety hazard as the spray contacts the fruit. This may require appropriate treatment of surface water prior to spray mixing procedures.

### Manure and Municipal Biosolids

Properly treated manure or biosolids can be an effective and safe fertilizer if the proper precautions are in place.

- Use treatments to reduce pathogens in manure and other organic materials. Treatments may be active (e.g., composting) or passive (e.g., aging).
- Be aware that siting manure treatment and storage sites close to fresh produce fields increases risk of contamination.
- Consider factors such as slope and rainfall and the

likelihood of runoff into fresh produce production areas.

- Use barriers or physical containment to secure storage and treatment sites.
- Organic citrus operations must follow recommended treatment and application guidelines when utilizing manure-derived fertilizers.
- In a related matter, a grove manager observing signs of domestic or feral animals in the grove (tracks, scat, animals themselves) should make every effort to exclude their presence. Feral pigs, for example, are known carriers of foodborne pathogens and have been identified as the probable cause of several produce-related illness outbreaks.

### **Worker Health and Hygiene**

Infected and/or unhygienic employees who work with fresh produce can increase the risk of transmitting foodborne illness.

- Train employees to follow good hygiene practices.
- Establish a training program about health and hygiene. Include basics, such as proper handwashing techniques and the importance of using toilet facilities.
- Become familiar with typical signs and symptoms of infectious diseases.
- Offer protection to workers with cuts or lesions on parts of the body that may make contact with fresh produce.
- Citrus harvesting contractors should address this issue with their workers, and provision should be made for excluding workers who are visibly ill from handling fruit.
- In the packinghouse, proper training and documentation should be part of worker hygiene programs. Bilingual materials are often appropriate, and are available from Florida Cooperative Extension representatives.

### **Sanitary Facilities**

Poor management of human and other wastes in the field or packinghouse can significantly increase the risk of contaminating produce.

- Toilet facilities should be properly located.
- Toilet facilities should be accessible.
- Toilet facilities and handwashing stations should be well-supplied.
- All facilities should be kept clean.

### **Field Sanitation**

Fresh produce can become contaminated from contact with soil, fertilizers, water, workers, and harvesting equipment during preharvest and harvest activities.

- Clean harvest containers or bins prior to use.
- Take care not to contaminate fresh produce that is already washed, cooled, or packaged.
- Use harvesting and packing equipment appropriately and keep it as clean as practicable.
- Assign responsibility for equipment to the person in charge.
- In addition to these guidelines, requirements for canker containment must be followed as necessary.

### **Packing Facilities**

Maintain packing facilities in good condition to reduce the potential for microbial contamination.

- Remove as much dirt as practicable outside of packing facility.
- Clean pallets, containers or bins before use; discard damaged containers.

- Keep packing equipment, packing areas and storage areas clean.
- Store empty containers in a way that protects them from contamination.
- Establish and maintain a pest control program.
- Citrus packinghouses are considered food facilities, and should be operated according to state and federal guidelines for such. Additionally, under the Bioterrorism Act of 2002, packinghouses must be registered with the FDA (see <http://www.fda.gov/oc/bioterrorism/Bioact.html> for more information on this topic, or contact the authors).

### **Transportation**

Proper transport of fresh produce will help reduce the potential for microbial contamination.

- Good hygienic and sanitation practices should be used when loading, unloading and inspecting fresh produce.
- Inspect transportation vehicles for cleanliness, odors, and obvious dirt and debris before loading.
- Avoid leaving harvested crop in the sun and maintain proper temperatures throughout the transportation process.
- Load produce to minimize physical damage.
- Additionally, final packed citrus should be shipped in clean, sanitary vehicles to warehouses or other distribution sites. Ensure sanitation is addressed in shipping and trucking contracts. Under no circumstances should fresh citrus be loaded into a vehicle that has carried or is carrying raw meat or poultry products.

### **Traceback**

The ability to identify the source of a product is an important component of food safety programs. Under the Bioterrorism Act of 2002, this is now mandatory for any shipper or packer of fresh fruits and vegetables.

- Documentation should include the source of the product, the date of harvest, farm identification and a record of who handled the product.
- The product must be traceable from the farm through the packers, distributors and transporters, and retailers.
- Technical advances in tracking technologies such as GPS harvesting systems, on-skin laser coding and radio-frequency ID devices are becoming available for growers, packers and handlers of fresh citrus to more effectively fulfill the traceback requirement.

### **SUMMARY**

As with other commodities, producers and packers of fresh citrus should follow the guidelines outlined above as much as possible. Audit tools generally follow these guidelines quite closely, although individual customers often impose requirements of their own that must be addressed. It is important to ensure the food safety of all citrus commodities in order to maintain the economic vitality of the industry and to maintain the trust of the consumer.

### **FOR MORE INFORMATION**

For questions on GAPs, or to obtain training materials, please contact any of the authors at [goodrich@ufl.edu](mailto:goodrich@ufl.edu), [keiths29@ufl.edu](mailto:keiths29@ufl.edu) or [mddanyluk@ufl.edu](mailto:mddanyluk@ufl.edu)

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