Physicochemical characteristics of chicken egg whites by addition of red dragon fruit extract (*Hylocereus Polyrhizus*) at different fermentation times

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Abstract. Nutritious food is important for humans. Eggs are a highly nutritious food. However, eggs have a weakness, which is easily damaged. Natural damages, biological, chemical or damages caused by microorganisms. Damages can occur through the egg pores. Therefore, egg processing is very important to maintain egg quality, including fermented eggs. Egg whites processing using three LAB (*Lactobacillus bulgaricus*, *Lactobacillus achidopillus* and *Streptococcus themophillus*) with the addition of red dragon fruit (*Hylocereus polyrhizus*). Dragon fruit can be used by lactic acid bacteria as an energy source to live and grow well in products. The purpose of this study was to determine the effect of fermentation time and the addition of red dragon fruit on physicochemical characteristics. This study used a completely randomized design (CRD) with 5 treatments with 5 replications. The treatment in this study was fermentation time, namely 0 hours, 6 hours, 12 hours, 18 hours and 24 hours. The parameters measured were water content, lactic acid, and pH value in fermented egg whites with the addition of red dragon fruit. The results of this study explained that the duration of fermentation had a significant effect on the total acid, pH value, while the length of fermentation had no significant effect on water content. It was recommended that egg whites with the addition of red dragon fruit were fermented at 24 hours produced good physicochemical characteristics.

1. Introduction

Chicken eggs are a food material of animal origin with high nutritional value. These nutrient are very important for humans [1]. Eggs contain protein with a balance of amino acids, fats, vitamins and minerals [1,2]. The eggs are easily damaged both naturally and chemically [3]. The damage caused by microorganisms through the egg pores [4]. Therefore, egg processing is very important to maintain egg quality, including fermented eggs.

Eggs that have been fermented undergo changes in the composition of the contents, namely the protein and changes in the composition of other ingredients [5]. Egg fermentation is carried out to increase the beneficial value of eggs, including the manufacture of fermented egg products in the form of drinks [5]· Egg whites processing used three LAB (*Lactobacillus bulgaricus*, *Lactobacillus achidopillus* and *Streptococcus thermophillus*) with the addition of red dragon fruit (*Hylocereus polyrhizus*). Dragon fruit is thought to be used by lactic acid bacteria as an energy source to live and grow well in products. The application of red dragon fruit in the processing of fermented egg whites requires a different study of fermentation time to produces a good physicochemical characteristics.

2. Materials and method

The equipment used in this study were measuring cups, PCR HOOD, analytical scales, tablespoons, test tubes, refrigerators, thermometers, petri dishes, incubator, autoclave, pH meter, biuret, oven, tube rack, spoit and markers. The materials used in this study were aluminum foil, distilled water, alcohol, formalin, $KMnO_4$, chlorine, sodium borate, NaOH 0.1 N, PP (*phenolphthalein*), buffer solution pH 4 and pH 7, glucose, NaCl, chicken eggs, milk full cream and red dragon fruit. The research design used was a completely randomized design (CRD) with 5 treatments and 5 replications, as follows: P1: 0 hour fermentation time; P2: 6 hours fermentation time; P3: 12 hours of fermentation time; P4: 18 hours of fermentation time; P5: 24 hours of fermentation time. The parameters measured were water content [6], total acid, pH value [70]. The data obtained in this study were processed by analysis of variance based on a completely randomized design (CRD) [8].

3. Results and discussion

The results of the research, the addition of dragon fruit with different fermentation time to chicken eggs had an impact on the parameters of water content, pH value and total lactid acid.

3.1. Water content

Figure 1 showed that the fermentation time has no significant effect (P>0.05) on the water content of egg whites fermentation with the addition of red dragon fruit. This showed that there was no change in water content at different fermentation times. But there was a tendency for prolonged fermentation to increase water content. This was probably due to the influence of bacterial growth and to produce water from the metabolism of these lactic acid bacteria.

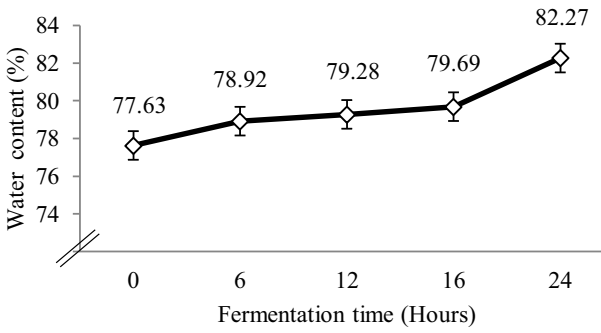

Figure 1. Water content of chicken egg whites with the addition of red dragon fruit extract (*Hylocereus polyrhizus*) at different fermentation time.

The addition of red dragon fruit also be one of the causes of increasing water content in the product. This was in accordance with [9] opinion that the longer fermentation the water content tends to increase due to the influence of bacterial growth from the metabolism of lactic acid bacteria, metabolism resulting from the fermentation process.

3.2. Total lactic acid

Figure 2 showed that the fermentation time had a significant effect (P<0.01) on the total lactid acid fermentation of egg whites with the addition of red dragon fruit. The results showed that the fermentation time had an impact on changes in total acid in fermented egg whites. This was probably caused by the longer the fermentation increased the total lactic acid. The results showed that the fermentation for 0 hour, 6 hours, 12 hours and 16 hours did not show a significant difference with each other. However, fermentation for 24 hours was significantly different which increasing total lactic acid.

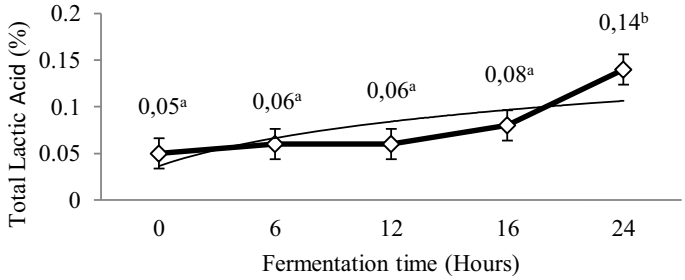

Figure 2. Acid lactic of egg whites of purebred chickkens with the addition of red dragon fruit extract (*Hylocereus Polyrhizus*) at different fermentation time.
Note:[ab] superscripts showed very significant differences (P <0.01).

Dragon fruit contains high carbohydrates which are needed as a source of energy for microbes [7, 10]. The addition of dragon fruit provides sufficient energy for microbes to metabolize. One of the end products of the metabolism of lactic acid bacteria is to produce lactic acid [7]. The longer fermentation the tendency to increase the total acid, this is due to the addition of sugar and milk in the egg media [9]. Red dragon fruit (*Hylocereus polyrhisuz)* contains carbohydrates and other compounds, and is rich in antioxidants [11]. Carbohydrates in red dragon fruit can be used by LAB as a source of energy during fermentation.

3.3. The pH value

Figure 3 showed that the fermentation time has a significant effect (P <0.05) on the pH value of egg whites fermentation with the addition of red dragon fruit.

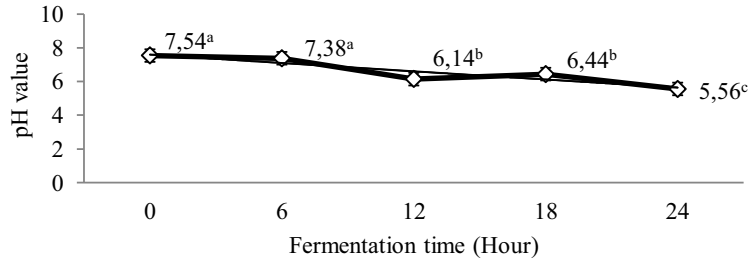

Figure 3. The pH value of chicken eggs white with the addition of red dragon fruit extract (*Hylocereus polyrhizus*) at different fermentation time.
Note:[abc]superscripts showed significant differences (P <0.05).

The fermentation time for 0 hour and 6 hours showed no significant difference to the pH value. However, the pH values of the two were significantly different with the increasing fermentation time. This was probably due to the 24 hour fermentation that optimized LAB growth conditions. In addition, this condition was the best medium for the growth of LAB. In the 24 hours fermentation time treatment, the availability of more nutrients and increased the amount of LAB so reduced the pH value compared to other treatments. This was in accordance with previous study that the decreasing in pH value was caused by fermentation activity which converted carbohydrates or sugars in foodstuffs in to acids and water and other end products [7]. A similar study, on bread showed that the pH value of the dough on bread decreased with a longer fermentation time [12].

4. Conclusion

Long fermentation time increased the total lactic acid. However, it reduced the water content and pH value in fermented egg whites with the addition of red dragon fruit extract. The 24-hour fermentation

time of egg whites with the addition of red dragon fruit extract obtained the best physicochemical quality.

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