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Quality test weight and pH of duck eggs using level treatment of melinjo leaves extract (*Gnetum Gnemon* Linn) and storage time

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Quality test weight and pH of duck eggs using level treatment of melinjo leaves extract (*Gnetum Gnemon* Linn) and storage time

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Abstract. Eggs are a rich source of animal protein, such as vitamins A, B, E, D, niacin and riboflavin, carbohydrates, calcium, phosphorus, fat and calories. Apart from having high nutrients, low prices and easy processing, eggs are a livestock product that is easily damaged. Efforts to overcome the damage, it is necessary to carry out preservation. Preservation of eggs can be done by soaking, dry and wet methods, covering the skin with preservatives and storing in a cold room. Soaking fresh eggs is done by soaking various solutions such as lime water, brine solution and filtrate or vegetable tannins containing tannins. The results of the proximate analysis of melinjo leaves contain a tannin concentration of 4.55% which is expected to be one of the vegetable tannins. This study used 176 duck eggs using a completely randomized design (CRD) with 4 x 4 factorial pattern each with 3 replications, consisting of 2 factors. The first factor was the level of melinjo extract (0%, 30%, 40% and 50%) and the second factor was the length of storage (1 day, 14 days, 21 days and 28 days). The results showed s emakin long storage time, the value depreciation egg weight and pH increased. The use of melinjo leaf extract can be used as a preservative starting from the level of 30%.

1. Introduction

Eggs are one of the most widely consumed animal products compared to other livestock products. Eggs that are commonly consumed by Indonesians are those from chicken farms [1]. Eggs are a source of animal protein which is rich in nutrients such as vitamins A, B, E, D, niacin and riboflavin, carbohydrates, calcium, phosphorus, fat and calories [2]. Apart from having high nutrients, low prices and easy processing, eggs are a livestock product that is easily damaged. Eggs are easily contaminated by microbes, either directly or indirectly from water, air, soil and dust [3]. Preservation needs to be done to overcome the damage. One of the preservation of eggs that can be done by soaking, dry and wet methods, cold storage and covering the skin egg with preservative [4]. Soaking eggs can be done by soaking in a solution of salt water, lime water and phytrate or vegetable tannins containing tannins. [5]. One of the plants containing tannins is melinjo. Saponins, flavonoids and tannins are the chemical content of melinjo (*Gnetum gnemon* L.), especially in the seeds and leaves [6].



Melinjo is a plant that is rich in polyphenols called resveratrol. Resveratrol has antibacterial and antioxidant activity, plays a good role in food preservative. The result of the proximate analysis of young melinjo leaves contain a concentration of tannin of 4.55% which is expected to be one of the vegetable tannins [7]. The results of preserving duck eggs by immersion using melinjo leaf extract can maintain the internal quality of duck eggs [8]. Therefore, in this research more deeply regarding the quality of weight loss and pH of duck eggs by soaking melinjo (*Gnetum gnemon* L.) and storage time.

2. Materials and methods

The materials used in this research were melinjo leaves, water, fresh duck eggs, tissue, label distilled water, pH 4, pH 7 and pH 9 buffers. The research used a Completely Randomized Design (CRD) with factorial pattern. The first factor was the level of melinjo leaf extract (0%, 30%, 40% and 50%), and the second factor was the duration of storage (1 day, 14 days, 21 days and 28 days).

2.1. Research and procedure

In this research, the melinjo leaves used were young leaves. Young melinjo leaves have high tannin content [9]. Before being boiled melinjo leaves are dried and sliced into small pieces first. The concentration of melinjo leaves used in this research was a ratio of 0% (w/v), 30% (w/v), 40% (w/v) and 50% (w/v), namely 450gram, 600gram, and 750gram of melinjo leaves. Each boiled in 1.5 liters of water. How to obtain tannins from the melinjo leaves is boiled for 10 minutes. The mixture of melinjo leaves and water is boiled to speed up the process of dissolving tannins in water so that more tannin extract is obtained, after boiling then the water is filtered and cooled [10]. 176 duck eggs that were studied were not more than 24 hours old, then the eggs were cleaned with a cloth to remove dirt on the egg shells, then the eggs were weighed. Duck eggs are put into a container containing the melinjo leaf extract solution and completely submerged, then the container is closed to avoid contamination with outside air so as to maximize the occurrence of the tanning reaction [11]. Eggs are immersed in a melinjo leaf extract solution for 24 hours, then dried using a tissue and put on an egg tray and labeled then stored at room temperature. Measurements and observations were made on days 1, 14, 21 and 28.

2.2. Measured parameter

Parameters measured in this research were weight loss and pH of duck egg whites.

2.3. Data analysis

Data were analyzed according to the one way by analysis of variance (ANOVA) procedure using SPSS 16.0. All experiments were conducted in three replicates. The data were presented as means and standard deviations. The treatment significance of their variance was verified using Duncan's method.

3. Result and discussion

3.1. Effect of melinjo leaf extract and storage time, weight loss of duck eggs

One of the quality factors that can indicate the freshness of an egg is shrinkage of egg weight. Factors that can reduce egg weight and freshness are eggs stored at room temperature resulting in evaporation of water and CO₂ gas as respiration activities that take place during storage. The effect of Melinjo Extract on weight shrinkage of duck eggs is presented in Table 1.

Table 1. The average weight loss of duck eggs (%) by soaking in the extract of melinjo leaves and storage time.

Melinjo extract level (%)	Storage time (days)				Average
	1	14	21	28	
0	0.28	1.81	3.68	4.94	2.67
30	0.15	2.10	3.04	4.16	2.36
40	0.09	1.89	3.11	4.65	2.43
50	0.17	2.36	3.11	4.01	2.41
Average	0.17 ^a	2.04 ^b	3.23 ^c	4.44 ^d	

Note: Difference superscript on the same row and column show very significant differences between treatments ($P < 0.01$).

The longer the duck eggs were stored, the shrinkage value of the duck eggs increased. The shrinkage level of the melinjo extract did not show a difference in the shrinkage value of duck eggs. This is caused by tannins that tan the egg pores, so that evaporation is not too large. The average storage time at 28 days is 4.44%. This data is smaller than the research data by soaking using betel leaf extract in purebred chicken eggs, there is a shrinkage of 4.69% on 28 days of storage. From this data it can be seen that preservation using melinjo leaf extract has a smaller shrinkage value of eggs weight compared to using betel leaf extract [12].

The storage time very significant effect on the percentage of weight of the depreciation value of duck eggs. The average percentage time show that the longer the storage life, the shrinkage weight will increase. The increase in eggs weight shrinkage is caused by the evaporation process in the eggs and low humidity accelerates the evaporation of water from inside the eggs and the influence of high temperatures during storage. The decrease in egg content is caused by the evaporation process of water from the egg and the storage time so that the egg weight can be reduced [13].

The results of the *Least Significant Difference* (LSD) further test showed that the storage time was very significantly different between each treatment. The decrease in weight loss of duck eggs is balanced from the beginning of storage to the final day of storage. This is because the physiological process takes place quickly at room temperature storage where the eggs undergo water evaporation and emit a certain amount of CO₂ so that the longer the storage the freshness will decrease [14].

3.2. Effect of melinjo leaf extract and storage time on the pH of duck eggs.

One of the measurements of eggs quality in interior is the pH value of egg whites. The pH of freshly laid egg whites or fresh eggs is approximately 7.6–7.9. The increase in pH value of egg whites is due to the loss of CO₂ gas present in eggs [15]. The average result of the research on changes in pH values in duck eggs immersed in melinjo leaf extract at various levels during different storage periods at room temperature can be seen in Table 2.

Table 2. The average value of pH white duck eggs with immersion melinjo leaf extract and old storage.

Melinjo extract level (%)	Storage time (days)				Average
	1	14	21	28	
0	8.47	9.35	8.69	8.65	8.79
30	8.29	8.95	8.78	9.14	8.79
40	8.21	8.77	8.83	9.03	8.71
50	8.41	8.55	8.73	9.08	8.69
Average	8.34 ^a	8.90 ^{bc}	8.75 ^b	8.97 ^c	

Note : Different superscripts on the same row show very real between a treatment ($P < 0.01$).

The level of the melinjo extract shows that as the extract level increases, the pH value decreases except without the extract level (0%) and 30% the melinjo extract level produces the same pH value. The storage time treatment show that the longer the storage, the pH value will increase. The pH value at 28 days of storage is 8.97, this value is higher than which used betel leaf extract on eggs with a pH value of 8.81 [12]. These data indicate that the pH parameter of betel leaf extract is better than that of melinjo leaf extract.

Storage time was highly significant to the pH value at each treatment. This is because the pH of the eggs will increase over time which causes CO₂ gas in the eggs to decrease due to evaporation through the egg pores. The loss of CO₂ gas in eggs decreases the bicarbonate ion concentration and the *buffer* system becomes damaged, which will result in an increase in pH [16].

The results of Duncan's continued test showed that storage time showed very significant differences between each treatment of duck egg pH. The longer the eggs are stored, the pH of the eggs will increase due to the loss of CO₂ gas. The pH of fresh egg whites is 7.6. During storage, there will be an increase in pH due to loss of CO₂ gas, for example after being stored for 1 week the pH of egg whites becomes 9.0–9.7 [16]. The pH of egg whites, which is between 7.6 and 8.5, can change depending on the temperature used. Eggs are stored for 3 days in a room where the temperature is 3°C (37°F), then the pH of the eggs is 9.18 while after 21 days the pH of the egg whites is around 9.4 [17].

4. Conclusion

The test results of weight shrinkage and pH of duck eggs to increase the level of melinjo leaf extract can maintain quality, while storage time decreases the quality of duck eggs, often increasing days.

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