Antioxidant effectiveness and pH value of red dragon fruit skin powder (*Hylocereus polyrhizus*) on pasteurized milk with different storage times

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Abstract. On peoples farms that do not yet have a modern milk processing industry, marketing becomes an obstacle because the milk is easily damaged. In addition, public interest in consuming fresh milk is still very low due to the lack of attractiveness from milk. One of the ingredients that has the potential to improve the quality attractiveness of consumers is the use of dragon fruit skin powder. Dragon fruit skin contains antioxidants and antibacterial so that it can maintain the pH value. The purpose of this research was to determine the time limit for pasteurized milk storage by adding dragon fruit skin powder at room temperature. This research was conducted using a Completely Randomized Design (CRD) with different storage duration treatments (0 hours, 4 hours, 8 hours, 12 hours, 16 hours). Dragon fruit skin powder can was added as much 2%. Storage treatment with the addition of dragon fruit skin powder affects the pH value. The pH value increased from 0 hours storage then decreased at 12 and 16 hours storage. This shows that the addition of dragon fruit skin powder can increase the pH value until 4 hours of storage. Antioxidant value decrease with duration of storage. Significant decrease in the value of antioxidant activity occurs in storage for 16 hours. The quality of pasteurized milk with the addition of dragon fruit skin powder can be maintained up to 12 hours storage at room temperature.

1. Introduction

On society farms that did not yet have a modern milk industry, marketing becomes an obstacle because the milk was easily damaged. In addition, public interest in consuming fresh milk was still very low due to the lack of milk attractiveness. The research on the addition of natural ingredients to milk and its processed products has been widely carried out. It aims to improve the functional properties of these products [1–4]. One of natural ingredient that could be utilized was dragon fruit peel. Red dragon fruit peels in the community are mostly just wasted as waste, the part of dragon fruit that was often wasted as trash was the skin part consisting of 30-35% of the fruit [5]. The natural content of it which has the potential as a preservative was
quite high. Some researchers have previously proven that red dragon fruit peel could kill pathogenic bacteria. Red dragon fruit peel extract \((\text{Hylocereus polyrhizus})\) could inhibit pathogenic bacteria in sausage products. The content of phytochemical compounds could kill these bacteria \([6–8]\).

Besides functioning as an antibacterial, red dragon fruit skin also functions as a natural antioxidant \([9]\). This was evidenced from previous studies that stated that antioxidants from the skin of red dragon fruit \((\text{Hylocereus polyrhizus})\) could inhibit free radicals \([5,10,11]\). Based on phytochemical and FTIR tests, the skin of red dragon fruit \((\text{Hylocereus polyrhizus})\) contains a variety of antioxidant compounds. Based on the relationship between the content and benefits of red dragon fruit peel and the physical properties of milk it was deemed necessary to conduct research with the aim to determine the effectiveness of red dragon fruit peel extract as a preservative and natural antioxidant in pasteurized milk \([12]\).

### 2. Materials and methods

The ingredients on it are milk, red dragon fruit peel powder \((\text{Hylocereus polyrhizus})\), distilled water, methanol, Folin Ciocalteu reagent, sodium carbonate reagent, gallic acid reagent, and 1,1-diphenyl, 2-picrylhydrazil (DPPH). The design used was a complete random design (CRD). The treatment in this study was the difference in storage time (0 hours, 4 hours, 8 hours, 12 hours and 16 hours) with three replications.

#### 2.1. Research procedure

Red dragon fruit \((\text{Hylocereus polyrhizus})\) was washed and peeled manually before the skin was cut into small size (2 mm). Pieces of skin are dried at 50 °C in an oven and ground into powder \([7]\).

Pasteurized milk was made from reconstituted milk that was from full cream milk powder with a concentration of 10% (w / v). The milk was added with red dragon fruit skin powder as much as 2% and then pasteurized by HTST method (± 72°C for 15 seconds). Then storage for 0 hours, 4 hours, 8 hours, 12 hours and 16 hours.

#### 2.2. Measured parameters

The parameters measured in this study are the pH value and antioxidant activity.

#### 2.3. Data analysis

The data were analyzed variously and processed with SPSS 16. The treatment which showed the effect was further directly tested by Duncould's method.

### 3. Results and discussion

#### 3.1. Antioxidant milk pasteurization by addition of red dragon fruit skin powder in different storage times

The antioxidant activity of red dragon fruit peels in pasteurized milk was identified based on inhibitory activity against DPPH free radicals. Antioxidant activity of pasteurized milk added to the powder of red dragon fruit peels with different storage times, it could be seen in Figure 1.
Figure 1 shows that the storage time in pasteurized milk with a different storage time has a significant effect (P <0.05) on antioxidant activity. The longer the storage time so that the lower the inhibitory value of DPPH free radicals. Antioxidant activity decreases with increasing storage time. The decrease in antioxidant activity could be caused by oxidation during storage. Betasianin levels in dragon fruit that act as antioxidants may decrease due to storage factors [13]. This condition occurs because antioxidants are susceptible compounds oxidized by several actors, such as light and oxygen so that the percentage value of antioxidant activity decreases during storage [14].

The result of antioxidant activity was lower if it compared to the research that was already done by (10), 36-45%. The presence of protein or grease compounds in fractions could interfere with the process of capturing free radicals by flavonoid compounds. Protein or grease in plants could provide the hydrogen atom of it so that it would bind with hydroxyl radicals in DPPH.

3.2. PH value of Pasteurized Milk with the addition of Red dragon fruit skin Powder in Different Storage Times

The pH value calculated on a measurement using a pH meter was the concentration of H+ produced during the storage process. The more acid produced by a product, the concentration of H+ ions increases and was measured in a pH meter [15]. The pH value of pasteurized milk added with red dragon fruit peel powder with different storage times could be seen in Figure 2.
In figure 2, it shows that the addition of dragon fruit skin powder with different storage times affects the pH value of pasteurized milk. Milk pH value at 4 hours storage has increased. It shows that the skin of red dragon fruit contains substances that could improve the pH value. This was in line with the results of the study [16] Phytochemical content found in the extract of the skin of red dragon fruit could inhibit some pathogenic bacteria both Gram positive and Gram negative. The contents include phenol hydroquinone, flavonoids, triterpenoids, steroids, saponins and tannins.

The pH value of pasteurized milk with the addition of red dragon fruit peels decreased at 12 hours and 16 hours storage. However, at 12 hours storage, milk Ph still including normal pH. Milk pH value based on SNI [17] was 6-7. These results are in line with research conducted by [18] that the incubation time or storage time could reduce the pH value in milk products. The decrease in pH was caused by the activity of microorganisms. The growth of microorganisms would affect the physicochemical characteristics of the product including the pH value [19,20].

4. Conclusion
The decrease in the value of antioxidant activity was due to the long storage time. The quality of pasteurized milk with the addition of red dragon fruit peel powder could be maintained up to 12 hours storage at room temperature.

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