



## How to Increase the Shelf Life of Fruit Crops Organically

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The shelf life of fruit crops is a critical factor in both commercial and home-scale fruit production. Extending the freshness and quality of fruits after harvest is essential for reducing post-harvest losses, improving profitability, and meeting consumer demand for fresh produce. While conventional methods often rely on chemical preservatives, organic methods provide a more sustainable and health-conscious approach to extending fruit shelf life. This article explores various organic techniques that can be used to enhance the shelf life of fruit crops naturally, ensuring quality and safety.

### Importance of Shelf Life in Fruit Crops

Fruits are highly perishable, with many varieties exhibiting rapid deterioration after harvest due to processes such as:

- **Respiration:** The fruit continues to metabolize after harvesting, leading to the depletion of nutrients and the generation of heat.
- **Water loss:** Fruits can lose moisture through transpiration, causing shriveling and wilting.
- **Ethylene production:** Fruits like apples and bananas release ethylene gas, which accelerates ripening and spoilage.
- **Microbial growth:** Bacteria and fungi can colonize fruits, leading to mold, rot, and other forms of spoilage.

Extending the shelf life of fruit crops not only reduces food waste but also allows farmers to access distant markets, ensures better quality for consumers, and improves profitability. Organic methods focus on maintaining or slowing down the biological processes responsible for fruit decay without relying on synthetic chemicals.

### Organic Methods to Increase Shelf Life of Fruit Crops

A. **Post-Harvest Handling and Cooling:** Proper post-harvest handling is crucial in maintaining fruit quality and extending shelf life.

- **Cool Storage:** Cooling fruits immediately after harvest is one of the most effective ways to slow down respiration, water loss, and microbial growth. Organic cooling methods like **refrigeration**, **evaporative cooling**, or **cold storage** rooms can significantly reduce the rate of deterioration.
- **Hydrocooling:** For certain fruits, especially berries, **hydrocooling** (where fruits are sprayed with or submerged in cold water) can quickly lower the temperature of the produce, preventing excessive metabolic activity and extending freshness.
- **Modified Atmosphere Packaging (MAP):** By using materials that control the levels of oxygen, carbon dioxide, and humidity, MAP slows down the ripening process and prevents spoilage. Organic MAP materials include biodegradable plastics, cellulose films, or compostable wraps.

- B. Organic Coatings and Natural Waxing:** Natural coatings and waxes are effective in providing a protective layer on fruit skins, which helps reduce water loss, prevent microbial growth, and slow down ripening.
- **Beeswax Coating:** Applying a thin layer of organic **beeswax** can provide a natural barrier that prevents moisture loss and protects the fruit from external contaminants.
  - **Citrus-Based Wax:** Citrus oils, such as those derived from lemons or oranges, can be used as natural waxes. These are rich in antioxidants and also have antimicrobial properties.
  - **Carnauba Wax:** Derived from the leaves of a Brazilian palm, **carnauba wax** is an edible, organic alternative to synthetic waxes and can be used to coat fruits like apples and pears.
  - **Chitosan Coating:** **Chitosan**, a natural biopolymer derived from the shells of crustaceans, can be used to coat fruits like strawberries, apples, and peaches. It creates a semi-permeable film that helps retain moisture, reduce oxidation, and inhibit fungal growth.
- C. Organic Preservatives and Natural Antioxidants:** Several organic substances can be used to preserve fruits naturally by preventing oxidation and microbial growth.
- **Vinegar and Lemon Juice:** A mixture of organic **vinegar** (such as apple cider vinegar) and lemon juice is an effective natural preservative. The acetic acid in vinegar and the citric acid in lemon juice can slow down the growth of bacteria and fungi.
  - **Cinnamon and Clove Oil:** Both **cinnamon oil** and **clove oil** contain antimicrobial properties that can help preserve fruits by inhibiting bacterial and fungal growth. They can be used as sprays or incorporated into coatings.
  - **Aloe Vera Gel:** Aloe vera has antimicrobial and moisturizing properties, making it an ideal organic option for preserving fruit freshness. It can be applied as a thin coating to reduce water loss and protect against spoilage.
  - **Rosemary Extract:** **Rosemary extract** is a natural antioxidant with preservative properties. It can help delay ripening by reducing the oxidation process and extending the shelf life of fruits like apples, grapes, and pears.
- D. Controlled Atmosphere and Storage Techniques:** Storage conditions are a key factor in prolonging the shelf life of fruit crops. By adjusting the atmospheric conditions under which the fruit is stored, the respiration rate and ethylene production can be reduced, thus delaying ripening.
- **Reduced Oxygen Levels:** Lowering the oxygen content in storage environments slows down the metabolic activities of fruits. For example, controlled atmosphere (CA) storage with reduced oxygen and increased carbon dioxide can help extend the shelf life of fruits like apples and bananas.
  - **Humidity Control:** Maintaining the right humidity levels in storage can reduce moisture loss and prevent wilting. However, too much humidity can promote mold growth, so it is essential to strike the right balance.
- E. Natural Fermentation and Organic Vinegar Production:** Fermentation, when controlled properly, can be a method of preserving certain fruits and extending their shelf life.
- **Fermentation for Preservation:** Some fruits, like peaches, grapes, or apples, can be fermented to make products such as organic **apple cider vinegar**, which acts as a preservative. This method can add value to fruit crops while preserving them.
  - **Fruit Pickling:** For certain fruits, pickling in vinegar (made from organic sources) is a traditional way to preserve their shelf life. The vinegar's acidity prevents the growth of spoilage-causing microorganisms.
- F. Natural Ethylene Blockers:** Ethylene is a natural gas released by many fruits that accelerates ripening and aging. Certain organic compounds can be used to block or slow down the action of ethylene:

- **1-Methylcyclopropene (1-MCP):** While **1-MCP** is synthetically produced, its use is considered "organic" in many contexts because it inhibits the effect of ethylene on fruits without directly altering the food itself. It is widely used for apple storage.
- **Plant Extracts:** Some plant extracts, such as **mint** and **oregano**, have been found to reduce ethylene production. Incorporating these extracts in storage conditions can delay ripening and extend shelf life.

### **Innovative Organic Techniques: Using Bioactive Packaging**

Bioactive packaging, made from organic materials like plant fibers, chitosan, or seaweed, is an emerging trend in sustainable fruit preservation. These materials not only protect fruits but also release antimicrobial compounds that help extend shelf life.

- **Chitosan-based Films:** Made from the exoskeletons of shellfish, chitosan-based films can be used to wrap fruits. These films are biodegradable and can slow down ripening while inhibiting mold growth.
- **Seaweed-based Packaging:** Seaweed-based packaging is an innovative alternative that helps control humidity and provides antimicrobial protection, which is beneficial for fruits like berries.

### **Conclusion**

Increasing the shelf life of fruit crops organically involves adopting practices that maintain fruit quality, reduce spoilage, and promote sustainability. By using methods such as natural coatings, proper post-harvest handling, temperature and humidity control, and organic preservatives, farmers can enhance fruit longevity without relying on synthetic chemicals. These techniques not only preserve the nutritional value and flavor of fruits but also cater to growing consumer demand for organic, environmentally friendly produce.

The shift toward organic post-harvest management practices in fruit crops is an important step toward reducing food waste and supporting sustainable agriculture. As technology advances and more research is conducted, new organic methods will continue to emerge, offering even greater potential for improving the shelf life of fruit crops.

### **References**

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