

Effects of Drying Methods on the Physico-chemical and Sensory Properties of Mango (*Mangifera indica*)

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INTRODUCTION

Mango (*Mangifera indica*) is often referred to as the "King of Fruits" due to its delicious flavor, nutritional richness, and versatility in culinary applications. This tropical fruit is enjoyed by millions worldwide, both fresh and in various processed forms. One of the most common methods for preserving mangoes is drying, which extends their shelf life while retaining their essential qualities. However, the choice of drying method can significantly impact the physico-chemical and sensory properties of dried mangoes. In this article, we delve into the effects of different drying methods on mango, considering both its chemical composition and sensory attributes.

The importance of drying in mango preservation

Drying is an ancient food preservation method that involves the removal of moisture from food products, thereby inhibiting the growth of spoilage microorganisms and preserving the food's nutritional content. In the case of mangoes, drying allows for the long-term storage of this seasonal fruit, making it available year-round. It also reduces the fruit's weight and volume, making it easier and more cost-effective to transport.

Mangoes are rich in essential nutrients, including vitamins (such as vitamin C, vitamin A, and B vitamins), minerals (like potassium and magnesium), and dietary fiber. Additionally, they are renowned for their delightful aroma, vibrant color, and unique sweet-tangy flavor. The challenge in drying mangoes lies in preserving these nutritional and sensory qualities.

DESCRIPTION

Common drying methods for mangoes

Several drying methods are commonly employed for mangoes, each with its own advantages and drawbacks. The choice of drying method depends on factors like climate, available resources, and desired end-product characteristics. The most frequently used drying methods for mangoes include:

Sun drying: Sun drying is the traditional method of mango drying. It involves spreading mango slices or pieces on trays or mats under direct sunlight. While cost-effective and environmentally friendly, sun drying is highly dependent on weather conditions and can lead to longer drying times, increasing the risk of spoilage.

Solar drying: Solar drying is an improved version of sun drying, utilizing solar energy to accelerate the drying process. Solar dryers consist of trays or racks placed in a closed box with a transparent cover to trap solar heat. Solar drying offers better control over environmental conditions, resulting in faster and more consistent drying.

Hot air drying: Hot air drying involves the use of heated air to remove moisture from mango slices. It is a controlled drying process with adjustable temperature and humidity conditions. Hot air drying is efficient and allows for precise control over the drying parameters, reducing the risk of nutrient loss.

Freeze drying: Freeze drying is a more advanced and expensive drying method. It involves freezing the mango slices and then subjecting them to a vacuum, which causes the frozen water to sublimate directly into vapor. This method preserves the fruit's color, flavor, and nutritional content exceptionally well but is not as widely accessible due to its cost.

Effects of drying methods on physico-chemical properties

Drying methods can significantly impact the physico-chemical properties of dried mangoes. These properties include moisture content, texture, color, and nutrient retention. Let's explore how different drying methods affect these aspects:

Moisture content: The moisture content of dried mangoes is a critical factor in determining their shelf stability. Sun drying and solar drying often result in higher moisture content compared to hot air drying and freeze drying. Excessive moisture can lead to mold growth and reduced shelf life.

Texture: The texture of dried mangoes is influenced by drying methods. Sun-dried mangoes tend to be chewier and have a

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more leathery texture due to the prolonged exposure to air and sunlight. Hot air drying and freeze drying preserve a more tender and crisp texture.

Color: The color of dried mangoes is another crucial quality parameter. Sun drying may lead to darkening of the fruit's color due to prolonged exposure to sunlight, whereas hot air drying and freeze drying better retain the fruit's vibrant orange-yellow color.

Nutrient retention: Different drying methods can affect the retention of essential nutrients. Freeze drying is known for preserving the highest levels of vitamins and minerals, followed by hot air drying. Sun drying, due to its extended drying period, may result in significant nutrient losses, especially in heat-sensitive vitamins like vitamin C.

Effects of drying methods on sensory properties

The sensory properties of dried mangoes, including aroma, taste, and overall acceptability, play a pivotal role in consumer preference. The choice of drying method can influence these sensory attributes:

Aroma: The aroma of dried mangoes is a significant sensory attribute. Sun drying often enhances the development of a unique sun-dried aroma, which some consumers find appealing. In contrast, hot air drying and freeze drying may retain the fruit's natural aroma more effectively.

Taste: The taste of dried mangoes is influenced by the concentration of sugars and acids. Sun drying can lead to a higher concentration of sugars due to prolonged exposure to sunlight, resulting in a sweeter taste. Conversely, hot air drying and freeze drying better preserve the natural balance of sweetness and acidity.

Overall acceptability: The overall acceptability of dried mangoes depends on a combination of factors, including texture, flavor, and appearance. Consumer preference varies, with some individuals favoring the unique characteristics of sun-dried mangoes, while others prefer the milder and more consistent attributes of hot air-dried or freeze-dried mangoes.

Factors influencing drying method selection

Choosing the appropriate drying method for mangoes depends on several factors, including:

Climatic conditions: The local climate can significantly impact the choice of drying method. In regions with ample sunlight,

sun drying or solar drying may be viable options. In contrast, regions with high humidity or unpredictable weather may benefit from hot air drying or freeze drying.

Resource availability: The availability of resources, such as electricity and refrigeration, can influence the choice of drying method. Hot air drying and freeze drying require access to electrical power and refrigeration, which may not be readily available in some areas.

Product quality and market demand: Consideration must be given to the desired product quality and consumer preferences. If there is a demand for unique sun-dried mangoes with distinct sensory attributes, sun drying may be preferred. However, if consumers seek standardized, high-quality products, hot air drying or freeze drying may be more suitable.

Cost considerations: The cost of implementing different drying methods can vary significantly. Sun drying and solar drying are generally the most cost-effective methods, while freeze drying is the most expensive due to its energy-intensive nature and equipment costs.

CONCLUSION

Drying is an essential preservation method for mangoes, allowing consumers to enjoy this delectable fruit year-round. However, the choice of drying method can significantly influence the physico-chemical and sensory properties of dried mangoes. Each method has its advantages and drawbacks, making it essential to consider local conditions, resource availability, and consumer preferences when selecting the most suitable drying method.

Sun drying, solar drying, hot air drying, and freeze drying each offer unique advantages and challenges, impacting moisture content, texture, color, nutrient retention, aroma, taste, and overall acceptability. Ultimately, the goal is to strike a balance between preserving essential nutrients and sensory attributes while ensuring the product's shelf stability.

As consumers continue to seek nutritious and flavorful food options, understanding the effects of drying methods on mango quality becomes increasingly important. Researchers and food producers must continually innovate and adapt drying techniques to meet both consumer demands and global food preservation challenges. In doing so, we can ensure that dried mangoes retain their status as a delicious and nutritious tropical treat enjoyed worldwide.