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Quality Laying Hen Eggs through Soaking Guava (*Psidium guajava*) Leaves Extract

Alfian Adi Atma[1*], Anik Fadlilah[2], Edy Susanto[3], Wenny Ladhunka Nur Aliyya[4], Arif Aria Hertanto[5], Qabilah Cita Kurnianusa Nastiti Sumarsono[6]

[1,2,3,4,5,6] Lecturer of Faculty of Fisheries and Animal Husbandry, Lamongan Islamic University

ABSTRACT: This study aims to determine the extent to which the concentration of guava leaves extract (*Psidium guajava*) and storage time affect the quality of laying hen eggs. Food materials such as laying hen eggs are easily perishable, meaning that they will deteriorate in quality within 14 days of being stored at room temperature, and will even rot soon after. This study aims to determine the effect of giving guava leaf extract (*Psidium guajava*) and soaking time on the quality and shelf life of eggs. The method used was a Completely Randomized Design (CRD) with a factorial pattern consisting of 2 factors. Factor A is the concentration of guava leaves extract (*Psidium guajava*) solution and factor B is the storage time with 3 replications. The treatments used were: Factor A concentration of guava leaf extract solution A1 = 0%, A2 = 15%, A3 = 30%, and A4 = 45%. Factor B storage time B1 = 0 days, B2 = 7 days B3 = 14 days. The variables analyzed in this study were egg weight loss, egg white index, and yolk index. The data obtained were analyzed using the ANOVA test. If there is a significant difference between treatments, it will be continued with the Duncan Test. The results of the ANOVA analysis showed that the interaction had no significant effect (P>0.05) on the egg white index and egg yolk index. Giving each concentration gave good results in egg weight loss. Meanwhile, the egg white index and egg yolk index showed good results with a concentration of 15%. It is concluded that giving guava leaves extract (*Psidium guajava*) and storage time can maintain the quality and extend the shelf life of laying hen eggs.

KEYWORDS: Egg Weight Loss, Egg White Index, Guava Leaves Extract, Yolk Index

INTRODUCTION

Eggs are a very important food source. They are obtained from poultry and have a high nutritional content that plays a role in human activity. Eggs are a source of protein, fat, and minerals such as calcium, iron, and phosphorus that are easily obtained at an affordable price. One whole egg contains 85 kcal of energy, 6.75 grams of protein, 6 grams of fat, and 0.3 grams of carbohydrate (Pal and Judit, 2021). However, eggs have some drawbacks, one of which is that they spoil quickly if not stored properly. Storing eggs at a constant or normal temperature will not keep them for long, so they will spoil easily. According to Rahmawati et al., (2014), eggs have a short shelf life and can only last for less than two weeks. Eggs that are stored for a long time will be at risk of damage and will undergo changes in composition that will affect the economic value for farmers, traders, and consumers. Indications of egg spoilage include a decrease in egg quality, including the size of the air sac in the egg which causes weight loss, a decrease in the viscosity of the egg white and yolk, the presence or absence of stains, and the aroma of the egg. Akter, et al (2014) reported that storing eggs for a long time will cause a decrease in egg quality due to the evaporation of liquid and gas from the egg through the egg pores. Therefore, efforts that can be made to prevent spoilage are to prevent the evaporation of liquid and gas from the egg through preservation techniques.

The preservation technique by soaking in a guava leaf extract solution containing tannin has been widely used. Guava leaves (*Psidium guajava*) are single leaves that are oval in shape, with blunt tips, rounded bases and even edges. Guava leaves (*Psidium guajava*) contain bioactive tannins, saponins, flavonoids, eugenol, and triterpenoids which have antibacterial properties. The tannin content of 3.25-8.98% has the potential to tan the eggshell and can extend the shelf life of eggs. Tannin will cause the protein on the surface of the eggshell to coagulate and cover the pores, preventing evaporation, preventing the loss of CO_2, and preventing the entry of microorganisms so that the eggs are more durable (Mailoa, et al., 2014; Kamilah et al., 2010). Based on this background, a study was conducted on the use of guava leaves (*Psidium guajava*) extract concentration solution and soaking time on the quality of laying hen eggs.

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MATERIALS AND METHODS

Materials

The materials used in this study were 72 1-day-old laying hen eggs, with an average weight of 55 to 60 grams. The eggs that were selected were clean brown, not cracked, had a smooth shell texture, and were oval in shape, guava leaves (*Psidium guajava*). Other materials used were aquadest. The tools used in this study were a digital scale, calipers.

Methods

This study used a completely randomized design (CRD) with a factorial pattern consisting of 2 factors. Factor A is the concentration of guava leaves (*Psidium guajava*) extract solution and factor B is the storage period with 3 replications. The arrangement is as follows:

Factor A is the concentration of guava leaves (*Psidium guajava*) extract solution to be used:

A1 = 0%, A2 = 15%, A3 = 30%, A4 = 45%.

Factor B is the storage period:

B1 = 0 days, B2 = 7 days, B3 = 14 days.

The significantly different levels were determined by One-way analysis of variance (ANOVA), the difference was considered significant at ($P<0.05$), if it was significantly different, it was continued with the Duncan's Multiple Range Test (Churriyah, et al., 2022).

Fresh laying hen egg were cleaned using a cloth dampened with warm water. Then, they were placed on an egg tray and their initial weight was measured. Next, the eggs were put into plastic clip bags and then placed in a plastic container. Guava leaves extract (*Psidium guajava*) was added according to the treatment: 0%, 15%, 30%, 45%. The eggs were then soaked for 24 hours. After soaking, the eggs were removed from the Guava leaves extract and placed on an egg tray. They were then stored for 0 days, 7 days, and 14 days. Finally, they were observed and analyzed.

The variables observed in this study were:

1. Egg Weight Loss

Egg weight loss was calculated by subtracting the final weight of the egg (grams) after storage from the initial weight of the egg (grams), dividing by the initial weight of the egg (grams), and then multiplying by 100% (Junaedi and Husnaeni, 2020; Revanda and Oktavia, 2024). The formula used is:

EWL = (Initial Weight (grams) - Final Weight (grams)) / Initial Weight (grams) x 100%

2. Egg White Index

The egg white index was determined by measuring the height and diameter of the egg white with a caliper (Djunaidi, et al., 2023). The formula for the Egg White Index is:

EWI = Height of Egg White (mm) / Diameter of Egg White (mm)

3. Yolk Index

The yolk index is a measure of the firmness of the egg yolk. It is calculated using the following formula (Krisnaningsih, et al., 2023):

YI = (Yolk Height / Yolk Diameter) x 100

RESULTS AND DISCUSSION

1. Egg Weight Loss

The weight loss of eggs with different concentrations of guava leaves (*Psidium guajava*) extract and soaking times can be seen in Table 1. The average value of each treatment showed a decrease in egg weight loss (Table 1). The results of this study are in line with those of Imansari, et al (2018), who found that there was a significant effect of egg weight loss with storage for 7, 14, and 21 days. The increase in egg weight loss was directly proportional to the storage time. The longer the storage time, the greater the egg weight loss. The decrease in egg weight loss that occurs during storage is caused by the evaporation of water and the release of CO2 gas from inside the egg through the shell pores. This evaporation and gas release occurs continuously during storage, so the longer the eggs are stored, the lower their weight will be. Based on the average value of egg weight loss for each concentration, 15% concentration for 0 days of storage was 57.4 ± 0.9. For 7 days of storage, it was 57.2 ± 1.4. For 14 days of storage, it was 57 ± 1.1. 30% concentration for 0 days of storage was 60 ± 0.2. For 7 days of storage, it was 59.7 ± 1.5. For 14 days of storage, it was 59.4 ±

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1.2. 45% concentration for 0 days of storage was 59 ± 3.2. For 7 days of storage, it was 58.3 ± 4.6. For 14 days of storage, it was 58 ± 1.8. This shows that there was a decrease in egg weight for each treatment of guava leaves extract (*Psidium guajava*), starting from concentrations of 15%, 30%, and 45%.

Microorganisms degrade some of the compounds in eggs, especially in the egg white, making it thinner and accelerating the evaporation of water and gases CO_2, NH_2, N_2, and H_2S. Riawan et al. (2017) stated that eggs can experience physical damage caused by bacteria. They further explained that the longer the storage time, the higher the number of bacteria in the eggs. Other factors that affect damage (egg weight loss) include temperature, humidity of the storage space, dirt on the eggshell, and handling techniques and equipment used in handling. Soaking eggs in guava leaves (*Psidium guajava*) extract showed positive results. The tannin content in the guava leaves (*Psidium guajava*) extract can protect eggs from damage by microorganisms. As a macromolecular polyphenol, tannin has many phenolic hydroxyls, so it has strong antibacterial activity (Farha, et al., 2020).

Table 1. Egg Weight Loss with Soaking Eggs in Guava Leaves (*Psidium guajava*).

Treatment	Storage Times		
	0 Day	7 Day	14 Day
A1 0 %	60 ± 1.9	58.3 ± 4.3	56.4 ± 1
A2 15%	57.4 ± 0.9	57.2 ± 1.4	57 ± 1.1
A3 30%	60 ± 0.2	59.7 ± 1.5	59.4 ± 1.2
A4 45%	59 ± 3.2	58.3 ± 4.6	58 ± 1.8

2. Egg White Index

The average egg white index (Table 2) using guava leaves (*Psidium guajava*) solution concentration ranged from 0.081 to 0.108 mm. This research result is much higher than that reported by Riawan et al. (2017), where the egg white index soaked in moringa leaves extract gave a result of 0.019 mm - 0.029 mm. The results of the analysis of variance showed that the interaction between concentration and storage time of guava leaves (*Psidium guajava*) did not have a significant effect (P>0.05) on the quality of the egg white index. Tannin is a very complex organic substance and consists of phenolic compounds that are widely found in various plants. Generally, tannins are spread almost throughout all parts of the plant, such as the bark, stem, leaves, seeds, and fruit (Sajaratud, 2013). Tannins are potential secondary metabolite active compounds because they have various antioxidant and antibacterial properties that can suppress various pathogenic bacteria such as *E. coli*, *S. aureus*, *P. aureginosa*, *A. niger* and *C. albicans* (Maoli, et al., 2014).

The average storage time of guava leaves (*Psidium guajava*) did not have a significant effect (P>0.05) on the egg white index. The soaking time of eggs using guava leaf solution gave the highest egg white index value at 14 days of storage (0.108 mm). The longer the egg storage, the lower the egg white index value. This is because the egg white experiences dilution caused by microorganisms. Microorganisms degrade some of the compounds in the egg, especially in the egg white, so that it becomes thinner and accelerates the evaporation of water and gases CO_2, NH_2, N_2, and H_2S (Riawan et al., 2017). The egg white index is also affected by storage time, increased pH due to evaporation of CO_2 from the albumen through the pores of the shell and damage to ovomucin fibers (Lee, et al., 2016).

Table 2. Egg White Index with Soaking Eggs in Guava Leaves (*Psidium guajava*).

Treatment	Storage Times		
	0 Day	7 Day	14 Day
A1 0 %	0.082 ± 0.042	0.074 ± 0.036	0.071± 0.009
A2 15%	0.081 ± 0.016	0.089 ± 0.018	0.084 ± 0.008
A3 30%	0.094 ± 0.012	0.091 ± 0.016	0.092 ± 0.012
A4 45%	0.098 ± 0.014	0.103 ± 0.008	0.108 ± 0.037

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3. Egg Yolk Index

The average egg yolk index (Table 3) using guava leaves (*Psidium guajava*) extract on concentration ranged from 0.324 mm to 0.370 mm. This research result is higher than that reported by Riawan et al. (2017), where the egg yolk index soaked in moringa leaves extract gave a result of 0.141 mm - 0.179 mm. The results of the analysis of variance showed that the interaction between concentration and soaking time of guava leaves (*Psidium guajava*) did not have a significant effect (P>0.05) on the quality of the egg yolk index. The analysis results of the egg yolk index with a concentration of 45% for 14 days of storage showed a decrease of 0.327 from 0.332 for 0 days of storage.

The decrease in the egg yolk index in this study was influenced by the storage period. The longer the storage time, the lower the egg yolk index will be. This is because the diameter of the egg yolk increases due to the osmotic pressure of the egg yolk being greater than that of the egg white. This causes water to move from the egg white to the egg yolk through the vitelline membrane continuously, thus enlarging the diameter of the egg yolk (Tooy, et al. 2021). The longer the storage period and the presence of microorganisms that enter through the egg white can cause the elasticity of the vitelline membrane to decrease further. As a result, the quality of the egg yolk will decrease, showing physical characteristics that change from convex to flat and then break. Soaking eggs using guava leaves (*Psidium guajava*) gave the highest egg yolk index value at 14 days of storage (0.370 mm with 30% concentration). This shows that the longer the storage time, the higher the egg yolk index value. This is because the tannins in guava leaf solution contain ursolic acid which has antibacterial properties (Chen, et al., 2020) so that it has the potential to preserve eggs for a fairly long period of time, namely 1 month.

Table 3. Yolk Index with Soaking Eggs in Guava Leaves (*Psidium guajava*).

Treatment	Storage Times		
	0 Day	7 Day	14 Day
A1 0 %	0.237 ± 0.078	0.247 ± 0.065	0.365 ± 0.036
A2 15%	0.358 ± 0.027	0.336 ± 0.025	0.352 ± 0.025
A3 30%	0.324 ± 0.021	0.349 ± 0.002	0.370 ± 0.024
A4 45%	0.332 ± 0.024	0.341 ± 0.027	0.327 ± 0.027

CONCLUSION

The administration of guava leaves (*Psidium guajava*) extract at concentrations of 15%, 30%, and 45% for storage periods of 7 and 14 days showed good results in reducing egg weight loss. Meanwhile, the egg white index showed good results at a concentration of 45% and a storage period of 14 days, while the egg yolk index showed good results at a concentration of 30% and a storage period of 14 days. This indicates that the tannin content in guava leaves (*Psidium guajava*) extract can extend of eggs storage time.

REFERENCES

1. Akter, Y., A. Kasim, H. Omar, and A. Q. Saizi. Effect of Storage Time and Temperature on the Quality Characteristics of Chicken Eggs. Journal of Food Agriculture and Environment, 1212(3&4), 2014, pp. 87-92.
2. Chen, X., Y. Zhang, W. Ma, and Z. Wang. Effects of Ligustrum lucidum on Egg Production, Egg Quality, and Caecal Microbiota of Hens During the Late Laying Period. Italian Journal of Animal Science, 19(1), 2020, pp. 687-696.
3. Churriyah, R., O. Sjofjan, and M. H. Natsir. Growth Performance and Digestive Enzym Activity of Broiler Fed with Microwave Flaxseed Flour (*Linum usitatissimum*). Jurnal Ilmu Nutrisi dan Teknologi Pakan, 20(2), 2022, pp. 78-82.
4. Djunaidi, I., C. A. Damayanti, S. Wibowo, and O. Sjofjan. Exploring the Potential of Natural Feed Additivies From Herbs as an Alternative to Antibiotic Growth Promoters for Mojosari Layer Duck (*Anas javanica*) Farming: *in-silico* and *in-vivo* studies. Journal of the Indonesia Tropical Animal Agriculture, 48(4), 2023, pp. 243-257.
5. Farha, A. K., Q. Yang, G. Kim, H. B. Li, F. Zhu, H. Y. Liu, R. Y. Gan, and H. Corke. Tannins as an Alternative to Antibiotics. Food Bioscience, 38, 2020, pp. 1-14.

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6. Imansari, F. M. A. Djaelani, and S. Tana. Kualitas Telur Ayam Ras Setelah Pencelupan Ke Dalam Larutan Rumput Laut Berdasarkan Waktu Penyimpanan. Jurnal Biologi, 7(3), 2018, pp. 8-14.
7. Junaedi and Husnaeni. Relationship of Hatching Egg Weights with Egg Weight Loss and DOC Weights of Chicken from Bangkok Male Crossbreeding with Pelung Chicken Broodstock. Chalaza Journal of Animal Husbandry, 5(1), 2020, pp. 35-39.
8. Krisnaningsih, A., T., N., H. Leondro, F. Lija, and A. A. Setiawan. External and Internal Qualities of Chicken Eggs Early Production Various Storage Time at Room Temperature. Jurnal Ilmu dan Teknologi Hasil Ternak, 18(1), 2023, pp 64-72.
9. Lee, M. H., E. J. Cho, E. S. Choi, and S. H. Sohn. The Effect of Storage Period and Temperature on Egg Quality in Comercial Eggs. Korean Journal Poultry Science, 1(43), 2016, pp 31-38.
10. Mailoa, M. N., M. Mahendradatta, A. Laga, and N. Djide. Antimicrobial Activities of Tannin Extract Fro, Guava Leaves (Psidium Guava L) on Pathogens Microbial. International Journal of Scientific and Technology Research, 3(1), 2014, pp 236-241.
11. Pal, M. and Judit M. The Role of Eggs as an Important Source of Nutrition in Human Health. International Journal of Food Science and Agriculture 5(1), 2021, pp 180-182.
12. Revanda, F. A., and Oktavia R. P. The Effect of Eggshell Dipping with Various Types of Oils and Storage Duartion on The Weight Loss and Shell Thickness of Table Eggs. BIO Web of Conferences, 88, 00005(2024), 2024, pp. 1-6.
13. Riawan, Riyanti, and Khaira N. The Effect of Moringa Leaf Solution on Interior Quality of Egg Laying Hens. Jurnal Ilmiah Peternakan Terpadu, 5(1), 2017, pp 1-7.
14. Tooy, M. D., N. N. Lontaan, L. C. M. Karisoh, and I. Wahyuni. Physical Quality of Eggs Dipped in a Comercial Green Tea (*Camella sinensis*) Solution. Jurnal Ilmiah Peternakan Terpadu, 5(1), 2021, pp 1-7.

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