



The Effect Of Cold Temperatures On The Preservation Of Mangoes

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Abstract. The phenomenon of mangoes being easily damaged due to high water content requires a preservation method to extend their shelf life without losing their nutritional qualities. The purpose of this study is to examine the effect of cold temperatures on the physical quality of mangoes, including taste, texture, color, and aroma. The study was conducted using a qualitative experimental method with organoleptic tests on four treatment groups: whole mangoes and slices at cold temperature ($\pm 4^{\circ}\text{C}$) and room temperature ($\pm 23^{\circ}\text{C}$). The assessment is carried out subjectively using a scale for each physical quality parameter. The findings of the study proved that storage at low temperatures for six days slowed down the decay and retained the texture of the mango but led to a decrease in sweetness, aroma intensity, and a paler color change. In contrast, storage at room temperature retains taste, color, and aroma better, although the texture is slightly coarse. Mango slices are more susceptible to damage than whole mangoes at both temperatures. This research provides recommendations for mango storage methods, namely room temperature to maintain the natural quality of the fruit in a short time and cold temperature as a temporary alternative to slow down damage.

Keywords: Mango, preservation, storage, cold temperature, room temperature

INTRODUCTION

Mango (*Mangifera indica L*) is a fruit native to India that has spread throughout Southeast Asia, including Indonesia. Mangoes usually grow well in areas that have hot weather, but growing mangoes can still be done in highland places with moderate weather. Mangoes have various different types based on the shape, size, and color of mangoes. Mangoes are often used as processed foods because they have a sweet and sour taste at the same time when tried. The content of mangoes includes water content percentage of 80%, sugar content percentage of 15-20%, and

vitamins including vitamins A, C, B1, and B2 (Arsyad & Lorongasal, 2022); (Jamaludin, 2021); (Tsania, 2021).

Mangoes are rich in vitamins and minerals, but they have a weakness in the form of perishable properties that cause their shelf life to be short. To overcome this, preservation methods are needed, one of which is the freezing technique, to extend the shelf life. Freezing techniques help maintain the quality and freshness of fruit without losing its nutritional benefits (Amiarsi & Mulyawanti, 2013).

As we know, mangoes are a seasonal fruit that is very familiar to the people of Indonesia. Mango plants are optimal for growing in lowlands at altitudes of 0-500 meters, hot temperatures, sandy soils, and open areas (Bagus & Imron, 2018); (Tsania, 2021). Mango (*Mangifera indica L*) is a fruit from India that has spread throughout Southeast Asia, including Indonesia. Mangoes usually grow well in areas that have hot weather, but growing mangoes can still be done in highland places with moderate weather. Mangoes have various different types based on the shape, size, and color of mangoes. Mangoes are often used as processed foods because they have a sweet and sour taste at the same time when tried. The content of mangoes includes water content with percentage of 80%, sugar content percentage of 15-20%, and vitamins including vitamin A, vitamin C, vitamin B1, and vitamin B2 (Arsyad & Lorongasal, 2022); (Jamaludin, 2021). The study focused on mangoes, which are perishable foods due to their high water content. The water content triggers enzymatic activity and the growth of microorganisms, so the shelf life of mangoes is relatively short. Therefore, to increase the shelf life of this food, preservation is carried out using low temperatures (Ummah, 2019).

However, until now, studies that specifically examined the preservation by freezing of mangoes have been so limited that nutrient-rich manganese will lose their nutritional content if preserved in the wrong way. Previous studies have mostly focused on mango preservation methods through processing into syrup. Mango syrup is a beverage product produced from the processing of ripe mangoes or the liquefaction of mango juice concentrate without fermentation, which is preserved with or without the addition of permitted food ingredients. This results in the loss of some of the nutritional content in mangoes due to the presence of additives that damage the mango content, so the journal of mango preservation by freezing is very important to maintain the nutritional value of mangoes for consumption purposes (Masriatini, 2018).

METHOD

This study uses a qualitative experimental method, where the effect of cold temperature on the durability of mangoes will be tested under controlled conditions. The analysis to be carried out is an analysis of the taste, texture, color, and aroma of the mango, with the independent variables being the storage temperature of the mango ($\pm 4^{\circ}\text{C}$ and $\pm 23^{\circ}\text{C}$) and the storage method of the mango (whole and sliced), the bound variable is the physical quality (aroma, color, texture, and taste). The following are the details of the mango used as test material:

1. Whole mangoes (unpeeled) placed in low temperature ($\pm 4^{\circ}\text{C}$)
2. Mango slices placed in cold temperature ($\pm 4^{\circ}\text{C}$)
3. Whole mangoes (unpeeled) placed at room temperature ($\pm 23^{\circ}\text{C}$)
4. Mango slices placed at room temperature ($\pm 23^{\circ}\text{C}$)

This experiment was carried out on November 14-19, 2024, at the residence of one family, Jl. Kebun Rumpit RT 02/08 055B, Baros Village, Central Cimahi District, Cimahi City. The main ingredient of this study is mangoes. The study used tools in the form of knives, closed containers, refrigerators, and temperature gauges. The analysis was carried out using the organoleptic test method, which is a test based on the sensory process. (Arziyah et al., 2022). The results of testing using this method are subjective because the results of the assessment will depend on the person who will test this mango.

The assessment scale of the mango organoleptic test felt and seen by the examiner.

Research table

Mango condition	Organoleptic Test Scale			
	Taste	Color	Aroma	Texture
Intact at room temperature				
Whole at cold temperatures				
Slices at room temperature				
Slices at cold temperatures				

Information:

Scale							
Taste		Color		Aroma		Texture	
Scale	Information	Scale	Information	Scale	Information	Scale	Information
3	Sweet	3	Bright yellow	3	Strong	3	Smooth and chewy
2	Sweet, Slightly Bitter/Bland	2	Faded/pale yellow	2	Less powerful	2	A little rough
1	Bland/Bitter	1	Dull yellow (brown spots)	1	Rotten and unpleasant	1	Hard/Soft

DISCUSSION

The analysis was carried out using the organoleptic test method, which is a test based on the sensory process. (Arziyah et al., 2022) The results of testing using this method are subjective because the results of the assessment will depend on the person who tests this mango.

The analysis will be carried out of the taste, texture, color, and aroma of mangoes. Several forms of mangoes will be tested at different temperatures; here are the details:

1. Whole mangoes (unpeeled) placed in a low temperature (4°C)
2. Mango slices placed in cold temperature (4°C)
3. Whole mangoes (unpeeled) placed at room temperature (23°C)
4. Mango slices placed at room temperature (23°C)

The examiner felt and saw the mango organoleptic test assessment scale.

Research Table

The condition of unpeeled mangoes (whole)

Mango Condition	Organoleptic Test Scale			
	Taste	Color	Aroma	Texture
Intact at room temperature	3	3	3	2
Whole at cold temperatures	2	2	2	1

Whole mangoes at room temperature have sweet taste qualities, a bright yellow color, a strong mango aroma, and a slightly rough texture. At cold temperatures, they have a rather bland quality, a pale yellow color, a less strong aroma, and a hard texture.

Condition of peeled mangoes (whole)

Mango Condition	Organoleptic Test Scale			
	Taste	Color	Aroma	Texture
Slices at room temperature	0	2	2	2
Slices at cold temperatures	2	1	2	1

Mango slices at room temperature cannot be consumed; this is due to the condition of the mango, which has been contaminated with microorganisms so that it is not suitable for consumption, for the color is dull yellow, and there are brown spots; the smell is rotten and unpleasant, and for the texture itself is mushy.

Information:

Scale							
Taste		Color		Aroma		Texture	
Scale	Information	Scale	Information	Scale	Information	Scale	Information
3	Sweet	3	Bright yellow	3	Strong	3	Smooth and chewy
2	Sweet, Slightly Bitter/Bland	2	Faded/pale yellow	2	Less powerful	2	A little rough
1	Bland/Bitter	1	Dull yellow (brown spots)	1	Rotten and unpleasant	1	Hard/Soft

CONCLUSION

Preserving ripe mangoes at $\pm 4^{\circ}\text{C}$ for 6 days helps maintain the ripeness rate and slow down the decay process in the mangoes. This storage helps to maintain the texture of the fruit so that it remains soft and fresh. However, there are some negative impacts of storage at low temperatures, especially on the fruit's visual characteristics, taste, and aroma. The change that occurs is that the color of the mango becomes paler, thus reducing its visual appeal. In addition to the color change, cold temperatures also affect the typical sweetness of mangoes, which tends to decrease in intensity. The fresh and distinctive aroma of this fruit also weakens over time.

So, to maintain the quality of mangoes, it is recommended that they be stored at room temperature. Storage at room temperature tends to be better to maintain the natural quality of

mangoes. At room temperature, the distinctive aroma of mangoes remains strong, the natural sweetness is maintained, the texture of the fruit remains soft and fresh, and the color of the mango flesh does not change significantly. Cold storage can be a temporary alternative, but it is not effective in the long term. Storage at room temperature cannot be done for too long a period because the fruit will rot.

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