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Organoleptic quality of pasteurization milk by matoa (*Pometia pinnata*) leaf extract supplementation

M Munirah, R Malaka and F Maruddin

Department of Animal Production, Faculty of Animal Science, Universitas Hasanuddin, Makassar, Indonesia

E-mail: malaka_ag39@yahoo.co.id

Abstract. This study was aimed to analyze the effect of adding matoa leaf extract (MLE) and different pasteurization methods (PM) on organoleptic characteristics of pasteurized milk (PMi). This study used a completely randomized design of factorial pattern 5×2 with 3 replications consisting of 2 factors, the level of matoa leaf extract and pasteurization methods. Pasteurized milk was made from reconstituted milk i.e. full cream milk powder, each sample was added by MLE with levels of 0%, 0.05%, 0.10%, 0.15% and 0.20%, then pasteurized at Low-Temperature Long Time (LTLT) (63°C for 30 minutes) and High-Temperature Short Time (HTST) (72°C for 15 seconds). The result of the study indicated that supplementation of 0.20% MLE combination by HTST method results in best Pasteurization Milk, but not favored by the panelist. The HTST pasteurization method with Pasteurization Milk was color white (did not change the natural color of milk), specific flavor, taste, and preferred by panelists.

1. Introduction

Pasteurization is the simplest of processing and most commonly used by the community and small industry in milk processing. Today, pasteurized milk (PMi) has many varieties of innovations by varying taste, aroma, and color. Generally, PMi is made from fresh milk, reconstituted milk, or recombined milk through a heating process. Two pasteurization processes can be performed using the High-Temperature Short Time (HTST) and Low-Temperature Long Time (LTLT) methods [1].

The addition of functional ingredients to PMi is needed and important to make healthy products thus increasing the beneficial effect of products [2,3]. Functional food is a food product that provides health benefits that prevent or treat disease [3]. One ingredient that is often found in functional foods is antioxidants. Antioxidants are compounds that can be used to protect food from damage, rancidity, or discoloration caused by oxidation [4]. Also, antioxidants can inhibit oxidants in nature which can cause diseases, one of which is cancer. Matoa leaf contains vitamins and antioxidant compounds that can function as compounds that can suspend, retard and prevent lipid oxidation [5].

The usual PM used in dairy companies was the heating treatment of LTLT 63°C for 30 minutes and HTST of 72°C for 15 seconds [6]. The pasteurization process can reduce the number of bacteria found in milk [7]. In the milk processing industry with PM, chemical and physical properties need to be considered because it is closely related to product quality. B-lactoglobulin protein in milk is one component that is easily denatured due to heating. This change may affect the physical properties of food [8]. The quality of food affects the level of consumer preference. This can be tested using the senses (organoleptic test) which is the result of physiological reactions in the form of responses or impressions



of quality by panelists, whose task is to assess the nature or quality of food based on subjective impressions [9].

What's interesting for this case, the milk content that greatly affects the damage to dairy products is fat. Milk fat consists of three fatty acid molecules that are bound to one glycerol molecule. Damage to milk fat is the cause of various deviations in milk such as rancidity caused by hydrolysis of glycerides and the release of fatty acids such as butyrate and caproic which have a distinctive and unpleasant odor, oxidized taste caused by the presence of phospholipid oxidation [8]. If the heating temperature is higher, there will be an acceleration of the process of fat degradation [10]. Milk fat can also react with oxygen; oxidation starts in the double bonds in unsaturated fatty acids. The oxidation process will continue with the formation of taste, usually found in PMi [11].

The purpose of this study was to determine the effect of adding matoa leaf extract on the organoleptic quality of pasteurized milk. It is important to know the consumer's acceptance of pasteurized milk to be a healthy drink through the addition of matoa leaf extract.

2. Materials and methods

This research was conducted experimentally using a completely randomized design factorial pattern (5×2) with 3 replications. The independent factor is the level of Matoa Leaf Extract and Pasteurization Methods. The levels of Matoa Leaf Extract was 0% (MLE0), 0.05% (MLE5), 0.10% (MLE0.10); 0.15% (MLE 15), and 0.20% (MLE20). Pasteurization Methods are LTLT 63°C for 30 minutes (PM6330); HTST 72°C for 15 seconds (PM7215).

2.1. Milk pasteurization

Pasteurized milk was made from full cream reconstituted milk powder concentrations of 10% (w/v). Full cream reconstituted milk was added with 0% (without MLE) and 0.05%, 0.10%, 0.15% and 0.20% (w/v) of MLE. Furthermore, the milk was pasteurized LTLT 63°C for 30 minutes and HTST temperature of 72°C for 15 seconds [6].

2.2. Organoleptic test (OT)

The panelist of OT consisted of 25 semi-trained panelists. The indicator scale for assessing taste, flavor, aroma, color, and thickness of milk uses a scale of 1-6 [12].

3. Results and discussion

3.1. Organoleptic Test of PMi added by MLE with different PM

3.1.1. Color. Organoleptic test results showed that 25 panelists assessed that the higher use of MLE in PMi processing will affect the color of PMi. Generally, the percentage of panelists' assessment of the color of PMi was white to brownish. In the treatment without the addition of MLE, panelists' assessment of the color of PMi was white. Color changes began to appear on the use of 0.05% - 0.20% MLE. Panelists tend to choose a slightly white to brownish white color. The white color in milk is caused by the spread of globular fat globules. Fresh milk is also often yellowish due to the presence of carotene and riboflavin contained in animal feed. The brown color of PMi was due to the addition of MLE which has a brown color. The brown color comes from flavonoids, tannins, and saponins that are on the leaves of matoa.

That flavonoid compounds are the largest group of phenol compounds found in nature [13]. These compounds are dyes in the form of red, brown, purple and blue, and yellow that are found in plants. Thus, the higher the level of MLE in PMi, the color of the milk becomes brownish, the change is due to the influence of phenol compounds present on the matoa leaf.

Based on the organoleptic test results can be explained that the use of the LTLT and HTST PM contributed to the color of PMi. The color change caused by heating at high temperatures can affect the color of milk. Lactose in milk will brown the reaction if the milk is heated at high temperatures. Besides

the change in color due to this browning reaction, also caused by the MLE will be degraded due to heating and ultimately affect the color of PMi. The process of heating milk at temperatures for a long time close to boiling point causing some changes in the color of milk products [14].

3.1.2. Aroma and flavor. The flavor evaluation percentage of 25 panelists assessed that the higher addition of MLE causes the milk aroma to decrease. Changes in the aroma of PMi took effect with the use of 0.05-0.20% MLE. This is because matoa leaves contain triterpenoid compounds, which are typical and fragrant volatile compounds that cause specific flavor (not aromatic milk) so that they can influence the aroma in PMi. Triterpenoids are plant components that have a specific odor that can be isolated by distillation known as essential oil [13]. Essential oil consists of volatile substances (volatile) and non-volatile ingredients (nonvolatile) which are the causes of aroma characteristics [15].

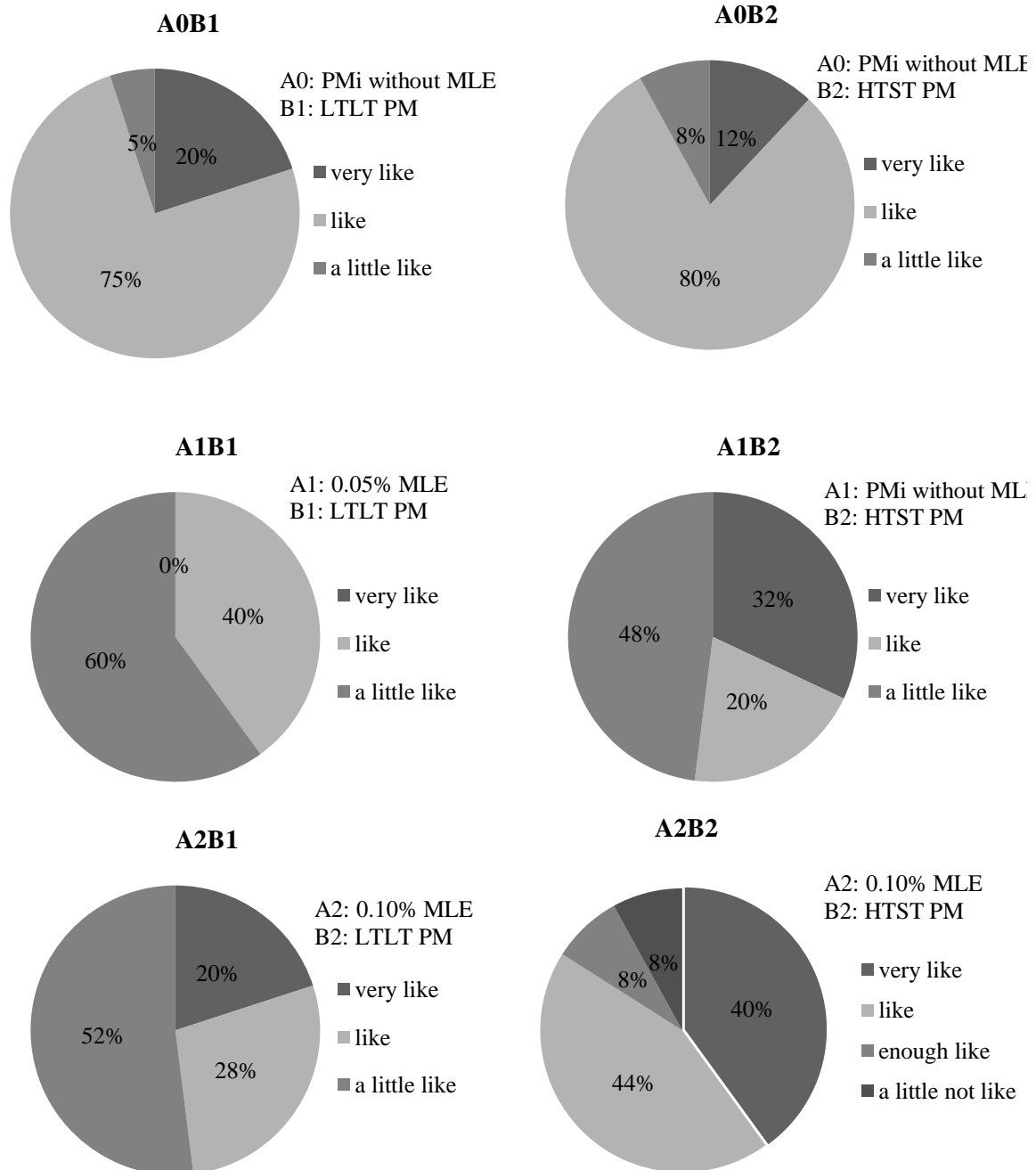
The LTLT PM tends to cause a stronger milk aroma which is 56% compared to the use of the HTST PM which is 44%. This was affected by high temperatures heating causes the evaporation of sulfides, especially hydrogen sulfide, as a result, the distinctive aroma of milk is lost. Also, the essential oil content of MLE contributed to the influence of aroma in PMi. When heating above 74°C occurs the activity of sulfhydryl (-SH) by denaturation of 2-lactoglobulin and milk protein so that it causes evaporation of sulfides especially hydrogen sulfide which allows changes in the normal aroma of milk [16].

3.1.3. Taste. The 25 panelists assessed that the higher the use of MLE in PMi processing, the taste of PMi decreased. Generally, the percentage of panelists' assessment of the taste of PMi between ratings was not inadequate to somewhat in taste. Changes in taste began to appear on the use of 0.05-0.20% MLE. This is due to the presence of tannin content on matoa leaves, causing a sense of bitterness, thus minimizing the distinctive taste in milk. State that tannin compounds give a bitter taste because they have astringent substances from their polyphenol groups [9].

The results of organoleptic testing on the taste of PMi indicated that the use of different PM can affect the taste of PMi, that the use of the LTLT PM, 72% of panelists rate tend to have a stronger milk taste compared to the HTST PM which only 68% of panelists rate as such. This indicates that the LTLT PM gives the milk a better taste than HTST PM. This difference is caused by the higher temperature heating of tannin compounds, the greater the solubility so that the bitter taste is also increasing.

3.1.4. Hedonic. The organoleptic test results in figure 1 illustrate that the preferred percentage of 25 panelists considered that the higher the level of addition of MLE in PMi, the panelist preference level decreased. Generally, the percentage of panelists' ratings of preference for PMi was between likes and dislikes. The use of 0-0.15% matoa leaf extract is preferred because the MLE added to PMi is still in a low percentage, but at the use of 0.20% some panelists began to express the impression of disliking the PMi. This is because panelists give different impressions, depending on the ability of the senses to react to the samples being tested. This is in accordance with the opinion of Indriyanti (2013) which states that the level of consumer preferences can be measured using organoleptic tests through the senses [15].

The panelists' preference level for PMi added by MLE with different PM shows that the LTLT PM to be preferred, which is 20% very like while in HTST PM only 12% states that they like it. This indicates that the LTLT PM gives the impression of being preferred over the HTST PM. This is due to the higher temperature heating the cooking flavor develops so that it affects the physical reaction in the form of a response or an impression of panelist quality on a product. Changes in normal flavours affect physiological reactions in the form of responses or an impression of panelist quality on the product being tested [9].



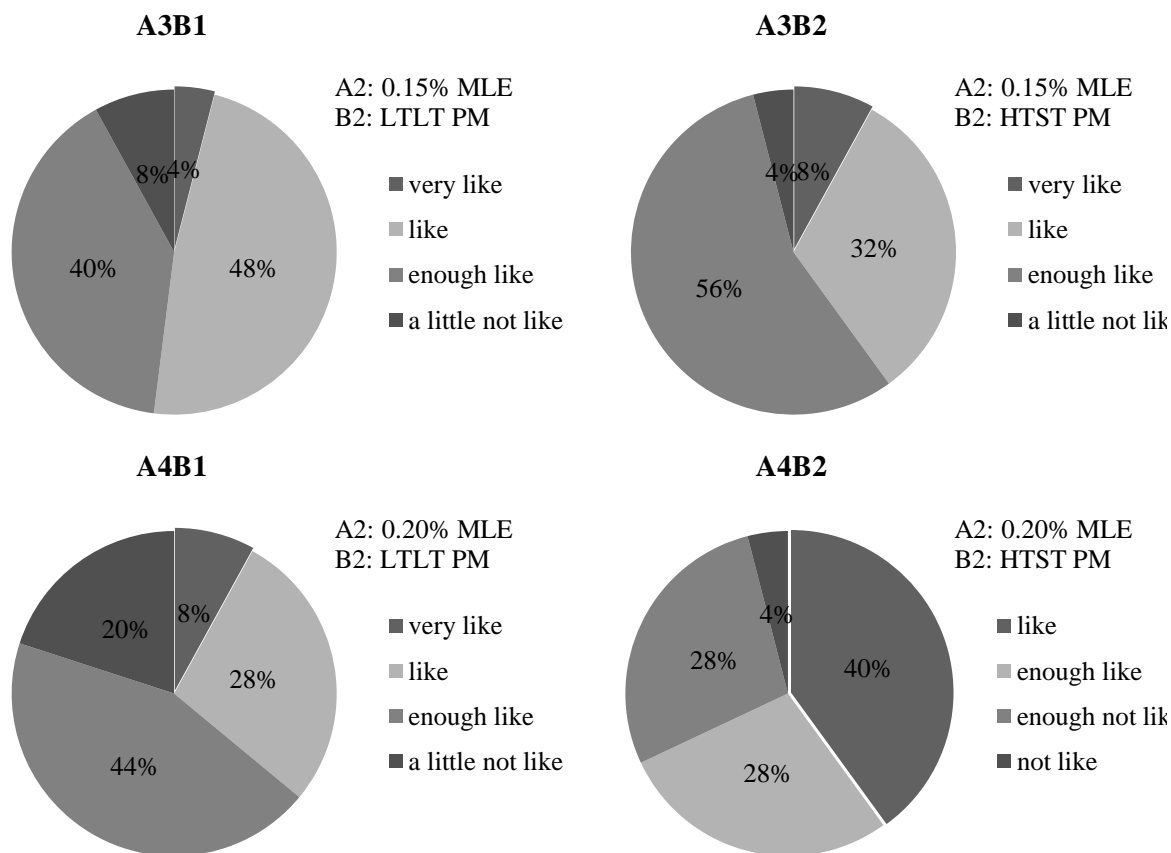


Figure 1. Hedonic PMi with Addition of MLE by Different PM.

4. Conclusion

The panelist and hedonic tests indicated that no addition of MLE in Pasteurized milk was favored by panelists.

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