

Analysis of Almond Milk Quality at ABC MSME Yogyakarta

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ABSTRACT

Milk is a secretion from mammals that has a function as a source of nutrition. The presence of lactose in milk causes some to be deprived of milk because of lactose allergies. Dairy product for those who are allergic to milk is to consume vegetable milk, such as almond milk. The almond milk produced by Micro Small and Medium Enterprises (MSME) ABC is raw almond milk, which have short shelf life. Quality analysis is a step made to achieve and maintain the desired standards of taste, odour, color and texture. This study contribution to investigate the quality of almond milk after five days of storage. In MSME ABC, quality analysis is done by sensory test and compared with the quality standards set by MSME ABC. The quality of the almond milk analysis takes five days, with three different batches. Data retrieval methods conducted with secondary and primary data. After analysis, obtained data of almond milk on day 5 of storage was devalued. The conclusion of the observations made is that almond milk changes in flavor, color, scent and texture parameters after 5 days of storage.

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1. INTRODUCTION

Milk is a liquid secreted from mammals which has a function as a source of nutrition. Milk consists of water, fat, minerals and protein. The presence of lactose in milk causes some people to be unable to consume milk due to an allergy to lactose. One of the safe dairy products for people who are allergic to milk is to consume plant-based milk (Pointke et al., 2022; Yenew et al., 2022).

Vegetable milk is a beverage based on plant-based food stuffs which belongs to non-dairy milk like drink such as soy milk, green bean milk and almond milk (Sentana et al., 2017). Nuts have high protein so they can be used as raw material in the manufacture of

vegetable milk. Vegetable milk, namely milk derived from nuts and cereals (Larosta et al., 2019). According to Pointke et al., (2022), vegetable milk is rich in vitamins and minerals such as vitamin E, B, antioxidants, phosphorus, and isoflavones. One example of vegetable milk is almond milk.

Almonds is a type tree nuts which has a slightly sweet and tender savory taste. The savory taste of almonds comes from the high vegetable fat content. Almonds rich in nutrients, in 100 g contains total vegetable fat of 49.9 g, dietary fibre 12.2 g, vitamin B 4.7 mg, vitamin E 25.63 mg, high Ca, K and P respectively 269,481 and 733 mg (United States Department of Agriculture National Nutrient Database, 2016). Almonds has good nutritional content for the body, such as vitamin E which functions as an antioxidant, vitamin D functions for bone health, protein, fibre, protein, and calcium (Maguire et al., 2004).

Almonds divided into two namely nuts almonds sweet and bitter. The most widely consumed are almonds sweet. Whereas almonds bitter is used in the manufacture of oils and aromas almonds (Astawan, 2009). When compared with almonds sweet, almonds bitter has a different shape that is wider and shorter (Banjanin et al., 2021).

Quality control analysis is a process that starts from material quality standards, production process standards, finished goods, to final product delivery standards to consumers (Vanga et al., 2020). According to Farag et al., (2023), quality or product quality is an important key to success in an industry. Quality control must be carried out from the beginning of the production process to distribution to improve consumer trust, increase product safety guarantees, prevent many damaged products and prevent wastage of costs due to losses.

Analysis of the quality of shelf life in MSME ABC was carried out using the organoleptic method. According to Manzoor et al., (2021), test organoleptic or sensory evaluation is a scientific measurement carried out by panellists in measuring and analyzing a food ingredient that is received by the five senses such as aroma, taste, texture and color. In this test, it was carried out by 3 panelists for 5 days and the test was carried out during working hours. Panelists are people who provide an assessment of a product.

Quality analysis is an effort made to achieve and maintain the planned taste, aroma, color and texture standards. The purpose of observing quality analysis is to determine the resistance of almond milk. At MSME ABC, quality analysis is carried out by directly tasting the products that have been produced and compared with the quality standards set by MSME ABC.

2. MATERIALS AND METHODS

2.1. Material

The material used in this research is almond milk from MSME ABC.

2.2. Research Methods

The procedure for making almond milk at MSME ABC is:

- a. Sorting is done by selecting almonds intact and bright in color.
- b. Soaking is carried out for 8 to 12 hours which aims to remove the dust that sticks to its almonds. Immersion almonds done using mineral water until the whole almonds soaked in mineral water so it doesn't get stale quickly and then covered with aluminium foil.
- c. Washing almonds done using mineral water by dipping it in mineral water 2 to 3 repetitions or until the color of the water is not cloudy. In one washing process, almonds weighed at 300 g.
- d. Almonds which have been washed clean, then weighed so that the taste of the milk

is carried out almonds stay consistent. Almonds weighed as much as 300 g for one production. Weighing was also carried out on 5 g of lecithin, 30 g of honey, 2 g of Himalaya, and 800 mL of mineral water. Almonds and the additional ingredients that have been weighed are then put inside freezer.

- e. Smoothing almonds done for 2 minutes by adding additional ingredients such as honey, lecithin, mineral water, and Himalayan salt. Tools used in the smoothing process almonds namely the Getra Blender KS-778.
- f. Filtering is done using a filter cloth in stage 1 and then filtered again using an aluminium filter.
- g. Milk almonds bottled temporarily and refrigerated at 2°C for at least 15 minutes. The cooling aims to maintain the quality and quality of milk almonds.
- h. Packaging is done using bottles. Packaging bottles have four sizes, namely 100 ml, 250 ml, 500 ml and 1 liter. Almond milk which has been cooled, then packed using bottles. The packaging used is a plastic bottle with PET material (Polyethylene Terephthalate) because it can keep the milk from damp, keep the milk from bacterial contamination. Once packed, milk almonds stored inside freezer so as not stale.
- i. Almond milk that has been packaged must be stored on freezer so as not stale. Milk almonds stored in freezer can last up to 10 days.

The research method used is primary data and secondary data which includes interviews, observation, and documentation.

3. RESULT AND DISCUSSION

Almond milk is good to consume it raw, because it does not undergo a cooking process so that the nutrients are maintained. However, almond milk which do not go through the cooking process have short shelf life (Wang et al., 2022). When at room temperature, almond milk only last for 3 hours, if stored in the refrigerator can last for 3 to 4 days. However, when saved on freezer can last for 7 to 10 days. According to Pendyala et al., (2022), the high nutritional value content causes milk to be a medium for microbial growth and development, so that milk cannot last long if it is not properly processed.

MSME ABC has predetermined quality standards, such as the taste of almond milk namely normal or savory, not overpowering aroma, yellowish white color and semi-thick texture. The requirements for vegetable milk are that it is free of odour, unpleasant taste and has appropriate stability (does not precipitate or clot) (Manzoor et al., 2021). The unpleasant odour is caused by the activity of the lipoxygenase enzyme which can catalyse the oxidation reaction of unsaturated fats into hydroperoxides which can be broken down into short chain aldehydes and ketones. Hydroperoxides can interact with amino acids to form volatile compounds with an unpleasant odour (Drewnowski, 2022).

Based on Table 1. parameters of taste, aroma, color, and texture of almond milk changed after 5 days of storage at 2°C. The taste of almond milk at day first and second did not change. On the third and fourth day it changes to slightly sour, then on the fifth day it also changes to acid. According to Iorio et al., (2019), the microbes found in almond milk able to utilize the source of sugar in almond milk so that more of these acids will be formed over the length of the storage process.

Almond milk odor at the first and second day did not change. On the third and fourth day the aroma changes to a little pungent, then on the fifth day the aroma changes to sting. According to Guimarães et al., (2018), the longer the storage process, the microbial growth also increases and forms an unpleasant odour.

Color in almond milk on the first, second day, no change. On the third and fourth day the color changes to pale yellowish white. Then on the fifth day it also changes color to

yellowish. This can happen because of the length of the milk storage process almonds.

Milk texture almonds the first and second day did not change. On the third and fourth day the texture changes to become thick, then on the fifth day the texture changes to a little lumpy. According to Manzoor et al., (2021), low temperature storage will cause an increase in milk viscosity due to lumps. The higher the temperature, the viscosity of the milk will decrease, and the lower the temperature, the viscosity of the milk will increase (Comak Gocer & Koptagel, 2023).

Table 1. Decline in milk quality almonds for 5 days in MSME ABC at 2°C

Days	Information			
	Flavor	Aroma	Color	Texture
1	3	3	3	3
	3	3	3	3
	3	3	3	3
2	3	3	3	3
	3	3	3	3
	3	3	3	3
3	2	2	2	2
	2	2	2	2
	2	2	2	2
4	2	2	2	2
	2	2	2	2
	2	2	2	2
5	1	1	1	1
	1	1	1	1
	1	1	1	1

Information:

a. Flavor

1 = sour

2 = slightly sour savory

3 = savory

b. Aroma

1 = stings

2 = slight sting

3 = no sting

c. Color

1 = yellowish

2 = pale yellowish white

3 = yellowish white

d. Texture

1 = slightly lumpy

2 = thick

3 = semi-condensed

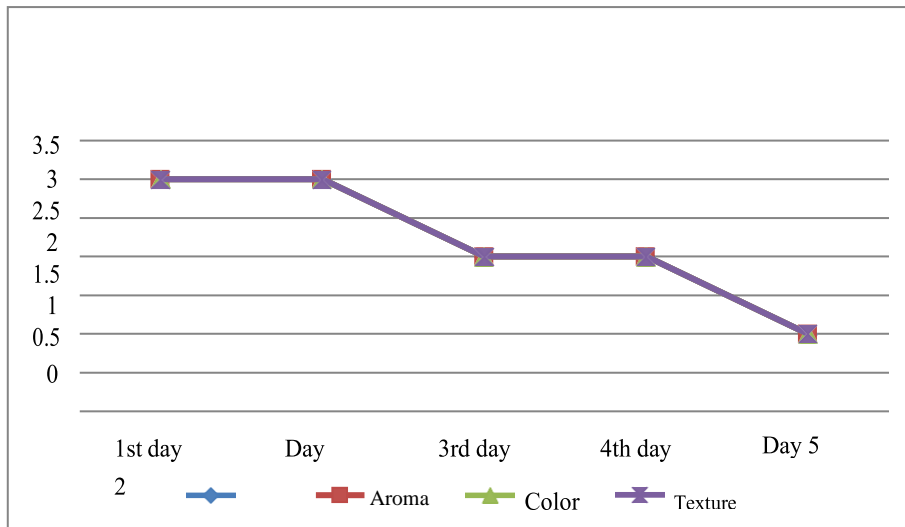


Figure 1. Diagram of decreasing milk quality almonds during 5 days of observation

Table 3. Requirements for the quality of vegetable milk according to SNI (Indonesian National Standard)

No	Test Criteria	Unit	Requirements	
			Milk (Milk)	Drink (drink)
1	Condition	-		Normal
1.1	Smell	-	Normal	Normal
1.2	Flavor	-	Normal	Normal
1.3	Color	-	Normal	Normal
1.4	Texture	-	Normal	Normal

Table 2. Conformity of vegetable milk with conditions according to SNI

Day	Observations at ABC SMEs				Compliance with the Terms according to SNI			
	Flavor	Aroma	Color	Texture	Flavor	Aroma	Color	Texture
1	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
2	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
3	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
4	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
5	SR	S	Y	LA	NA	NA	NA	NA
	SR	S	Y	LA	NA	NA	NA	NA
	SR	S	Y	LA	NA	NA	NA	NA

Table 3. Conformity of the results of observations with the MSME ABC standard

Day	Observations at MSME ABC				Compliance with MSME's Standards ABC			
	Flavor	Aroma	Color	Texture	Flavor	Aroma	Color	Texture
1	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
2	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
	TS	NS	WY	ST	A	A	A	A
3	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
4	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
	TLS	LS	PY	T	NA	NA	NA	NA
5	SR	S	Y	LA	NA	NA	NA	NA
	SR	S	Y	LA	NA	NA	NA	NA
	SR	S	Y	LA	NA	NA	NA	NA

Information:

A = appropriate

N = not appropriate

T = thick

ST = semi thick

LA = little agglomerate

WY = white yellowish

PY = pale white yellowish

Y = yellowish

LS = little sting

NS = not sting

S = sting

TS = tasty

SR = sour

TLS= tasty little sour

Based on the results and discussion, almond milk after 5 days of storage, the quality has decreased so that it cannot be consumed because it is not in accordance with the standards set by MSME ABC and the requirements for vegetable milk according to SNI. The requirements for vegetable milk according to SNI (1995) are normal taste (savory), normal color (yellowish white), normal aroma (free of odour), and normal texture (does not precipitate and does not clot). A decrease in quality can be influenced by several factors, such as the difference between room temperature and refrigerator temperature, the method of sterilizing bottles and the tools used during the milk production process are not quite right. In addition, full refrigerator conditions and unstable temperatures can also affect the quality of almond milk.

According to Comak Gocer & Koptagel (2023), states that poor milk storage will cause vegetable milk to contain microorganisms that can cause disease. Raw vegetable milk, should be stored at low temperatures. Good storage is a system that can be regulated such as storage temperature and humidity, so that it is able to retain the nutrients in it. Low temperature storage can inhibit microbial growth in almond milk. In addition, the condition of a full refrigerator can also affect the quality of almond milk, because milk has the property of easily absorbing odours, so if there is a strong-smelling food ingredient it can change the aroma of the milk (Huang et al., 2023).

Improper method of sterilizing packaged bottles can also affect the quality of almond milk. Packaging made from plastic with the type PET (Polyethylene Terephthalate), is a plastic packaging that can be softened at 80°C. So, how to sterilize milk bottles almonds just rinse with warm water. In addition, improper storage of packaged bottles, such as being stored together with other foodstuffs at 2°C, can also affect the quality of almond milk (Mazzaglia et al., 2020).

4. CONCLUSIONS

Based on the analysis of the quality of the final product at MSME ABC, the quality of almond milk in MSME ABC after 5 days of storage at 2°C showed a decrease. Almond milk cannot be consumed on the 5th day after production because it does not comply with the quality standards set by MSME ABC, such as savory taste, non-stinging aroma, yellowish- white color, and semi-condensed texture.

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