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Organoleptic quality of pasteurized milk with addition Binahong leaf extract (*Anredera cordifolia* (Ten) Steenies) during storage

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Abstract. Organoleptic is a study of the use human senses to measure panelist acceptance of a food product which includes aroma, flavor, texture, color and level of preference. The purpose of this research is to contain the quality of pasteurized milk during storage, with the addition of binahong leaf extract including the level of preference, aroma and color of pasteurized milk. The research used a completely randomized design (CRD) factorial pattern with 2 (two) factors, namely the first factor (A) is the concentration of the addition of binahong leaf extract (0, 4, 5, and 6%) and the second factor (B) is the storage time (0, 3, 6 and 9 days). The treatment of repeated 3 times. The result is that concentration of binahong leaf extract storage time, and interaction between the two treatments had a very significant effect on the level of preference, aroma and color of pasteurized milk.

1. Introduction

Dairy products that use processing and heating at certain temperature and time are pasteurized milk [1–3]. The principle of pasteurization aims to kill pathogenic bacteria, that can affect the quality of the physical and chemical properties of milk. Shelf life of the pasteurized milk ranges from 3–18 days depending on the raw material used for milk. In the United States, shelf life of pasteurized milk is generally still feasible to be taken in the 16–18 days range, or even longer. In European countries, shelf life of pasteurized milk in the range 10–14 days. Whereas in other countries, shelf life of pasteurized milk that can be guaranteed is only in the range of 3–5 days [4].

Pasteurized milk with the addition of binahong leaf extract can be used as an alternative to natural preservatives in extending the shelf life of pasteurized milk. Binahong leaf extract has antimicrobial compounds such as flavonoids, saponins, alkaloids, terpenoids, and essential oil [5–7] which can inhibit *Escherichia coli* and *Staphylococcus aureus*. Research on the antibacterial activity of pasteurized milk with addition binahong leaf extract (*Anredera cordifolia* Ten. Steenis) and sucrose has been investigated [8]. Based on this explanation, this study examines in depth the quality of the pasteurized milk storage capacity with addition of binahong leaf extract. This study analyzes the physical properties through panelist assessments to determine the level of acceptance of the product.



2. Materials and methods

The materials of this research are reconstituted full cream powder milk (SSR) 10%, binahong leaf extract, sugar, distilled water and tissue. The research used a completely randomized design (CRD) factorial 4 x 4 with 2 (two) factors and 3 replications. Namely the first factor (A) : Concentration of milk with addition binahong leaf extract (0, 4, 5 and 6%) and the second Factor B : Storage times (0, 3, 6 and 9 days).

2.1. Research procedures

At room temperature, the selected binahong leaves are dried by aerating, then weighed and added with distilled water and then soaked for 5 days [9]. Furthermore, the soaked extract result are added in the manufacture of pasteurized milk.

Preparation of pasteurized milk from reconstituted milk from 10% (g/ml). The binahong leaf extract were added 0%, 4%, 5% and 6% (g/ml) and concentration of sucrose (sugar) 7% (g/ml). Pasteurization of the solution using the LTLT method ($\pm 65^{\circ}\text{C}$ for 30 minutes) and then stored at 4°C for 0, 3, 6 and 9 days respectively.

2.2. Parameters measured

The parameters measured in this researched are organoleptic testing including color, aroma and level of preference for pasteurized milk carried out by 25 semi-trained panelists. The hedonic test rating indicator scale is 1–5 (very dislike-very like) [10].

2.3. Data analysis

The data obtained in this research were analysis of completely design (CRD) 4x4 factorial of variance according to factorial completely randomized design (CRD) 4x4 factorial pattern with 3 replications. The data were processed with the SPSS 16 program.

3. Results and discussion

3.1. Milk aroma

Organoleptic tests on food products have an important meaning because they relate to the panelist's acceptance of the product. The panelist organoleptic testing included the aroma of milk, the color of the milk and the level of liking of the milk. In the food industry, aroma testing is considered very important because it determines whether or not the food product is accepted and aroma is also an indicator of damage to food or beverage products. The results of the panelist assessment of the aroma pasteurized milk with the addition of binahong leaf extract concentrations and different storage times are presented in table 1.

Table 1. The aroma of pasteurized milk with the addition of binahong leaf extract concentrations and different storage times.

Binahong concentration (0%)	Aroma of pasteurized milk				Average
	Storage times (days)				
	0	3	6	9	
0	4.44±0.51	3.76±0.52	4.24±0.52	3.44±0.51	3.97±0.64
4	3.56±0.51	3.26±0.68	3.32±0.47	3.4±0.50	3.39±0.54
5	3.20±0.71	2.52±0.51	2.56±0.5	2.68±0.69	2.74±0.66
6	3.28±0.68	1.76±0.98	3.04±0.73	1.76±0.59	2.46±0.98
Average	3.62±0.77	2.83±0.98	3.29±0.83	2.82±0.89	

Aroma of pasteurized milk with the addition binahong leaf extract concentration decreased in value as the concentration of the binahong leaf extract increased (table 1). The addition of 0% to 6% concentration of binahong leaf extract in pasteurized milk ranges from 2.46–3.97 (slightly milky

flavor). The aroma of milk with the addition of 0% concentration binahong leaf extract resulted in the highest average of 3.97 (slightly milky). The higher concentration of binahong leaf extract is added, the less milk aroma is. The aroma of pasteurized milk is influenced by the aroma of the binahong leaf extract. The aroma of binahong leaf extract is very distinctive but does not affect pasteurized milk because the concentration added is quite low. The distinctive aroma of binahong leaf extract is produced by essential oil compounds that cause a fragrant smell. Essential oils can be sourced from any part of the plant, namely leaves, flowers, fruit, seeds, stems/bark and roots. Essential oils are widely used as raw materials for the perfume, fragrance, aroma, pharmaceutical, cosmetics and aromatherapy industries [11].

The analysis result of variance showed is pasteurized milk with the addition of binahong leaf extract, storage time and interaction between two treatments (binahong leaf extract and storage time) has a very significant effect on the aroma of pasteurized milk ($P < 0.01$). The aroma pasteurized milk due to the concentration binahong leaf extract treatment and storage time ranging from a little milk aroma to slightly milky aroma is influenced by the increase in the concentration of binahong leaf extract and storage time, where the higher the treatment interaction, the aroma value in the milk has a slightly milky aroma. The aroma of milk is influenced by the fat and protein content. The addition of binahong leaf extract affects change from previous aroma [12] also states that the smell of milk is generally delicious, but it is also very easy to change when exposed to or interacting with certain objects.

3.2. Milk color

A food product that is considered nutritious and tastes good will not be able to increase consumer interest if the color of the food product gives the impression that it has deviated from the actual color, therefore color greatly affects consumer acceptance. The results of the panelist assessment color of pasteurized milk with the addition of binahong leaf extract concentrations and different storage times are presented in table 2.

Table 2. Pasteurized milk color with the addition of different concentrations binahong leaf extract and storage time.

Binahong concentration (%)	Color of pasteurized milk				Average
	Storage times (Days)				
	0	3	6	9	
0	1.28±0.46	1.40±0.50	1.20±0.41	1.12±0.33	1.25±0.43
4	1.32±0.48	1.84±0.75	2.36±0.70	2.32±0.48	1.96±0.73
5	1.96±0.73	2.56±0.51	2.92±0.76	2.64±0.49	2.52±0.72
6	2.48±0.71	3.12±0.72	3.32±0.56	3.20±0.71	3.03±0.74
Average	1.76±0.78	2.23±0.91	2.45±1.00	2.32±0.92	

The addition of binahong leaf extract enhances the color of pasteurized milk (table 2). The addition of 0% to 6% concentration of binahong leaf extract ranging from 1.25 to 3.03 (not green to slightly green). The color of pasteurized milk is slightly green due to the addition binahong leaf extract. Color of binahong leaf extract is a green. The green color is due to the chlorophyll content. Chlorophyll is a green pigment found in plants. Apart from being an antioxidant, the green color contained in chlorophyll can be used as a natural coloring agent in food so that it can give an attractive impression to food products. According to Gloria (2015), based on its chlorophyll content, binahong is a green plant that has a moderate chlorophyll content of 52.74 mg/L [13].

Pasteurized milk color with a storage time of 0 days to 9 days ranged from 1.76–2.45 (slightly green). The color of milk increases with the storage duration of 0 days to 9 days. The color of pasteurized milk without storage is white. The spread of colloidal fat granules, calcium caseinate, calcium phosphate and minerals cause white color in milk [14].

The analysis result of variance showed that pasteurized milk with the addition of binahong leaf extract, storage time and interaction between the two treatments had a very significant effect ($P < 0.01$)

on the color of pasteurized milk. This shows that the higher the interaction between the concentration of binahong leaf extract and storage time, the color value of pasteurized milk products will increase from white (not green) to slightly green due to the influence of the natural color of the green Binahong leaf extract.

3.3. Hedonic test

The Hedonic Test Technique is a technique designed to measure the level of desirability of a product. Panelists showed their level of love for each sample by selecting the appropriate category [15]. These levels of liking are called the hedonic scale. Based on the analysis, hedonic scale erted into a numerical scale according to the level of preference. The preferences for adding concentrations of binahong leaf extract and sucrose to pasteurized milk include preferences for color, aroma, and general taste. The level of preference for the panelists to pasteurized milk with the addition of different concentrations of binahong leaf extract and sucrose concentrations is shown in table 3.

Table 3. The level of preference for pasteurized milk with the addition of the binahong leaf extract concentration and different storage times.

Binahong concentration (%)	The level of preference for pasteurized milk				Average
	Storage times (days)				
	0	3	6	9	
0	4.60±0.50	4.08±0.70	3.48±0.51	2.44±0.58	3.65±0.98
4	3.64±0.64	3.44±0.51	2.48±0.51	1.60±0.50	2.79±0.97
5	3.00±0.71	2.84±0.75	3.16±0.85	1.44±0.51	2.61±0.98
6	3.20±0.71	2.20±0.82	2.72±0.61	1.24±0.43	2.34±0.97
Average	3.61±0.89	3.14±0.98	2.96±0.74	1.68±0.68	

The panelists' preference for pasteurized milk with the addition leaf extract and storage time decreased (table 3). The higher of binahong leaf extract and the longer it is stored, the lower the level of preference. The addition of binahong leaf extract concentration from 0%–6% ranged from 2.34 to 3.65 (a little like it to a little like it) and the storage time ranged from 1.68–3.61 (dislike to slightly like it). This is in accordance with previous research by Maryana (2016) which states that the higher concentration of binahong leaf extract, the panelists' preference is slightly towards pasteurized milk [16].

The analysis result of variance showed that the addition of binahong leaf extract, storage time and interaction between the two treatments had a very significant effect ($P < 0.01$) on the level of preference for pasteurized milk. The higher the interaction between the concentration of binahong leaf extract and the storage time, the value of the panelists' preference for pasteurized milk will decrease from slightly like to dislike. The assessment of the panelists' preference was related to the color and aroma of pasteurized milk, where the higher the level of binahong leaf extract concentration and storage time, the color of the milk was slightly green and had a slightly milky aroma. So that the panelists prefer pasteurized milk with a concentration of 0% and 4% binahong leaf extract at 0 to 3 days of storage. This is in line with the study [17] which used Aileru leaf samples with storage time in pasteurized milk, which stated that the higher the interaction between concentration of aileru leaf extract and the length of storage for pasteurized milk at room temperature, the panelists' preference for pasteurized milk would decrease from very high. likes to be somewhat like to dislike.

4. Conclusion

Binahong leaf extract concentration, storage time and interaction between the two treatments had a very significant effect on the preference, aroma and color of pasteurized milk. Panelists prefer pasteurized milk with binahong leaf extract concentrations of 0% and 4% at 0 to 3 days of storage times.

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