Matoa pasteurized milk quality subjected to the different levels of alginate

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Abstract. The addition of alginate in pasteurized milk processing could improve the impact of using matoa leaf extract on pasteurized milk. Matoa leaf extract was acidic. The use of a certain amount of matoa leaf extract in the processing of milk pasteurization could affect the stability of the (colloidal) dispersion of the final product. Hence, alginate was known to have the ability to inhibit some pathogenic bacteria. The purpose of this study was to determine the level of alginate used in matoa pasteurized milk processing on the microbiological and physical quality of matoa pasteurized milk. The parameters measured were the inhibitory effect on *Escherichia coli*, organoleptic on viscosity, and preference of matoa pasteurized milk. This study used a completely random design. The treatment used was without the addition of alginate (0%) and the addition of 0.1%; 0.2% and 0.3% alginate. The results showed that the increasing use of alginate in matoa pasteurized milk showed an increase in the ability to inhibit *E. coli* and an increase in panelists' assessment of viscosity, and changed the panelists' preference for matoa pasteurized milk. The use of alginate levels between 0.1-0.2% in the processing of matoa pasteurized milk improved the quality of the final product.

1. Introduction

Pasteurized milk is one of the most popular processed milk products in the market. The addition of functional ingredients continued to be done, thereby increasing the superiority of dairy products at large [1]. Pasteurized milk with the addition of matoa leaf extract could prevent the bacteria *Staphylococcus aureus and Escherichia coli* [2]. The use of matoa leaf extract in the production of pasteurized milk could produce products with good functional (as antibacterial) properties.

Matoa leaf extract is acidic. The use of matoa leaf extract at a certain degree in the production of pasteurized milk changed the stability (consistency) of colloidal products. Stabilizers were materials that contribute to improving product consistency. Stabilizers could contribute to product consistency during processing and storage. Alginate was a type of stabilizer that can improve the decline in the quality of pasteurized milk due to the use of matoa leaf extract [3,4]. Alginate is a plant origin natural stabilizer. It could improve consistency, taste, and extend shelf life, and could be used for various purposes. Junianto [5] stated that alginate compounds function as thickening agents, balance regulators and emulsifiers in various industries, besides that alginates contain several compounds that can work as antibacterial agents such as flavonoids, terpenoids, steroids, coumarin and alkaloids, rich in bioactive substances polyphenols, phlorotannin, and tannin compounds [6].

The switch of constituent components in the processing of matoa pasteurized milk with the addition of alginate levels affected the panelist's assessment of the viscosity and the preference for the final product. On the other hand, the addition of alginate was allegedly able to increase the ability to prevent the milk pasteurization of matoa toward *E.coli*. Regarding the comprehension, it considered necessary to know the quality (inhibition of *E.coli*, viscosity, and preference) of matoa pasteurized milk with the addition of alginate levels.

2. Materials and methods

The ingredients used in this study were full cream milk powder, matoa (*Pometia pinnata*) leaf, alginate, *E. coli* culture. Media for bacterial growth were nutrient agar. Other ingredients used were 70% alcohol, NaCl, distilled water, 70% ethanol and NaOH (from Sigma aldrich), etc.

This study was analyzed using a completely randomized directional pattern design. The treatment in this study was without alginate (0%) and the use of different alginate levels (0.1%; 0.2% and 0.3%).

2.1. Research procedure

Selected matoa leaves were washed, dried, and aerated at room temperature. The dried matoa leaves then mashed, weighed, and distilled water was added. The maceration was carried out for 2×24 hours. Further, the maceration products were used as powder extract with the freeze-drying method [7].

Pasteurized milk was made from reconstituted milk from full cream milk powder with a concentration of 10% (w/v). The matoa leaf extract were added of 0.20% and the alginate concentrations ware added 0%, 0.1%, 0.2% and 0.3%, respectively. The solution was then pasteurized by the HTST method (± 72°C for 15 seconds) [8].

2.2. Measured parameters

The parameter measured in this study was the inhibitory effect of pasteurized milk on *E. coli* (by agar-well diffusion method) and the panelist assessment of viscosity level. Twenty-five semi-trained panelists assessed the viscosity level on a scale of 1-6 (thin-thickened) and the preference level, also on a scale of 1-6 [9].

2.3. Data analysis

Inhibitory effect of *E.coli* and viscosity test data were analyzed and processed with SPSS 16.0 for windows, while hedonic data were analyzed descriptively.

3. Results and Discussion

3.1. Inhibition of E. coli

Escherichia coli was a pathogen, Gram-negative, motile, and not spherical bacteria. This bacteria was used as an indicator of contamination in food. The ability of matoa pasteurized milk with the addition of alginate to inhibit *E. coli* was presented in figure 1.

The results showed that 0%, 0.1%, and 0.2% of alginate in pasteurized milk did not significantly inhibit *E. coli*. However, the use of a concentration of 0.3% alginate in pasteurized milk experienced a significant ability in the inhibition of *E. coli*. The alginates derived from seaweed and had antibacterial properties [10]. Selim [10] suggested that alginate had the ability as an antioxidant, immunostimulant, and antibacterial activity. Hermund et al. [6] further expound that alginates contained secondary metabolite compounds in different forms such as terpenoids, steroids, coumarin, flavonoids, and alkaloids, rich in bioactive substances polyphenols, phlorotannin, and tannin compounds that could inhibit the activity of free radicals and absorb metals, and was able to be applied in food.

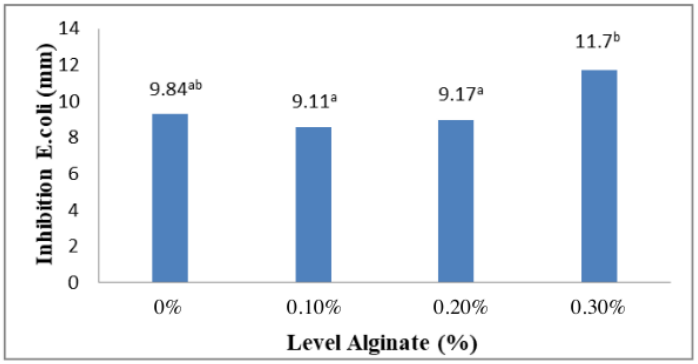

Figure 1. The inhibition of *E. coli* of matoa pasteurized milk by addition of alginate.

3.2. Panelists assessment on the viscosity of matoa pasteurized milk by addition of alginate

The addition of alginate in matoa pasteurized milk processing affected the panelists' assessments of viscosity. The viscosity of matoa pasteurized milk with the addition of alginate was assessed by panelists on a scale of 1-6 (thin-thickened). The results were presented in figure 2.

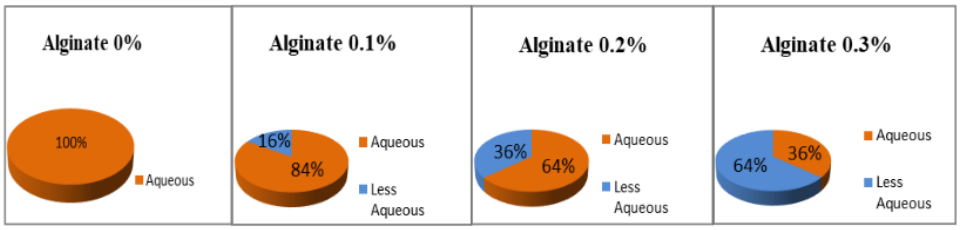

Figure 2. Assessment on the viscosity of matoa pasteurized milk by the addition of alginate.

Increasing the level of alginate addition in matoa pasteurized milk processing enhanced the panelist's assessment of the viscosity of the final product. Alginate bound the water present in the ingredients. The more alginate used, the more water was bound. Besides, alginate would stabilize changes in colloidal dispersion due to the use of matoa. Reis et al. [11] suggested that stabilizers could minimize the occurrence of syneresis. The stabilizers could form gels and were thermostable. Syneresis that occurred in food was closely related to the strength of the gel from the addition of alginate as a stabilizer. Unrestricted water in the food component causes syneresis. Higher syneresis caused lower ability of the material to bind water [12]; consequently, a lot of water in the product came out. Conversely, if the value of syneresis was low, the ability to bind water was higher and the gel formed became stronger.

3.3. Panelists assessment on the preference of matoa pasteurized milk

Panelist assessment on the preferences was an overall evaluation of matoa pasteurized milk for color, taste, flavor, and thickness. Soekarto [13] argued that in the preference test, panelists were asked for their personal responses concerning likes or dislikes. In the analysis, the preference scale was transformed into a numerical scale according to preference level. The preference level of panelists in matoa pasteurized milk with the addition of alginate was presented in figure 3.

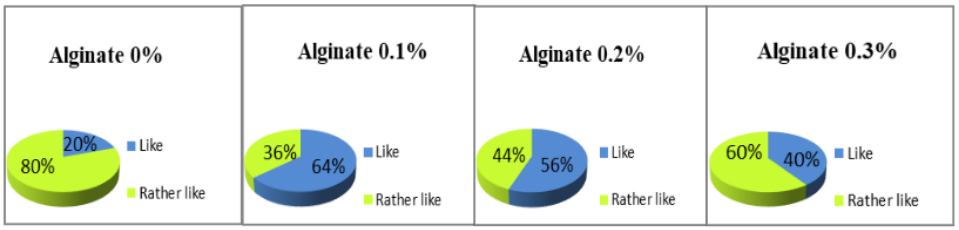

Figure 3. Assessment on the preference of matoa pasteurized milk by addition of alginate

The addition of 0.1% alginate level material in matoa pasteurized milk processing clearly showed the best panelist evaluation response. A total of 64% out of 25 panelists gave like responses and the rest gave rather-like responses. The use of alginate levels of 0.2 to 0.3% showed a slightly decreased panelist preference responses compared to the use of 0.1% alginate. However, in general, the response of using alginate in pasteurized milk processing was still better than without the use of alginate. This result indicated that the use of alginate improved physical quality. The use of alginate will improve the ability to bind water in matoa pasteurized milk raw material. Junianto [5] suggested that alginate compounds functioned as thickening agents, balance regulators, and emulsifiers in various food industries. Transformation in texture and taste of a food product derived from its constituent components and the combination of various ingredients other than processing affected the level of one's liking for the final product. Violisa et al. [14] further stated that the addition of alginate in food processing was useful not only as a stabilizer to improve texture, but also increase the product viscosity.

4. Conclusion

The increasing use of alginate in matoa pasteurized milk showed an increase in the ability to inhibit *E. coli* and an increase in panelists' assessment of viscosity. The assessment of preference showed that 0.1-0.2% of alginate in matoa pasteurized milk gave the most panelists preference. The use of 0.1-0.2% alginate in the processing of matoa pasteurized milk improved the quality of the product.

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