Antioxidant activity of milk pasteurization by addition of Matoa leaf extract (*Pometia pinnata*)

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Abstract. This study aims to analyze the effect of the addition of Matoa leaf extract (*Pometia pinnata*) on the production of pasteurized milk with HTST pasteurization on the antioxidant activity of pasteurized milk. This research was conducted using a completely randomized design (CRD) in a unidirectional pattern with 5 treatments with 3 replications. Milk is made from 10% reconstituted milk, each sample is added Matoa leaf extract (*Pometia pinnata*), 0%, 0.05%, 0.10%, 0.15 and 0.20% respectively, then pasteurized using the HTST method (High-Temperature Short Time) at 72°C for 15 seconds. The results showed that the addition of Matoa leaf extract increased antioxidant activity and decreased the TBA value.

1. Introduction
Pasteurized milk is the simplest milk processing product by heating it below boiling point temperature. Heating by HTST (High-Temperature Short Time) method is considered more effective because it causes less damage to the nutritional content of pasteurized milk. But in milk, there are antioxidants and several other nutritional components that are easily damaged during heating, so it needs the addition of natural ingredients [1] to minimize the loss of antioxidant compounds and nutritional components in milk.

One alternative natural ingredient that can be used as a source of antioxidants and improve the physical and chemical properties of milk is the Matoa leaf extract (*Pometia pinnata*). Matoa is a potential plant whose benefits are not widely known by the public. Matoa plants have long been used by Asian people as one of the traditional medicines [2]. Antioxidant activity of Matoa leaf ethanol extract (IC50 of 45.78 ppm) and based on phytochemical screening, Matoa leaf extract contains flavonoids and tannin compounds. Matoa leaf extract can inhibit the HIV-1 IN virus [3, 4]. Flavonoid chemical compounds have been proven to have pharmacological effects as antioxidants, antibacterial and antifungal.

Based on the potential of the Matoa plant as a natural antioxidant, it is considered necessary to further study the extract Matoa leaf is added to pasteurized milk. Therefore, the general objective of this study is to determine the exact level of Matoa leaf extract as an additional ingredient in the production of pasteurized milk. This is intended so that Matoa leaf extract can replace the antioxidants in milk damaged during heating and improve the quality of pasteurized milk both physically and chemically so that it can be used as a health drink product. The presence of antioxidative compounds enables to a
reduction of the oxidative reaction, while also serve to eliminate the main cause of degenerative diseases and delay the aging process [5].

2. Materials and methods

This research is an experimental study using a completely randomized design unidirectional pattern. Pasteurized milk is made from 10% reconstituted milk and Matoa leaves are added (0%, 0.05%, 0.10%, 0.15%, 0.20%). Furthermore, milk is pasteurized by HTST (High-Temperature Short Time) temperature of 72°C for 15 seconds [6]. DPPH testing is carried out utilizing a sample dissolved with ethanol as much as 5 ml then adding a 4 ml DPPH reagent then allowed to stand for 20 minutes. Absorbance measurements were carried out at a wavelength of 515 nm using a spectrophotometer [7]. Determination of the Thiobarbituric Acid (TBA) number is by adding HCl and distilled water to the sample, then distilled by heating 300-600 watts for 10 minutes. The distillate is transferred to the test tube and a TBA reagent is added. The solution is mixed in a closed test tube and put in 75°C hot water for 35 minutes. The test tube is cooled with running water then the absorbance is measured at a wavelength of 528 nm with the blank solution as the zero points. TBA rates are calculated and expressed in mg of malonaldehyde/kg of the sample [8].

3. Result and discussion

Based on the analysis of variance we can see that the addition of Matoa leaf extract (Pometia pinnata) to pasteurized milk has increased antioxidant activity. The antioxidant activity of pasteurized milk is presented in figure 1.

![Figure 1. Antioxidant activity of pasteurized milk by the addition of different Matoa leaf extracts (Pometia pinnata).](image)

The addition of Matoa leaf extract (Pometia pinnata) to pasteurized milk had a very significant effect (p<0.01) on the antioxidant activity of pasteurized milk. The higher the level of use of Matoa leaf extract, the higher the antioxidant activity of pasteurized milk produced. This is due to the presence of flavonoid compounds found in the leaves of Matoa in the form of phenols. Phenol is an antioxidant compound that acts as an inhibitor to inhibit the oxidation process in milk. The configuration and total phenol greatly influence the antioxidant mechanism [2, 9]. Matoa leaves contain antioxidants in the form of phenols which have the potential to prevent the oxidation process in a food ingredient in order to neutralize free radicals [10]. Thiobarbituric Acid (TBA) value decrease along with the addition of Matoa leaf extract levels into pasteurized milk (figure 2).
Figure 2. TBA value of pasteurized milk by different percentage Matoa leaf extract (Pometia pinnata).

The addition of Matoa leaf extract (Pometia pinnata) with different levels in pasteurized milk had a very significant effect (p<0.01) on the decrease in TBA values. The decrease in TBA in pasteurized milk indicates that the phenol compound in the leaves of Matoa (Pometia pinnata) has a good inhibitory effect on oxidative damage. The inhibition of oxidative damage is related to antioxidant activity on Matoa leaf. Antioxidant compounds are inhibitors used to inhibit oxidation [11]. The addition of Matoa leaf extract (Pometia pinnata) with different levels in pasteurized milk had a very significant effect (p<0.01) on the decrease in TBA values. The decrease in TBA in pasteurized milk indicates that the phenol compound in the leaves of Matoa (Pometia pinnata) has a good inhibitory effect on oxidative damage. The inhibition of oxidative damage is related to antioxidant activity on Matoa leaves. Antioxidant compounds are inhibitors used to inhibit oxidation [11].

4. Conclusion

The addition of Matoa leaf extract (Pometia pinnata) gives the best value as an antioxidant at a concentration of 0.2% in pasteurized milk that increases antioxidant activity and decreases the value of TBA.

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