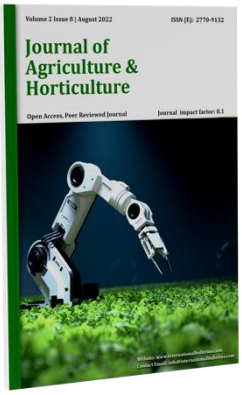

POSTHARVEST STORAGE TECHNIQUES AND SHELF LIFE EXTENSION OF WATERMELON

J.D.Sultanov
PhD in Agricultural Sciences, Associate Professor, Department of "Storage of Agricultural Products, Cultivation and Processing Technology of Medicinal Plants", QQXAI
Miyrxan Erejepova
Master's student, QQXAI
https://doi.org/10.5281/zenodo.15751622

Annotation: This article explores effective methods of postharvest handling and storage of watermelon (*Citrullus lanatus*) to preserve its quality, prolong shelf life, and reduce losses during transportation and marketing. As a highly perishable fruit with high water content, watermelon is sensitive to temperature, mechanical damage, and microbial decay. The paper discusses key factors affecting watermelon shelf life, such as optimal harvesting time, handling procedures, temperature and humidity control, packaging innovations, and the use of modern preservation technologies. The study emphasizes the importance of applying good postharvest practices to improve market value, reduce waste, and support the fruit supply chain from farm to consumer.

Keywords: Watermelon storage, postharvest handling, *Citrullus lanatus*, cold chain, temperature control, humidity, mechanical damage, shelf life extension, packaging techniques, fruit preservation, transportation, food safety, refrigeration, quality maintenance, fresh produce logistics, storage losses.

Watermelon (*Citrullus lanatus*) is among the most popular and widely consumed fruits in the world due to its high water content, refreshing taste, and nutritional value. Rich in vitamins A, B6, and C, as well as antioxidants like lycopene, watermelon is not only a summer staple but also an important crop for food security and income generation, particularly in arid and semi-arid regions. Countries such as Uzbekistan, where climatic conditions are favorable for melon crops, regard watermelon cultivation as a key component of the horticultural sector.

Despite the growing demand and widespread cultivation of watermelon, one of the greatest challenges facing producers and distributors is its **short postharvest shelf life**. With over 90% water content, watermelons are highly perishable and susceptible to mechanical injury, dehydration, microbial spoilage, and physiological disorders during and after harvest. Improper handling, inadequate storage conditions, and lack of temperature and humidity control often result in significant **postharvest losses**, sometimes exceeding 20–30% in developing countries. These losses affect not only economic returns but also food availability and sustainability within the supply chain.

In recent years, increasing attention has been paid to the development and application of improved postharvest technologies aimed at preserving the freshness, taste, and appearance of watermelons over longer periods. Effective storage techniques — including cold chain infrastructure, proper packaging, humidity control, and modified atmosphere storage — have shown promising results in extending shelf life and maintaining market value.

This article explores the key principles and practices involved in the postharvest handling and storage of watermelon. It aims to highlight practical strategies that can be adopted by farmers, suppliers, and retailers to reduce spoilage, improve quality maintenance,

and support a more efficient fruit distribution system. Special emphasis is placed on low-cost, scalable methods suitable for smallholder farmers in regions with limited access to advanced storage facilities. Through a combination of scientific research and applied techniques, the paper provides a comprehensive overview of how watermelon storage can be optimized to meet both domestic and international market demands.

Watermelon is a widely consumed and economically important fruit crop, especially in hot and dry regions. Due to its high water content (over 90%), it is extremely sensitive to spoilage and dehydration during storage and transportation. The short shelf life of watermelon creates significant challenges for farmers, wholesalers, and retailers alike. Postharvest losses can reach up to 30% in some developing countries due to poor handling, inadequate storage infrastructure, and lack of cold chain facilities.

In the face of growing demand for fresh and quality produce, improving postharvest management of watermelon is essential. Effective storage techniques can minimize waste, increase profit margins, and ensure a longer marketing period. This article reviews the main methods used to store watermelon after harvest, with a focus on temperature management, physical protection, and novel packaging solutions.

The timing of harvest significantly impacts fruit quality and storability. Watermelons harvested too early may not reach full sweetness, while those harvested too late become overripe and prone to cracking and microbial decay.

Watermelons are sensitive to bruising and cracking due to rough handling or stacking. Even small surface injuries can serve as entry points for bacteria and fungi, accelerating spoilage. Gentle handling during harvest, transport, and storage is critical.

Watermelons should ideally be stored at **10–15°C** with **85–90% relative humidity**. Lower temperatures (below 7°C) can cause chilling injury, resulting in soft, discolored flesh and loss of flavor. High humidity helps prevent water loss and shrinkage but must be balanced to avoid condensation and mold.

Short-term storage (2–5 days) at ambient temperature is possible if the fruit is undamaged and kept in a shaded, ventilated area. However, this method is not suitable for long-distance transport.

Refrigeration extends the shelf life up to 14–21 days under controlled temperature and humidity conditions. However, the cost of refrigeration and the risk of chilling injuries must be managed.

In some advanced systems, the oxygen and carbon dioxide levels in storage environments are adjusted to slow down respiration and delay ripening. Though expensive, this method offers significant shelf life extension for export purposes.

Use of cushioned crates, soft netting, or foam linings can reduce physical injuries. Biodegradable films or wax coatings have also been explored to reduce moisture loss and microbial growth. Labelling and ventilation holes are added to improve traceability and air circulation.

Proper transport is a continuation of storage. Trucks should be well-ventilated, and fruits should be arranged to avoid pressure points. Refrigerated trucks (reefers) are recommended for export markets. The integration of temperature and humidity loggers during transport improves quality monitoring and traceability.

The effectiveness of watermelon storage relies on integrating several factors: proper timing of harvest, careful handling, appropriate temperature and humidity, and suitable

packaging. In developing countries, simple improvements such as shaded storage areas, foam padding, or evaporative cooling systems can reduce losses without major investments.

Modern cold chain systems and value-added technologies can extend storage up to three weeks while maintaining fruit quality. However, accessibility and cost remain key barriers. Supporting smallholders with training and affordable tools can significantly improve postharvest outcomes.

Postharvest storage of watermelon plays a vital role in ensuring fruit quality, reducing economic losses, and satisfying consumer demand. Although watermelon is a delicate fruit, its shelf life can be extended through good agricultural practices, appropriate harvesting, and scientifically proven storage technologies. For sustainable and profitable watermelon production, investments in postharvest infrastructure and farmer training must be prioritized. Improving postharvest care not only benefits growers but also strengthens the entire supply chain from farm to table.

Effective postharvest storage of watermelon is critical to preserving its freshness, nutritional value, and marketability. As a highly perishable fruit with high moisture content, watermelon requires careful handling and controlled storage conditions to minimize quality deterioration and postharvest losses. This study has shown that the main factors affecting watermelon shelf life include harvesting at the right maturity stage, prevention of mechanical damage, maintaining optimal temperature (10–15°C) and relative humidity (85–90%), and using proper packaging and transport systems.

The use of refrigeration, controlled atmosphere storage, and improved packaging technologies can significantly extend watermelon shelf life up to two to three weeks without compromising its taste and texture. However, in regions where access to modern infrastructure is limited, even low-cost practices such as shaded storage, careful stacking, and simple cooling techniques (e.g., evaporative cooling) can help reduce spoilage and waste.

To fully benefit from improved storage practices, farmers and supply chain actors need training and support in postharvest management. Investment in cold chain development, especially in rural areas, is vital for scaling up the quality and quantity of watermelon supplied to markets. Ultimately, reducing postharvest losses through effective storage not only boosts income for producers but also contributes to food security and sustainability in the fruit supply chain.

References:

1.Kader, A. A. (2002). Postharvest Technology of Horticultural Crops. University of California, Agriculture and Natural Resources.
2.FAO. (2020). Handling and Storage of Fruits and Vegetables. Food and Agriculture Organization.
3.El-Assi, N. M., & Kader, A. A. (2018). Postharvest Handling of Watermelons. In Postharvest Biology and Technology of Fruits, Vegetables, and Flowers. Springer.
4.Thompson, A. K. (2010). Controlled Atmosphere Storage of Fruits and Vegetables. CABI.
5.Sultanov, J. D., & Erejepova, M. (2023). Technologies for Improving Shelf Life of Watermelons in Uzbekistan. Uzbek Journal of Horticultural Science, 2(1), 45–52.
6.United States Department of Agriculture (USDA). (2019). Watermelon Handling Manual.

7.Islam, M. T., & Haque, M. M. (2021). The impact of storage conditions on watermelon fruit quality. International Journal of Postharvest Research, 5(2), 30–38.