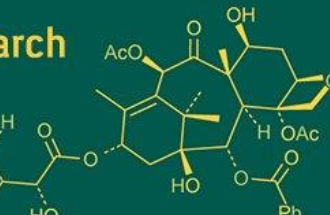
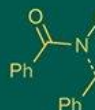
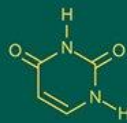
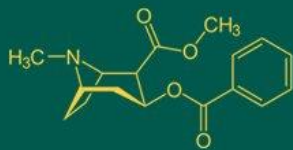


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## Post-harvest handling and value-addition of organic produce

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### Abstract

Organic farming has gained considerable popularity due to its emphasis on sustainable and environmentally-friendly agricultural practices. However, the success of organic farming largely depends on the proper post-harvest handling and value-addition of organic produce. This paper aims to explore the key aspects of post-harvest management for organic produce and the various value-addition techniques that can enhance its marketability, nutritional content, and overall quality. We will discuss the importance of post-harvest handling, challenges faced, and innovative strategies to optimize the potential of organic produce in the global market.

**Keywords:** Post-harvest handling, value-addition, organic produce

### Introduction

Organic farming has emerged as an essential practice to address concerns related to environmental sustainability, food safety, and human health. Organic produce is grown without the use of synthetic chemicals, pesticides, or genetically modified organisms, making it more appealing to health-conscious consumers. However, for organic agriculture to be economically viable, an efficient post-harvest handling and value-addition system is vital. This paper aims to shed light on the crucial role played by proper post-harvest management and value-addition techniques in maintaining the quality and enhancing the value of organic produce.

### Post-Harvest Handling of Organic Produce

Post-harvest handling of organic produce is a crucial aspect of organic farming, as it directly impacts the quality, shelf life, and marketability of organic products. Organic produce should be handled with care to maintain its organic integrity, prevent contamination, and reduce post-harvest losses (Table.1).

By following these best practices, organic farmers and processors can ensure that their organic produce remains fresh, nutritious, and safe for consumers. Proper post-harvest handling not only enhances the quality of organic products but also reinforces the trust of consumers in organic farming practices.

### Value-Addition Techniques for Organic Produce

Value-addition techniques for organic produce involve transforming raw organic products into processed goods with enhanced value, improved shelf life, and increased market appeal. These techniques aim to capitalize on the unique qualities of organic produce, ensuring that they meet consumer demands for convenience, variety, and nutritional content.

### Some common value-addition techniques for organic produce

**Drying/Dehydration:** Drying is a widely used value-addition technique for organic fruits, vegetables, and herbs. Dehydration removes moisture, inhibiting microbial growth and extending shelf life. Dried organic produce, such as dried fruits and herbs, are convenient, lightweight, and have concentrated flavours.

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**Table 1:** Practices and considerations for post-harvest handling of organic produce

| S. No. | Post-harvest practice        | Consideration  |
|--------|------------------------------|--|
| 1.     | Harvesting                   | Proper timing of harvest is essential to ensure that organic produce reaches its peak maturity and nutritional value. Harvesting should be done using clean and sanitized tools to avoid contamination                                     |
| 2.     | Sorting and Grading          | Organic produce should be sorted to remove damaged or spoiled items and graded based on size and quality. This helps in providing consistent quality to consumers and facilitates packaging.   |
| 3.     | Cleaning                     | Organic produce should be cleaned using approved organic cleaning agents or natural methods like water and vinegar to remove dirt, debris, and surface contaminants.   |
| 4.     | Cooling                      | Rapid cooling of organic produce is essential to slow down the natural aging process and minimize spoilage. Proper cooling techniques can help preserve the freshness and nutritional content of organic fruits and vegetables.            |
| 5.     | Packaging                    | Organic produce should be packed in eco-friendly, biodegradable, or recyclable materials to maintain its organic status. Packaging should be designed to protect the produce from physical damage and contamination during transportation. |
| 6.     | Storage                      | Organic produce should be stored in well-ventilated and temperature-controlled environments to extend its shelf life. Ethylene-producing fruits and vegetables should be stored separately to prevent accelerated ripening.                |
| 7.     | Transportation               | Organic produce should be transported in clean and dedicated containers to prevent cross-contamination with conventional produce or non-organic substances.  |
| 8.     | Traceability                 | Maintaining traceability throughout the post-harvest handling process is vital for organic certification. Records should be kept to track the origin, handling, and processing of organic produce.   |
| 9.     | Avoiding Synthetic Chemicals | Synthetic preservatives, pesticides, and post-harvest treatments are not allowed in organic produce handling. Instead, natural alternatives should be used to control pests and extend shelf life.   |
| 10.    | Organic Certification        | Post-harvest handling facilities and processes must be certified organic by accredited certification bodies to ensure compliance with organic standards.   |
| 11.    | Minimal Processing           | Minimal processing is encouraged in organic produce handling to retain the natural characteristics and nutritional content of the product.   |
| 12.    | Quality Control:             | Regular quality checks should be conducted to ensure that organic produce meets the required standards and is free from contamination.   |
| 13.    | Waste Management             | Organic waste generated during post-harvest handling should be managed through composting or other environmentally friendly methods.   |

**Canning and Bottling:** Canning and bottling involve sealing organic produce in jars or cans after proper processing. This method preserves the freshness and nutrients of organic fruits and vegetables, making them available year-round. Organic jams, sauces, and pickles are popular examples of canned and bottled organic products.

**Fermentation:** Fermentation is a natural value-addition process that enhances the taste and nutritional value of organic produce. Fermented organic products, such as yogurt, sauerkraut, and kimchi, contain beneficial probiotics and have increased shelf life.

**Freezing:** Freezing is an effective method to preserve organic produce while maintaining its nutritional content and taste. Organic frozen fruits, vegetables, and prepared meals are convenient options for consumers seeking organic products with longer shelf life.

**Juicing:** Organic fruits and vegetables can be juiced and bottled to create organic juices and smoothies. Juicing retains the natural vitamins and minerals present in the produce, offering a refreshing and nutritious option for health-conscious consumers.

**Organic Snack Foods:** Organic fruits, nuts, and seeds can be processed into organic snack foods like trail mixes, granola bars, and roasted nuts. These ready-to-eat snacks cater to the growing demand for healthy, organic on-the-go options.

**Freeze-Drying:** Freeze-drying is a sophisticated technique that removes moisture from organic produce while preserving its natural flavors and nutritional value. Freeze-dried organic fruits, vegetables, and snacks have a longer

shelf life and retain their original texture and taste when rehydrated.

**Organic Fruit Spreads:** Organic fruits can be transformed into spreads and preserves without the use of synthetic preservatives. Organic fruit spreads are popular for breakfast items and as toppings for various dishes.

**Organic Salsas and Dips:** Organic vegetables and herbs can be combined to create a variety of organic salsas, dips, and spreads, offering consumers flavourful and healthy alternatives to conventional options.

**Specialty Organic Products:** Unique value-added organic products, such as organic baby food, organic fruit leathers, and organic herbal teas, cater to specific market niches and consumer preferences.

By utilizing these value-addition techniques, organic producers can diversify their product offerings, increase profitability, and meet the demands of an expanding organic market. Moreover, value-addition contributes to reducing food waste and extends the availability of organic products beyond their seasonal harvests.

#### Preservatives for organic processing

In organic food processing, the use of synthetic preservatives is generally not allowed. The main principle of organic agriculture is to avoid the use of synthetic chemicals, including preservatives, pesticides, and additives. Instead, organic food processors rely on natural methods and non-synthetic substances to preserve the quality, freshness, and shelf life of organic products.

Some of the common natural preservation techniques and ingredients used in organic food processing include:

- High-Temperature Processing:** Heat treatment methods such as pasteurization and sterilization are

- used to kill or inactivate microorganisms that cause spoilage. These processes extend the shelf life of organic products without the use of chemical preservatives.
- Low-Temperature Processing:** Freezing is a popular method to preserve organic produce and products. It helps to retain the nutritional content and freshness of the food.
  - Drying/Dehydration:** Removing moisture from organic products inhibits the growth of microorganisms and prevents spoilage. Dried fruits, vegetables, and herbs are common examples of dehydrated organic products.
  - Fermentation:** Fermentation is a natural preservation technique that uses beneficial microorganisms to break down sugars and convert them into organic acids, alcohol, or gases. Fermented organic products include yogurt, sauerkraut, kimchi, and pickles.
  - Salting:** Salt is used as a natural preservative in various organic food products, such as salted fish and salted vegetables.
  - Vinegar and Citrus Juice:** The acidity in vinegar and citrus juice helps preserve organic products by creating an inhospitable environment for spoilage-causing microorganisms.
  - Sugar and Honey:** High sugar content in jams, jellies, and fruit preserves inhibits microbial growth, acting as

a natural preservative.

- Organic Essential Oils and Plant Extracts:** Some essential oils and plant extracts have antimicrobial properties and can be used in organic food processing as natural preservatives.
- Modified Atmosphere Packaging (MAP):** This method involves altering the atmosphere around the organic product, reducing oxygen levels and slowing down the growth of spoilage microorganisms.
- Vacuum Packaging:** Vacuum-sealing organic products helps in preserving their quality by removing oxygen, which slows down the deterioration process.

Organic food processors must adhere to strict organic certification standards and regulations, ensuring that only approved natural preservation techniques and ingredients are used. This maintains the organic integrity of the products, ensuring consumers that no synthetic preservatives are used in the processing of organic foods.

#### Cleaning agents for organic processing

In organic food processing, it is essential to use cleaning agents that are compliant with organic standards and do not leave harmful residues on the food products. The cleaning agents used should be natural, non-toxic, and free from synthetic chemicals (Table. 2).

**Table 2:** Some common cleaning agents suitable for organic processing

|                        |   |
|------------------------|---|
| Vinegar                | White vinegar is a natural and effective cleaning agent due to its acidity, which helps to dissolve grease, dirt, and mineral deposits.   |
| Baking Soda            | Baking soda (Sodium bicarbonate) is a gentle abrasive and an excellent natural deodorizer. It can be used to clean surfaces, equipment, and remove stains.  |
| Citrus-based Cleaners  | Citrus fruits, such as lemons and oranges, contain natural acids that have powerful cleaning properties. Citrus-based cleaners are effective for cutting through grease and grime.                |
| Hydrogen Peroxide      | Hydrogen peroxide is a natural disinfectant that can be used to sanitize surfaces and equipment in organic processing facilities.   |
| Plant-based Soaps      | Organic plant-based soaps derived from ingredients like coconut oil or olive oil are gentle yet effective for cleaning various surfaces.  |
| Alcohol                | Ethanol or isopropyl alcohol can be used as a natural disinfectant to sanitize surfaces and equipment.  |
| Salt                   | Coarse salt can be used as a gentle abrasive for scrubbing surfaces and removing stains.  |
| Organic Essential Oils | Some essential oils, such as tea tree oil, lavender oil, and eucalyptus oil, have antimicrobial properties and can be added to cleaning solutions for their pleasant scent and cleaning efficacy. |
| Castile Soap           | Castile soap is a plant-based soap made from vegetable oils, making it an ideal eco-friendly and biodegradable cleaning agent.  |
| Corn starch            | Corn starch can be used to clean windows and surfaces, as it has mild abrasive properties.  |

When using cleaning agents in organic food processing, it is essential to ensure that they are thoroughly rinsed from surfaces and equipment to avoid any potential contamination. Organic processors should also follow good manufacturing practices (GMP) and adhere to organic certification standards to maintain the organic integrity of their products and facilities.

It is important to note that specific cleaning practices may vary depending on the type of organic product being processed and the processing facility's specific requirements. Organic processors should always refer to their organic certification agency's guidelines to ensure compliance with the latest organic standards and regulations.

#### Organic certification standards for organic processed food

Organic certification standards for organic processed food are established by various organizations and government

bodies. The specific standards can vary depending on the country or region, but they generally share common principles and requirements.

Some commonly found in organic certification standards for organic processed foods are as below:

- Prohibition of Synthetic Chemicals:** Organic processed food must be produced without the use of synthetic pesticides, herbicides, fertilizers, and other artificial chemicals. This includes avoiding the use of synthetic preservatives, additives, and flavorings.
- Organic Ingredients:** Organic processed food should be made with organic ingredients that have been grown and processed according to organic principles. The use of genetically modified organisms (GMOs) is generally not allowed in organic processed food.
- Organic Processing Aids:** Processing aids used in organic food processing must comply with organic standards and should not contain synthetic chemicals.

4. **Non-GMO Verification:** Organic processed food should not contain genetically modified organisms (GMOs) and should be verified as non-GMO.
5. **Avoidance of Ionizing Radiation:** Organic processed food is typically not subjected to ionizing radiation, which is used for preservation purposes in conventional food processing.
6. **Cleaning and Sanitation:** Organic processing facilities must use approved organic cleaning agents and sanitation practices to ensure no contamination of organic products.
7. **Separation of Organic and Conventional Products:** Organic processing facilities must have measures in place to prevent cross-contamination between organic and conventional products.
8. **Traceability and Record-Keeping:** Organic processors must maintain records of all ingredients used, processing methods, and sourcing information to demonstrate compliance with organic standards.
9. **Packaging Requirements:** Organic processed food packaging should not contain synthetic materials or materials that may contaminate the organic product. Recyclable and environmentally friendly packaging is encouraged.
10. **Inspection and Certification:** Organic processed food

facilities must undergo regular inspections by accredited certification bodies to verify compliance with organic standards.

11. **Labelling:** Organic processed food should be labelled with the appropriate organic certification logo or label, indicating compliance with organic standards. Specific labeling requirements may vary based on regional regulations. Each country or region may have its own organic certification standards, and the certification process is typically carried out by authorized third-party certification bodies. These certification bodies assess compliance with organic standards and issue organic certificates to processors who meet the requirements. Organic processors must adhere to these standards to maintain the organic integrity of their products and provide consumers with reliable organic food choices.

### Market Opportunities for Value-Added Organic Produce

Market opportunities for value-added organic produce are expanding rapidly as consumer preferences shift towards healthier, convenient, and sustainable food options. Value-added organic products cater to these evolving demands by offering convenience, extended shelf life, unique flavors, and enhanced nutritional profiles (Table. 3).

**Table 3:** Key market opportunities for value-added organic produce.

| Health-Conscious Consumers      | The increasing awareness of health and wellness is driving demand for organic products that provide added nutritional benefits.                                    | Value-added organic produce, such as organic juices, smoothies, and snacks, align well with the preferences of health-conscious consumers seeking convenient and nutritious options. |
|---------------------------------|--|--|
| On-the-Go Lifestyles            | Busy lifestyles and the need for convenient food solutions are creating a demand for ready-to-eat and portable organic products                                    | Organic snack packs, pre-cut fruits and vegetables, and organic meal kits cater to consumers seeking quick and healthy choices.  |
| Premium Organic Products        | Consumers are willing to pay a premium for high-quality organic products that offer unique flavors and experiences.  | Specialty value-added organic items like artisanal jams, unique sauces, and exotic dried fruits target this premium segment of the market.   |
| Organic Baby and Kids Products: | Parents are increasingly seeking organic options for their children's diets.   | Value-added organic baby food, organic fruit pouches, and organic snacks for kids provide parents with convenient and healthy choices for their children.                            |
| Sustainable Packaging:          | As consumers become more environmentally conscious, there is a growing demand for value-added organic products packaged in eco-friendly and sustainable materials. | Packaging innovations that reduce waste and environmental impact can attract environmentally conscious consumers.  |
| Online Retail:                  | The rise of e-commerce and online grocery shopping has opened up new avenues for the distribution of value-added organic products.                                 | Organic producers can tap into the online market to reach a wider audience, especially those who may not have access to local organic stores.  |
| Functional Foods                | Value-added organic products that offer functional benefits, such as enhanced immunity, digestive health, or energy support, are gaining popularity                | Organic products fortified with superfoods, herbs, and functional ingredients appeal to consumers looking for holistic health solutions.   |

To capitalize on these market opportunities, organic producers should focus on product innovation, quality, transparent labelling, and effective marketing strategies. Understanding consumer preferences and market trends will be key to successfully positioning value-added organic products in the competitive marketplace. The growing demand for organic products has opened up significant market opportunities. Value-added organic produce, with improved taste, convenience, and nutritional content, appeals to health-conscious consumers seeking premium products.

### Challenges in Post-Harvest Management of Organic Produce

Handling organic produce poses unique challenges due to its vulnerability to spoilage, limited use of synthetic preservatives, and strict certification requirements. Factors

such as climatic conditions, supply chain inefficiencies, and lack of appropriate infrastructure can further exacerbate these challenges.

### Conclusion

Proper post-harvest handling and value-addition are integral to the success of organic farming and the growth of the organic produce industry. By addressing challenges, adopting innovative techniques, and exploring market opportunities, stakeholders in the organic sector can create a sustainable and thriving ecosystem that benefits both farmers and consumers alike. Embracing efficient post-harvest practices and value-addition will not only ensure organic produce reaches consumers in optimal condition but also strengthen the position of organic agriculture in the global market.

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