Assessment of organoleptic quality in fermented chicken egg whites at different times

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Abstract. Egg are livestock product derived from highly nutritious poultry and are needed by living things such as protein, fat, vitamins and minerals in sufficient quantities. Eggs are generally used as food in cake making or as side dishes. Egg processing has not been done much especially as a drink. New innovations are needed to increase the value of the benefits of eggs. One new innovation that can be done is by processing fermented eggs. The purpose of this study was to assess the organoleptic quality of fermented chicken egg whites at different fermentation times. The number of panelists in this study were 20 panelists in the category of semi-trained. The panelists' criteria were to consume eggs, aged 20-23 years, and sex, male and female. The research treatment is the fermentation time (hours) is 0, 6, 12, 18 and 24. The parameters assessed were organoleptic quality including aroma, taste, thickness, preference, and color. This study showed that there was a change of aroma, taste, preference and color with increasing fermentation time, but the thickness does not change during the fermentation process. The results showed that fermented egg whites at different times could improve the aroma and taste of eggs. The thickness of the egg white does not change during the fermentation process. However, the resulting color is yellowish white and is preferred. The organoleptic quality value of egg white changes during the fermentation time and is optimal at 6 hours of fermentation.

1. Introduction
Eggs are livestock products derived from highly nutritious poultry and are needed by living things such as protein, fat, vitamins and minerals in sufficient quantities [1,2]. Eggs as one source of animal protein which has a delicious taste. In addition, eggs are easily obtained and the price is relatively cheap. There are various types of poultry eggs that are commonly consumed, including chicken eggs, duck eggs and quail eggs.

Eggs are generally used as food in making cakes or as side dishes, and chicken eggs are contained in many foods [3]. Egg processing has not been done much especially as a drink. New innovations are needed to increase the value of the benefits of eggs. One new innovation that can be done is by processing fermented eggs.
Fermented eggs are egg processing with fermentation technology [4]. Fermentation in eggs results in changes in the egg, especially its protein parts [4]. The egg fermentation process is usually carried out on egg whites [5,6] and whole eggs [7,8].

The fermentation process by microbes is largely determined by the availability of nutrients in the growing media. Eggs have a low sugar content of 0.3% [9]. Sugar is needed in the fermentation process as a source of energy, especially types of lactic acid bacteria. The application of fermentation technology to eggs requires an ideal combination with an appropriate sugar source. Cow's milk is an animal food which has a lactose content of 4.6-4.49 [10]. In addition, cow's milk also contains quite high water around 87% [11]. Water content is needed in the fermentation process of eggs to help the process of dissolving or breaking down the structure of glycoprotein bonds in eggs. Decomposition of glycoproteins produces sugar or glucose available to microbes.

The level of addition of liquid milk in the egg white fermentation process by using three lactic acid bacteria namely Lactobacillus bulgaricus, Lactobacillus achidopillus, and Streptococcus thermopillus. The results showed that there was an increase in antioxidant activity in fermented egg whites in line with the addition of liquid milk. However, the addition of 2% liquid milk resulted in discoloration in fermented egg whites [8]. There have not been many studies regarding the assessment of organoleptic quality in fermented egg whites that obtain extra milk, especially milk powder. The organoleptic quality produced is strongly influenced by microbial fermentation activity. Microbial fermentation activity is determined by the time of fermentation carried out.

The purpose of this study was to assess the organoleptic quality of fermented purebred chicken eggs with different fermentation times.

2. Materials and methods
The equipment used in this study were measuring cups, analytical scales, tablespoons, sample bottles, spoilers, blenders, mixers, sterilizers, refrigerators, incubators and autoclaves, gloves, and masks, 20 semi-trained panelists and test sheets. The materials used are distilled water, alcohol, aluminum foil, egg whites, starter culture and full cream milk.

2.1. Research procedure

2.1.1. Preparation of equipment and materials. Sterilization of equipment such as measuring cups, spoilers, tablespoons and sample bottles and test tubes using an autoclave. Room sterilization and carried out using a mixture of formalin and KMnO4 for 5 minutes. Egg sterilization is done by using hot water at a temperature of 70°C. Then rinsed using 70% chlorine and alcohol solution. Chicken eggshells are broken and separated between egg whites and egg yolks. 100 ml egg whites are placed in a measuring cup and homogenized using a blender. Homogeneous egg whites are then given an additional 2% milk powder and 2% glucose. Addition of starter culture by 10 mL. Furthermore the sample is fermented at 37°C according to the treatment. The research treatment is the fermentation time (hours) is 0, 6, 12, 18 and 24. The parameters assessed were organoleptic quality including aroma, taste, thickness, preference, and color.

2.1.2. Organoleptic testing procedure. The number of panelists in this study were 20 panelists in the category of semi-trained. The panelists' criteria were to consume eggs, aged 20-23 years, and sex, male and female.

Panelists fill out a test sheet or fill in to assess the sample presented. The sample presentations are placed in front of each panelist. Furthermore, an assessment was made of the aroma, color, taste, thickness and likeness of the sample. Determination of value is done by using a structured line scale. Test instructions are (1) taste is tested using the sense of taste, (2) viscosity is tested using the sense of sight, (3) aroma is tested using the sense of smell, (4) color is tested using the sense of sight, which is adjusted to the color scale and (5) preferences are tested using the criteria for color, taste, thickness, and aroma as a standard for evaluating preferences.
3. Results and discussion

The results of organoleptic quality assessment which include aroma, taste, thickness, preference and color of fermented eggs during the study period are presented in Table 1.

Table 1. Assessment of aroma, taste, thickness, preference, and egg white color at different fermentation times.

| Fermentation Time (hours) | Organoleptic Assessment |
|--------------------------|-------------------------|
|                          | Aroma       | Taste       | Thickness | Preference | color     |
| 0                        | 2.92±1.21a   | 2.57±1.08a  | 3.91±1.11 | 3.58±1.12  | 4.93±0.25a |
| 6                        | 3.31±1.23b   | 2.70±0.93b  | 3.94±1.09 | 3.02±1.21b | 4.90±0.35a |
| 12                       | 3.51±1.18b   | 3.05±1.07b  | 3.94±1.11 | 2.91±1.08b | 4.83±0.37a |
| 18                       | 3.60±1.51b   | 3.11±1.13b  | 4.04±1.08 | 2.88±0.97b | 4.82±0.43a |
| 24                       | 3.60±1.33b   | 3.67±1.28c  | 4.43±1.30 | 2.72±0.86c | 4.65±0.60b |

1) different superscripts in the same column show very significant differences (P <0.01)
2) >3: Aroma (very fishy), taste (very eggy), thickness (thin), passions (don't like It), color (white)
3) <3: Aroma (no fishy aroma), Taste (no egg taste), Thickness (very thick), Passions (very like), Color (Yellow)

3.1. Aroma value

The results of the analysis of variance showed that the fermentation time had a significant effect (P <0.05) on the aroma of fermented egg whites. Duncan's test showed that the value of fermented egg white aromas differed significantly with increasing fermentation time. Although the scent assessment did not show a real difference between no fermentation and 6 hours of fermentation, they were not fishy-scented. However, unfermented egg whites showed significantly different scent ratings that were very fishy-scented at 12 hours of fermentation. The addition of fermentation time of 18 and 24 hours showed that the aroma value was not significantly different from the fermentation time of 12 hours.

This change is thought to occur because the fermentation time determines the ability of mixed bacteria Lactobacillus bulgaricus, Lactobacillus acidophilus and Streptococcus thermophilus in breaking down its media. The distinctive aroma of the egg is the fishy aroma influenced by the N and H content found in protein. Decomposition of the two compounds can cause a fishy aroma typical of eggs. This is also related to the ability of mixed bacteria Lactobacillus bulgaricus, Lactobacillus acidophilus and Streptococcus thermophilus in decomposing low protein so that it retains the specific aroma of eggs. This is consistent with the opinion of [4], which states that the growth of LAB bacteria in egg medium is closely related to the ability of these bacteria to break down existing nutrients, especially the ability to break down proteins. Eggs have a low sugar content so the nutrients needed by a mixture of Lactobacillus bulgaricus, Lactobacillus acidophilus and Streptococcus thermophilus are also limited. Growth is based on the presence of energy and nutrition sources, as well as suitable environmental conditions [12].

During its growth, lactic acid bacteria break down proteins into amino acids and peptides which are used as an energy source for cell growth and propagation [4,13]. Decomposition of nitrogen as an energy source is slower than decomposition of sugar into energy. In addition, the distinctive aroma of the product is caused by the ability of BAL to produce chemical compounds from lactic acid, acetaldehyde, acetic acid, diacetyl, or 2-3 pentanadiol and other volatile substances [14].

3.2. Taste value

The results of the analysis of variance showed that the fermentation time had a very significant effect (P <0.01) on the assessment of the taste of fermented egg whites. The Duncan test shows that the taste value of fermented egg whites differs significantly with increasing fermentation time. Although the flavor assessment did not show a real difference between no fermentation and 6 hours of fermentation ie no egg taste. However, unfermented egg whites showed significantly different flavor ratings to
increase the flavor of eggs in line with the increasing fermentation time of 12, 18 and 24 hours of fermentation. There was no difference in taste in fermentation 6, 12 and 16 hours but significantly different in fermentation 24 hours.

This difference is probably due to the ability of mixed bacteria *Lactobacillus bulgaricus*, *Lactobacillus acidophilus* and *Streptococcus thermophilus* which are still low in breaking down egg white as a source of energy. Lactic acid bacteria are organisms that convert sugar into lactic acid [15]. In addition, egg white has antimicrobial activity, namely lysozyme, so that it can inhibit the growth of microbes in egg white. Lysozyme is an enzyme that can destroy cell walls of certain groups of Gram-positive bacteria [16]. The addition of milk and sugar to the egg whites is expected to be able to meet the energy requirements of a mixture of *Lactobacillus bulgaricus*, *Lactobacillus acidophilus* and *Streptococcus thermophilus* so that it can trigger its growth and metabolism [5].

24 hour fermentation is thought to increase the ability of BAL microbes to break down components including egg protein, especially lysozyme. Likewise, decomposition of egg whites by a mixture of *Lactobacillus bulgaricus*, *Lactobacillus acidophilus* and *Streptococcus thermophilus* is expected to increase acid production as a result of microbial metabolism. However, 24-hour fermentation has not been able to increase the production of acid in fermented egg whites, so fermented egg whites still provide a more prominent flavor of the egg.

Acid taste is one of the specific characteristics of fermented products. This is consistent with the opinion [17], which states that Yogurt usually has a sour taste that is refreshingly sharp and has a distinctive aroma. Sour taste in yogurt is an indication there is a proliferation of bacterial mixing that runs well and quickly. The sour taste in yogurt also indicates that the presence of lactic acid has formed.

### 3.3. Value of thickness

The results of the analysis of variance showed that the fermentation time did not have a significant effect (P> 0.05) on the thickness of the fermented egg white. This shows that the fermentation time of 0, 6, 12, 18, and 24 hours did not contribute to the change in the thickness of fermented egg white. However, the results showed that there was a tendency for fermented egg white to decrease in thickness with increasing fermentation time.

Panelist assessment showed the change in fermented egg white from thick to thinner with increasing fermentation time. This is presumably because a longer fermentation time can increase microbial activity in breaking down glycoproteins. Egg glycoprotein is a thick colloidal compound and can be broken down by microbial activity in the fermentation process [4]. The fermentation process can break down the intermediate egg components so that they are more fluid [6,7]. Eggs have a thicker component than other ingredients [18]. This is due to the presence of sugar and protein components that bind to one another [9,19]. In addition, the microbes used in this study are lactic acid bacteria that can produce metabolism such as water [20].

Longer the incubation period, the more amount of water produced. High levels of water are suspected microbial metabolic activity. The incubation time will produce amylolytic activity of lactic acid bacteria due to an increase in the number of bacteria. Amylolytic activity will be able to hydrolyze starch that binds to protein, with the hydrolysis of starch and protein, glucose and other sugars will be produced. Furthermore glucose and sugar will be converted into pyruvate by freeing water molecules, so that the water content is also more. Increased water content will make fermented egg whites thinner [21].

### 3.4. Favorite value

The results of the analysis of variance showed that the fermentation time had a very significant effect (P <0.01) on the panelists' preference for fermented egg whites. Duncan's test shows that the preference value for fermented egg whites is significantly more preferred as the fermentation time increases. A preference assessment by panelists showed that egg whites that had not undergone fermentation were disliked compared to those that had undergone fermentation. Although there is no difference in the level of preference during the fermentation period of 6, 12, 18 and 24 hours. This is thought to occur because
the aroma, taste, thickness and color resulting from the egg fermentation process has changed the characteristics of the egg whites which can affect the taste and acceptance of the panelists.

Fermentation time can increase the preference of panelists on young coconut water probiotic products with the starter *Lactobacillus casei* [22]. The results of microbial metabolism in the fermentation process change the basic characteristics of the material so that it will provide a change in the acceptance of the final product [23].

### 3.5. Color value

The results of the analysis of variance showed that the fermentation time had a very significant effect ($P<0.01$) on the color value of fermented egg whites. Duncan's test showed that the fermented egg white color was significantly different at the time without fermentation and 24 hours fermentation. However, there was no difference in color assessment of egg whites with a time of 0.6, 12 and 18 hours of fermentation. The change in color of the fermented egg white from white to yellowish white in line with the increasing fermentation time. This is thought to occur due to a refurbishment of milk in the egg white liquid that has been added so that the color structure found in the egg white and milk mixture changes from white to yellowish white.

Milk generally contains betacarotene which emits a yellowish color [24], but according [25] the yellowish color of milk is also caused by globules of milk fat. This condition will give a color change when added to the egg whites. Egg white is a food that contains a lot of water [9]. Adding milk to the egg whites will increase the volume of water and have a yellowish discoloration on the egg whites. In addition, fermentation activity will break down the structure of certain compounds so that the color changes [26, 27].

### 4. Conclusion

The results showed that fermented egg whites at different times could improve the aroma and taste of eggs. The thickness of the egg white does not change during the fermentation process. However, the resulting color is yellowish white and is preferred. The organoleptic quality value of egg white changes during the fermentation time and is optimal at 6 hours of fermentation.

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