

FOOD SAFETY BEST PRACTICES: ELDERBERRY FREEZING, STORAGE, AND HOLDING



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INTRODUCTION

Freezing is a practical method for extending the shelf-life of elderberries and preserving taste, color, and nutritional value. For operations that are not able to process or sell elderberries immediately after harvest, freezing elderberries will allow these operators to make products, such as syrups, vinegars, and jams, at a later time. Additionally, freezing can be used as a step in the destemming process, as elderberries can be more easily removed from their stems when they are frozen than when they are fresh. As in other stages of elderberry handling, key steps should be taken to minimize the risk of physical, chemical, and biological contamination in food.

Freezing is not a “kill step,” a process that reduces harmful levels of pathogens in foods. Therefore, it is important to keep in mind that berries contaminated in the field, during harvest, or in post-harvest operations can introduce pathogens after thawing. You can familiarize yourself with harvest, post-harvest, and processing best practices to minimize the risk of microbial, physical, and chemical contamination by reviewing the other guides in our series:

- *Food Safety Best Practices: Elderberry Harvest*
<http://ucanr.edu/sites/Elderberry/FoodSafety/Harvest>
- *Food Safety Best Practices: Elderberry Post-Harvest Handling*
<http://ucanr.edu/sites/Elderberry/FoodSafety/Post-Harvest>
- *Food Safety Best Practices: Elderberry Drying*
<http://ucanr.edu/sites/Elderberry/FoodSafety/Drying>

*A note on elderflowers: The food safety best practices guides primarily focus on elderberry **fruit** rather than elder **flowers**. In the case of freezing, storage, and holding, the food safety principles of cleaning and sanitizing processing equipment and storage facilities apply to both elderberries and elderflowers, while freezing does not typically apply to elderflowers.*

FREEZING ELDERBERRIES

Elderberries can be frozen using quick freezing or slow freezing. With quick freezing, the temperature of the food is lowered to approximately -4°F (-20°C) within 30 minutes. For slow freezing, -4°F (-20°C) is achieved within 3 to 72 hours. For overall product quality, quick freezing is preferable to slow freezing because the food's cell membranes and texture are better preserved with quick freezing. However, blast freezers needed for quick freezing are more expensive than equipment used for slow freezing, which can be achieved with a home freezer. It is recommended that frozen products are stored at temperatures below the freezing point of water, approximately 0°F (-18°C), to maintain quality. At temperatures higher than this, products can be susceptible to freezer burn. Freezing operations should keep an appliance thermometer in their freezing compartment or freezer to check the temperature. This is important in the case of a power outage or mechanical problems.



KILL STEP

A kill step is a process between harvest and consumption that significantly minimizes the presence of any pathogens already present in food. Examples of kill steps include cooking, blanching, distilling, or pasteurizing. Freezing is not considered a kill step.

EQUIPMENT CLEANING AND SANITIZING

Freezing equipment and processing facilities should be considered potential points of cross contamination, making cleaning and sanitizing procedures important. The goal of cleaning and sanitation is to reduce the number of microorganisms (including foodborne pathogens) on equipment and in food processing facilities. Cleaning and sanitizing are NOT the same. Cleaning is the process of removing dirt, debris, and grease from an object. Sanitizing is the process of reducing or eliminating microorganisms from the surface of an object. Equipment and tools must be cleaned before they can be sanitized.

Food safety best practices and regulations provide a roadmap for minimizing the risk of contamination during freezing, storage and holding elderberries and elderflowers. Food contact surfaces that directly contact elderberries, including freezer trays, storage containers, and tables, should be cleaned and sanitized before use. Indirect food contact surfaces such as the walls and floors of a walk-in freezer or room that holds a smaller freezer should also be cleaned at regular intervals and sanitized periodically, though not as often as direct food contact surfaces.

As with other food safety best practices, it is important to establish procedures for how cleaning and sanitizing will be performed, and to keep records in a cleaning and sanitizing log that include what, how, when, and by whom. A written document detailing the steps that will be taken to complete a cleaning and sanitation task on your farm or facility can take the form of a Standard Operating Procedure (SOP). Elements of an SOP include **what** is cleaned and sanitized (e.g., freezer trays, storage containers), **how** the cleaning and sanitation will be conducted (e.g., type of sanitizing solution and process used), **who** will complete the cleaning and sanitation task, and how the task will be verified and documented (what records will be kept). SOP templates and examples are available on the Community Alliance with Family Farmers Food Safety Plan Templates webpage: <https://caff.org/organic-certification/food-safety-plan-templates/>. It is also a good idea to keep a cleaning and sanitation log documenting when the cleaning and sanitation took place (e.g., time and date). You or another person in your operation should date and initial each log entry as a verification step.

For more information about **how** to clean and sanitize, refer to an earlier guide in this series: *Food Safety Best Practices: Elderberry Post-Harvest Handling*.

COMMON FREEZING EQUIPMENT

If you are freezing and storing elderberries, it is helpful to be aware of freezer options as well as considerations for choosing the appropriate equipment. Freezer selection will be determined by the level of elderberry production, available floor space and preferred efficiency and defrosting features. Below are considerations for the type of freezing equipment you may use for your elderberry operation:

- The standard capacity of a freezer is about 35 pounds of frozen food per cubic foot of usable space.
- Freezers typically sold to consumers are less efficient in freezing food compared to equipment designed for commercial frozen food manufacturers.
- Home freezers use direct cooling systems, however the air temperature in a home freezer is much higher than a blast freezer and therefore the freezing process is slower.

With these considerations about space, efficiency, and freezing processes, we recommend evaluating different freezer options based on your needs and operations. Below are select freezer options for those with small-scale elderberry freezing operations:

UPRIGHT FREEZERS

These freezers have the same general shape and appearance as home refrigerators. Upright freezers are taller than chest freezers and open at the front. They have one or two outside doors and from three to seven shelves for storing food. Some upright freezers have drawers instead of shelves so packages at the rear can be reached promptly. Compared to chest freezers, upright freezers require less floor space, and food can be placed or removed easily. On the other hand, more cold air escapes each time the door is opened.

CHEST FREEZERS

Food is frozen in stationary air typically not circulated by fans. Chest freezers require more floor space when compared to upright freezers, lose less cold air when opened, and are more economical to buy. Chest freezers are not typically used for commercial freezing due to the slow freezing time.

REFRIGERATOR-FREEZER COMBINATIONS

This appliance has one compartment for frozen foods and another for refrigerated foods. This freezer can also be used for commercial and industrial refrigeration and freezing.

BLAST FREEZER

Compared to a standard freezer that operates at 0°C, these freezers operate at an air temperature of -30°C to -40°C to quick-freeze food. Blast freezers are typically more expensive than other freezer options.



Available space in your freezer is a consideration when freezing elderberries. While destemming frozen elderberries is generally a more time efficient process than destemming fresh elderberries by hand, the amount of space you have in your freezer may dictate the flow of your elderberry processing (Figure 1). Elderberries on the stem take up much more space than destemmed elderberries, whether you freeze them on trays in single layers or in freezer bags. On the other hand, if the elderberry harvest season coincides with a busy time on your farm and you have ample freezing space, you might consider harvesting the elderberries and leaving them on the stem in the freezer until you have time for processing. Therefore, it is worthwhile to consider your workflow and processes for harvest, destemming, freezing, and processing, particularly when working with limited freezer space.

POST-HARVEST PATHWAYS FOR ELDERBERRIES

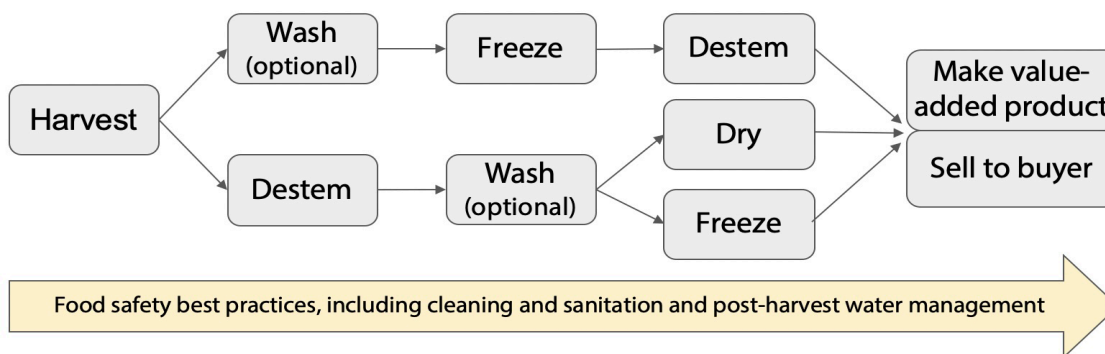


Figure 1. Consider your workflow and available freezer space when planning to harvest and process elderberries.

TIPS FOR PACKAGING & STORING

In addition to the appropriate freezing equipment, it is important to use packaging that maintains the quality of elderberries and take steps to package elderberries properly (Figure 2). Below are freezer packaging recommendations and tips for storing elderberries in the freezer.

Select packaging that is:

- Made from food-grade materials, for example:
 - » Glass canning jars
 - » Ceramic containers
 - » Plastic freezer bags
 - » Vacuum-sealed plastic bags
 - » Plastic freezer containers with tight lids
- Moisture and vapor-proof (or at least moisture-resistant) to prevent moisture loss and air from entering the container
- Durable and leak proof
- Does not become brittle and crack at low temperatures
- Resistant to oil, grease, or water
- Protects foods from off flavors and odor
- Easy to fill and seal
- Easy to label and store

Tips for freezer packaging process:

Reduce field heat of elderberries before freezing them. Methods to reduce the field heat of elderberries include rinsing elderberries or placing them in a walk-in cooler. If warm elderberries are put in the freezer, they can raise the temperature of the freezer, warming adjacent packages. If quick freezing is not an option, cool the elderberries and add a couple of bags to the freezer at a time.

Freeze elderberries in small quantities to prevent loss of quality. Smaller sizes of packages and containers freeze faster.

Use proper packaging that supports food-safe holding of frozen elderberries, and protects flavor, color, and moisture content of the elderberries while in the freezer.

Leave headspace in packaging. For any packaging used, leave ½-inch headspace to allow for the expansion of the elderberries as they freeze (Heer & Marrison, 2024). Seal tightly before freezing.

Remove as much air as possible from packaging.

Exposure to air can lead to moisture loss and result in freezer burn and loss of color, flavor, and texture (Schafer, 2021). The ice crystals in freezer burn originate from the water in the food that evaporates and freezes inside the packaging. When the air is removed from packaging, the water does not have space to evaporate.

Ensure sealing edges are free of moisture and food particles before closing freezer containers.

Freeze elderberries as quickly as possible (0°F or lower). Some home freezer manuals recommend setting the freezer temperature at the coldest setting several hours before placing foods in the freezer. Adding non-frozen food to a freezer will raise the temperature inside the freezer. A freezer thermometer can help you determine the actual temperature of your freezer.



Figure 2. Use proper packaging material to store elderberries to protect flavor, color, moisture content, and nutritive value of the elderberries. Photo by UC SAREP.

PREVENTIVE CONTROLS FOR HUMAN FOOD RULE

Food businesses that manufacture, process, pack, or hold human food for consumption are regulated by the U.S. Food and Drug Administration's Preventive Controls for Human Food Rule (PC Rule). With the PC Rule, there are different levels of compliance status – full compliance, modified requirements, partial exemption, and full exemption – and differing requirements associated with each. Compliance status depends on criteria such as the risk level of your processing activities, size of your business, gross annual sales, and the end users of your product. To determine your status under the PC Rule, corresponding requirements, and a toolkit including a sample letter, flowchart, attestation templates, and a checklist that growers can provide to their buyers to streamline the supplier verification process, we recommend reviewing: *Demystifying the Food Safety Modernization Act's Preventive Controls Rule: Supplier Verification Requirements*, <https://ucfoodsafety.ucdavis.edu/sites/g/files/dgvnsk7366/files/media/documents/FSMA-Supplier-Verification-Final-0412-21.pdf>

MONITORING AND RECORDING TEMPERATURE

Monitoring and keeping records for temperature is an important measure that can help maintain the quality of elderberries and minimize changes in their biochemical and physical properties. Records should be generated and maintained on the freezer temperature. The freezer monitoring record should be placed near the freezer and include: date, time, temperature measurements, freezer unit, and worker initials. For example, on a small-scale farm that freezes elderberries, a logbook can be kept in a desk drawer or the farm can keep a clipboard with temperature logs attached to the freezer. Temperatures of all freezer units should be monitored on a regular basis. Allow equipment to remain closed for a minimum of 15 minutes prior to reading temperature as the temperature fluctuates quickly when the door is opened. Another option that offers the advantages of continuous monitoring, high temperature alarms, and electronic data storage are data loggers. These devices measure and store temperature readings electronically.

SUPPLIER VERIFICATION

If your farm and/or processing business must be in full compliance with the PC Rule and you source fresh elderberries from a grower for freezing, you will be required to implement a supplier verification program. However, if your farm and/or processing business meets the standards for a fully or partially exempt facility, you do not need to create a supplier verification program. Regardless of your status with the rule, if you are sourcing elderberries from a grower for freezing, it is good practice to verify that the grower uses food safety practices that minimize the risk of chemical, physical, and biological contamination during production, harvest and handling, particularly since freezing on its own is not a kill step (see highlight box about kill steps, p. 2)



CONCLUSION

Freezing, which extends the shelf life of elderberries, is a useful method for preparing elderberries to be destemmed in addition to storing elderberries until they are ready for processing into value-added products such as syrups, vinegars, or jams. Freezing operations should consider their scale, efficiency, and processes when choosing freezing equipment. Following simple guidelines for using appropriate packaging can help uphold the quality of elderberries through their final use. Food safety measures that include cleaning and sanitation of equipment and contact surfaces, and supplier verification when appropriate, are essential to prevent microbial contamination and reduce the risk of foodborne illness.



RESOURCES

FOOD SAFETY REGULATIONS

Demystifying the Food Safety Modernization Act's Preventive Controls Rule: Supplier Verification Requirements. University of California Cooperative Extension, Community Alliance with Family Farmers, and Farm Commons.

<https://ucfoodsafety.ucdavis.edu/sites/g/files/dgvnsk7366/files/media/documents/FSMA-Supplier-Verification-Final-0412-21.pdf>

Food Safety Plan Templates. Community Alliance with Family Farmers. <https://caff.org/food-safety/food-safety-plan-templates/>

Value-Added On-Farm Processing: Regulatory Considerations. UC Davis Food Safety and Technology. <https://ucfoodsafety.ucdavis.edu/sites/g/files/dgvnsk7366/files/inline-files/287951.pdf>

FREEZING METHODS

Choosing containers to freeze food. Michigan State University Extension Food Preservation. https://www.canr.msu.edu/news/choosing_containers_for_freezing_food

Freezing. University of Georgia National Center for Home Food Preservation. <https://nchfp.uga.edu/how/freeze>

Freezing Fruit. Montana State University Extension MontGuide. <https://store.msuextension.org/publications/HomeHealthandFamily/MT200910HR.pdf>

How to safely freeze fruit for the best quality. University of Minnesota Extension. <https://extension.umn.edu/preserving-and-preparing/how-freeze-fruit-best-flavor>

Let's Preserve: Freezing Fruits. Penn State Extension. <https://extension.psu.edu/lets-preserve-freezing-fruits>

REFERENCES

Heer, C. and Marrison, E. (2024). Food Preservation: Freezing Fruits. Ohio State University Extension. Retrieved March 25, 2024, from <https://ohioline.osu.edu/factsheet/HYG-5349>

Schafer, W. (2021). The science of freezing foods. University of Minnesota Extension. Retrieved March 25, 2024, from <https://extension.umn.edu/preserving-and-preparing/science-freezing-foods>

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