

Impact of Preservation Using Moringa (*Moringa oleifera* L.) Leaf Juice on Chicken (*Gallus gallus domesticus*) Egg White Index

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Abstract: This study aimed to determine the consistency of the egg white index of native chickens (*Gallus gallus domesticus*) after soaking eggs in Moringa leaf juice. It aims to extend the shelf life of eggs. Egg white consistency is one way to measure the quality level of eggs that have been stored for a certain time. The egg quality variables measured were egg white diameter and egg white height, so the egg white index was obtained. The higher the egg white index, the better the egg quality. The material used is a solution of Moringa leaf juice to soak the eggs for 24 hours to maintain the consistency of the egg white index. Soaking is to maintain the state of the inside of the egg. The ingredients in Moringa leaves are used to wrap eggs to avoid the invasion of harmful microorganisms. In this study, a completely randomized design (CRD) was used. Moringa leaf juice had 4 concentrations, namely 0%, 15%, 30%, and 45%. Each concentration treatment was repeated 5 times. The number of eggs required is 1000 eggs, of which a sample of 420 eggs is used for processing. Eggs used in good condition are brown eggs, clean, intact, not cracked, smooth texture, and oval shape. The randomization method used random sampling in the form of a lottery system. Each of the 420 eggs is labeled. Randomly selected eggs were divided into 4 treatment groups. The soaking process is for 24 hours, then the eggs are dried in the sun and then stored in a room with a temperature between 28-30 degrees Celsius. Storage time and the internal quality of eggs will be tested for 21 days. This is done to determine the level of egg resistance accurately because the embryonic development period of the egg is 21 days. Every day at 08.00 WITA to measure egg parameters. The egg quality parameter analyzed was Egg White Index. All measurement data were analyzed by analysis of variance (ANOVA). If the results of the analysis have an effect, then the Tukey test is continued with 95% confidence ($\alpha > 0.05$). The data analyzed showed that eggs soaked in a solution of Moringa leaf juice had a higher and more stable egg white index than eggs that were not soaked in a solution of Moringa leaf juice. The optimal concentration to maintain the egg white index is 45%. Therefore, soaking eggs with Moringa leaves helps maintain the consistency of the egg white index.

Keywords: completely randomized design, egg white index; *Gallus gallus Domestica*; *Moringa oleifera* L.

Introduction

The nutrients in eggs are protein and cholesterol. These nutrients are needed by the body in building cells and cell metabolism. Therefore, a large supply of eggs is needed to meet the nutritional needs of the Indonesian people (Putra, 2019). Fulfilling the need for eggs in sufficient quantities, we need an appropriate technology. When egg production has been sufficient, there is a problem in post-harvest handling. The perishable nature of eggs is a big problem that must be solved. Therefore, we need

an appropriate handling technique in post-harvest processing in egg production. If post-harvest handling is not appropriate, it will reduce the internal quality of the eggs.

The decreased internal quality of eggs is caused by the nature of the eggs that rot quickly and the eggshells are easy to break. The internal quality of eggs only survives under optimal conditions at a shelf life of under 1 week. Meanwhile, eggs that are good for consumption are eggs that have a shelf life in the open for a maximum of 14 days (Putra

and Tiring, 2021). If it passes the 14-day shelf life, the nutrients stored in eggs are not good for consumption. Eggs that receive post-harvest handling in the right way can maintain the internal quality of the eggs until they are 21 days old (Putra and Tiring, 2021). Herawati (2008) explained that if eggs do not get proper treatment at post-harvest, it can reduce the internal quality of eggs. Several parameters that experienced a decrease in quality were decreased egg weight, increased airbag weight, increased egg white pH and egg yolk pH, and decreased egg yolk index and egg white index. this can be an indication of the cause of the eggs can rot more easily and emitting an unpleasant odor. Egg rot is caused by bacterial activity in the egg that enters through the air cavity in the eggshell. Even the report of Ridwan, et al., (2017) explains that eggs stored in open spaces will only last for 5-6 days. One indicator of a decrease in the internal quality of eggs is a decrease in the egg white index owned by the egg.

The right way of post-harvest handling is to use good storage technology for eggs. The tools and materials used are in nature. this can provide good information for solutions during the current covid-19 pandemic. when activities outside the home are restricted. so that it is necessary to fulfill the stock of food needs in sufficient quantities.

Therefore, using egg storage techniques in the right way must be done, so that they can be stored longer without worrying about getting damaged. The concept that must be considered in egg storage is optimizing the conditions in the egg so that it is not easily exposed to the environment outside the egg. A good egg storage process must pay attention that the egg does not lose water in the egg, because of the evaporation of water and the loss of gases in the egg due to long storage (Riawan, et al., 2017). Therefore, eggs must be coated with natural ingredients so that the pores of the eggshell can be covered. These natural ingredients must contain vegetable tanners (Koswara, 2009) because the tanner content in these natural ingredients can cover the surface of the eggshell so as to avoid the bacterial attack.

The use of the right material is a technique that needs to be considered in the selection of tanning materials in eggs. The use of natural ingredients in

storing eggs is a material that does not contain harmful chemicals. There are certain types of plants that people usually use in processing eggs so that they can survive for a long time. These natural ingredients have a positive impact on maintaining egg quality and extending egg shelf life. Ernawati, et al., (2019) reported that the concentration of 3 types of treatment with a soaking time of 6 hours can have an impact on the quality of broiler eggs, while a concentration of 12% with a storage period of 24 hours has a good impact on the egg white index. In addition, the spread of coconut oil combined with lemongrass and rosella flowers gives good results in increasing the shelf life of broiler eggs (Rahmawati, et al., 2015). Another natural ingredient that is commonly found in the yard of the house is Moringa leaves. The use of Moringa leaves (*Moringa_oleifera* L.) can extend the shelf life of eggs and maintain the internal quality of broiler eggs with a concentration of 30% (Riawan, et al., 2017). One of the internal qualities that are maintained is the egg yolk index.

The content of Moringa leaves plays a role in denaturing proteins in bacterial cells (Walter et al., 2011). The content of Moringa leaves that can maintain the stability of the egg white index is tannins and saponins. Tannins can damage and stop the growth of bacteria by denaturing proteins by destroying the membranes of bacterial cells (Neirborhu, 2002). Damage to the cell membrane can stop the work and bio enzymatic activity in bacteria. This is because the metabolic activity of bacterial cells stops. Therefore, the tannin content in Moringa leaves is expected to have an impact on the high egg white index. This can be seen by looking at the effect of soaking broiler eggs with Moringa leaf juice with concentrations of 15%, 30%, and 45% with a soaking time of 24 hours on the egg white index.

Materials and Methods

Study area

The research location is the Biology Laboratory of the University of Nusa Nipa Indonesia. The study started from January to August 2021. Completely Randomized Design was the method used in this

study. The egg samples used were 420 eggs. Each egg must have a condition that is not cracked, oval shape, brown shell color, and smooth texture, and relatively the same egg weight. The randomization method used random sampling with a lottery system. Each of the 420 eggs is labeled. Eggs that have been taken randomly were divided into 4 treatment groups. Each treatment group consisted of 5 treatment replications. So that 420 eggs were divided into 20 treatment replications. Eggs are soaked using a solution of Moringa leaf juice for 24 hours, then stored for 21 days according to the embryonic development period in poultry such as chickens. Therefore, the measurement of the egg white index parameter was measured for 21 days at 08.00 WITA. The concentration of Moringa leaf juice solution used was 0%, 15%, 30%, and 45%.

The equipment used was writing instruments, egg tray, analytical balance (accuracy 0.1 g), caliper (accuracy 0.05 mm), glass table, and toothpicks. The ingredients used are Moringa leaves, broiler chicken eggs (Isa brown strain 60 weeks old), and clean water. The eggs come from local livestock products in the Sikka Regency area.

Procedures

The stages in this research are; among others:

1. Making a solution of Moringa leaf juice in the following way; Moringa leaves that are already dark green are cleaned with water and then mashed using a blender. Moringa leaves that have been finely filtered and the juice is taken. Furthermore, the concentration of the solution was made with a concentration of 0%, 15%, 30%, and 45%.
2. The method for soaking eggs is as follows; eggs are cleaned with water and then dried. eggs are

soaked in a container that has been labeled according to a predetermined concentration. Next, the eggs are soaked for 24 hours.

3. the storage process is carried out in the following manner; The eggs that have been soaked for 24 hours are removed, then dried until the water attached to the eggshell is completely dry. Furthermore, the eggs were stored for 21 days at room temperature.
4. parameter measurement is carried out in the following manner; Each egg in each treatment was measured 1 egg every day for 21 days. The eggs are taken, then cracked, and placed on a glass table or rice paper. Parameters measured were egg white width and egg white thickness. Then the egg white index was analyzed by dividing the thickness of the egg white divided by the width of the egg white.

Data analysis

Egg white index parameter data were analyzed with SAS software and further tested with LSD (Least Significant Difference) at a confidence level of 95 ($\alpha=0.05$) (Putra et al., 2020).

Results and Discussion

Result

The results of the analysis on the egg white index explained that soaking eggs with a solution of Moringa leaf juice for 24 hours had a significant effect on the white index of chicken eggs. By the results of the analysis the P-value <0.05 . The distribution of observational data on the flavored chicken egg white index on each observation day for 21 days is summarized in table 1.

Table 1. Egg white index of broiler chickens after being given Moringa leaf soak for 24 hours.

Observation day	egg white index			
	0%	15%	30%	45%
first day	0,07690±0,00707 ^c	0,11298±0,00583 ^b	0,12585±0,00513 ^a	0,12101±0,00891 ^{ab}
second day	0,06619±0,00877 ^b	0,11458±0,01283 ^a	0,12292±0,00262 ^a	0,12169±0,00810 ^a
third day	0,06645±0,01286 ^b	0,11447±0,01312 ^a	0,10459±0,01813 ^a	0,10922±0,02085 ^a
fourth day	0,05238±0,01413 ^b	0,09508±0,01183 ^a	0,09572±0,02545 ^a	0,09911±0,01893 ^a
fifth day	0,05581±0,01384 ^b	0,09329±0,00553 ^a	0,09734±0,01062 ^a	0,09061±0,00551 ^a
sixth day	0,06212±0,01197 ^b	0,10139±0,00809 ^a	0,08848±0,01449 ^a	0,10941±0,01636 ^a
seventh day	0,06284±0,00353 ^b	0,07052±0,00965 ^a	0,08658±0,00621 ^a	0,09335±0,00848 ^a

Observation day	egg white index			
	0%	15%	30%	45%
eighth day	0,04794±0,00446 ^b	0,08697±0,00807 ^a	0,09156±0,00632 ^a	0,09102±0,005832 ^a
ninth day	0,03974±0,0129 ^b	0,08308±0,0139 ^a	0,09053±0,00769 ^a	0,08476±0,00910 ^a
tenth day	0,04093±0,00451 ^b	0,09275±0,00701 ^a	0,09346±0,01121 ^a	0,08821±0,01880 ^a
eleventh day	0,02754±0,01019 ^b	0,08530±0,01023 ^a	0,08946±0,00867 ^a	0,09222±0,00750 ^a
twelfth day	0,03611±0,00483 ^b	0,08812±0,01602 ^a	0,09656±0,00877 ^a	0,09093±0,01327 ^a
thirteenth day	0,03914±0,01222 ^b	0,08594±0,01017 ^a	0,08913±0,00292 ^a	0,10433±0,01369 ^a
fourteenth day	0,01943±0,00627	0,08302±0,01200	0,06929±0,01663	0,07167±0,01158
fifteenth day	0,02899±0,01489 ^b	0,08329±0,01107 ^a	0,08216±0,00707 ^a	0,08681±0,01186 ^a
sixteenth day	0,02524±0,01150 ^b	0,08966±0,03564 ^a	0,08095±0,01004 ^a	0,08190±0,01644 ^a
seventeenth day	0,02867±0,01517 ^c	0,06639±0,02195 ^b	0,09647±0,00685 ^{ab}	0,07096±0,01757 ^a
eighteenth day	0,03484±0,00977 ^b	0,08769±0,02037 ^a	0,08281±0,01528 ^a	0,08912±0,02027 ^a
nineteenth day	0,02275±0,00483 ^b	0,07615±0,01260 ^a	0,07330±0,01440 ^a	0,08438±0,01499 ^a
twentieth day	0,01834±0,00552 ^b	0,08999±0,01849 ^a	0,08653±0,01241 ^a	0,07156±0,01353 ^a
twenty-first day	0,01922±0,0035b	0,05542±0,01274b	0,06629±0,01558b	0,07354±0,01076b

The use of a solution of Moringa leaf juice has a good impact on the white index of chicken eggs stored in open spaces. This is by the results of the analysis on measurements carried out for 21 days explaining that the level of egg white index in eggs that received treatment with soaking using a solution of Moringa leaf juice (solution concentration of 15%, 30%, and 45%) was higher than that which did not receive treatment the same (figure 1). It can be seen that starting from the observation on the first day, a significant difference was seen in the egg white index at each

concentration. This is indicated by the subscript in each treatment. The data explained that the 30% concentration had the highest egg white index compared to the others, and the lowest index was in those who did not get treatment with Moringa leaf juice. This was most clearly seen on the 21st day of observation, that all eggs that received treatment with Moringa leaf juice (either 15%, 30%, or 45% solution concentration) had the same relative egg white index compared to those who did not receive treatment.

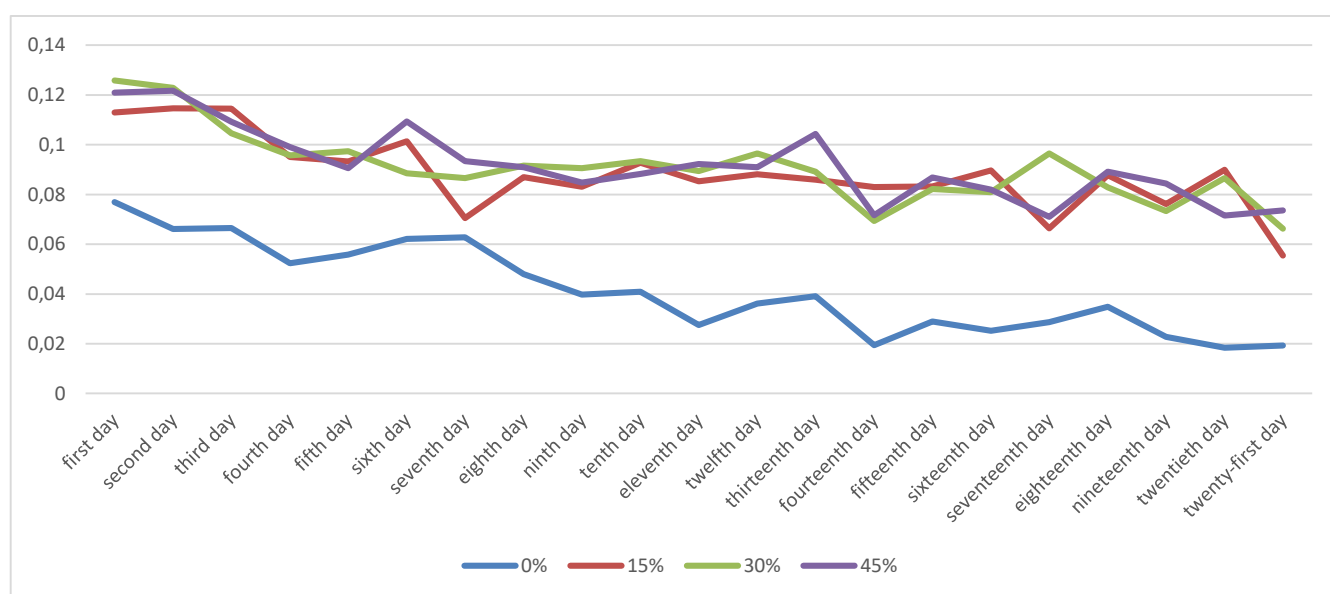


Figure 1. The white index of chicken eggs that have obtained a solution of Moringa leaf juice with different concentrations.

Discussion

Moringa leaves can preserve chicken eggs. This is indicated by the results of the study which can be seen in Figure 1. that the egg white index was seen to be higher in eggs that were treated by immersing a solution of Moringa leaf juice for 24 compared to those who did not. The high egg white index in the treated eggs was due to the tannins and saponins which can maintain the internal quality of the eggs, such as the thickness and width of the egg whites. This can be seen from the measurement of the egg white index carried out on day 1 to day 21. This condition occurs because the tannin content can coat the pores of the eggshell so that it is not easily entered by microbes and can maintain the gas present in the egg (Jimenez, et al., 2017).

The tannins and saponins in Moringa leaves have antimicrobial properties and can keep eggs from being attacked by bacteria that can damage the internal eggs (Sreelatha and Padma, 2009). Tannins are responsible for damaging bacterial cells by weakening the metabolic activity of bacterial cells, and then denaturing proteins in the bacterial body (Pandey et al., 2012). Of course this can directly kill bacteria, by Naiborhu's statement (2002, that the tannin content in Moringa leaves can denature proteins in bacterial cells, thereby disrupting the bacterial digestive system. This situation has an impact on the destruction of the bacterial cell membrane, which in the end has an impact on the paralysis of the bacteria). metabolic activity in bacterial cells.

Thus the bacteria cannot survive on the surface of the egg shell. Egg white/eggshell can change or decrease if an error occurs in the egg storage process. In addition, the increase in storage time can reduce the value of the egg white index. This occurs due to the evaporation of gases in the eggs and an increase in egg pH, as well as damage to the ovomucin fibers by Koswara (2009). Moringa leaf solution serves to inhibit the evaporation of water and CO₂ gas present in the egg, by coating the pores of the eggshell with tannins in Moringa. This can keep the pH of the egg stable. If this is not done post-harvest for egg production it will cause damage to the eggs quickly. An increase in the internal pH of the egg occurs due to the release of

CO₂ in the egg. According to Kurtini et al. (2014), the content of egg white is inorganic elements such as sodium and potassium bicarbonate. So when CO₂ evaporation occurs, the egg white will turn alkaline which has a pH value higher than the normal pH in eggs.

Conclusions

The use of Moringa leaf juice solution with concentrations of 15%, 30%, and 45% was effective in maintaining the consistency of the egg white index on each day of observation. The concentration that had the most influence on the egg white index was 30%.

Acknowledgements: Thank you to the Kementrian Riset dan Teknologi for selecting research as one of the winners of the Ristek Dikti grant for the 2021 fiscal year.

Conflict of Interest: The authors declare that there are no conflicts of interest concerning the publication of this article.

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