Physical Quality of Laying Hen Eggs Given *Manihot esculenta* Leaf Extract

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ABSTRACT
The research aims to find out the physical quality of laying hen eggs given *Manihot esculenta* extract using ingredients consisting of laying hens numbering 32 heads with the age of 1 year and for 5 weeks. The study used a Complete Randomized Design (CRD) of 4 treatments and 4 replays with observed parameters were egg weight, egg white index, egg yolk index, shell thickness, Z value, and yolk color. The data obtained were analyzed using fingerprint analysis with the Duncan test. The results of the analysis concluded that the administration of *Manihot esculenta* leaf extract at a level of 100 mg/bird had a significant influence on the index of egg yolks, thick egg cutting, and Z value in laying hens. However, it has no significant effect on the weight of eggs, the index of egg whites, and the yolk color of laying hens.

Keywords: *Physical egg, Laying hens, Manihot esculenta*

1. INTRODUCTION

Increased purchasing power and public understanding of the importance of fulfilling nutrition, especially from animal sources, has led to increased demand for livestock production. This encourages the rapid development of the livestock sector, including in the poultry sector. The poultry industry in Indonesia is generally dominated by broiler and laying hens whose management is carried out intensively. The increasing need for egg protein is a challenge for laying hens companies to increase the productivity of laying hens [1],[2]. The appearance of laying hens productivity can be displayed optimally with the support of quality feed [3],[4],[5].

Quality feed is feed that has a composition of nutritional content following the needs of livestock production. Feeding following the nutritional needs of laying hens is one thing that must be considered [6]. Efforts are being made to utilize local feed while still paying attention to several things, namely the amount of availability of nutritional content/quality, quantity, price, and content of anti-nutrients [7]. An alternative that can be used with the use of local feed is the use of *Manihot esculenta* leaf extract [8]. *Manihot esculenta* extract has various active substances, namely saponins, flavonoids, and tannins which play a role in increasing the absorption of feed nutrients so that livestock productivity is more optimal [9]. High feed digestibility can affect the body's metabolism, including products such as egg production and quality. In addition, the class of flavonoid compounds, tannins, and saponins are anti-microbial substances [10].

Increasing nutrition through the consumption of animal protein is a public demand for health. Consumption of protein per capita/day is 55 g consisting of 80% (44 g) vegetable protein and 20% (11 g) animal protein divided into 6.5 g protein from fish and 4.5 g protein from livestock [11],[12]. Consumption of protein from livestock from the standard 4.5 g/capita/day can only be reached at 4.19 g [13],[14],[15]. Efforts to meet the protein needs of livestock origin are to develop the potential of local livestock. Chicken eggs are favored by the community because they contain good nutrition and the price is relatively cheap compared to other foods of animal origin. Chicken eggs are also widely used in making cakes and for the treatment of nutritional deficiencies. The nutritional composition of broiler eggs per 100g is 70.83% water, 185 kcal energy, 12.81g protein, 13.77g

fat, 1.45g carbohydrates, 674.36 mg minerals, 0.25 mg vitamin B6, 12 amino acids, 99g, pantothenic acid 1.862mg, riboflavin 0.404 mg, thiamine 0.156mg, vitamin 1328 IU, niacin 0.20 mg, vitamin B12 5.40 mcg, vitamin A 674 IU and cholesterol 884 mg [16],[17]. The nutritional content of chicken eggs can be food that contributes to human nutritional needs, so the need for eggs will continue to increase, especially since the price is very affordable by the community [18],[19].

Egg quality is influenced by the quality of the ration consumed by laying hens, factors that affect egg size are genetic traits, daily diet, age, sex maturity level, and drugs [20]. The big difference in eggs is influenced by the amount of protein and amino acids, as well as linoleic acid contained in the diet [21]. Egg weight and shell thickness are good indicators of egg quality [22]. About 35%-75% of calcium for eggshell formation comes from food consumption [23], while calcium from the medullary bone will be used if calcium from feed for classification is insufficient [24],[3],[25].

Provision of animal feed must be as needed so that the product is produced both in quantity and quality and the feed ingredients are easy to obtain, inexpensive, non-toxic, and have the required nutritional value. *Manihot esculenta* is an ingredient that can be used in laying hens rations because it contains good macro and micronutrients. The micronutrients contained include vitamin A, vitamin B1, vitamin C, calcium, phosphorus, iron, zinc, potassium, copper, magnesium, manganese, also contains beta carotene and essential amino acids, namely lysine, leucine, isoleucine, valine, and arginine [26],[27]. *Manihot esculenta* is an agricultural waste and is very easy to find in Southeast Sulawesi. The results of the chemical analysis show that *Manihot esculenta* flour has a crude protein content of 24.32% [27],[8],[28]. The high protein content in *Manihot esculenta* is the reason for the protein source material in the preparation of laying hens rations. [29],[10].

Based on this background in the use of cassava flour, the authors are interested in reviewing articles about the use of *Manihot esculenta* flour for laying hens. The study aimed to determine the percentage of addition of *Manihot esculenta* flour in the ration to Egg Weight, Egg White Index, Egg Yolk Index, Egg Shell Thickness, Z Value, and Egg Yolk Color, laying hens.

2. MATERIAL AND METHODS

The research was carried out for 5 weeks in January-February 2021, at the Laboratory of the Poultry Unit, Faculty of Animal Science, University of Halu Oleo. The material used was 30 layer chickens aged 1 year. Using feed ingredients in the form of corn, bran, and RK 24 concentrate, as well as *Manihot esculenta*, extract, and drinking water. The equipment used for further testing of egg quality is a caliper, egg yolk color fan, cutting board, spatula, micrometer screw.This study used a completely randomized design (CRD) consisting of 4 treatments and 4 replications. The treatment applied is as follows:

P0 = (No *Manihot esculenta* extract)
P1 = 50 mg/bird *(Manihot esculenta* Extract)
P2 = 100 mg/bird (*Manihot esculenta* Extract)
P3 = 150 mg/bird (*Manihot esculenta* Extract)

The mathematical model used for this design is as follows:

$$Yij = \mu + \alpha i + \mathcal{E}ij$$

Information:

Y_{ij} = Observation value on test 1 – 4, the effect of feed treatment
μ = General mean of treatment effect
α_i = Effect of treatment on-i (i=1,2,3, and 4).
$\mathcal{E}_{ij}$ = Effect of treatment error to-i, on the-j (i=1,2,3, and 4) and (j=1,2,3, and 4).

3. RESULTS AND DISCUSSION

3.1 Egg Weight

The results of the analysis showed that the administration of *Manihot esculenta* extract to laying hens did not have a significant effect (P>0.05) on the egg weight of laying hens. The average weight of broiler eggs produced in this study was in the range of 59-63 gr. The absence of differences in egg weight in this study was probably due to the nutritional content of the *Manihot esculenta* extract that had not been able to increase feed consumption so that it had an impact on the number of nutrients utilized by laying hens. Nutritional factors that affect egg weight are the content of protein, amino acids, and linoleic acid contained in it [9],[8].

There may be no difference in the treatment of *Manihot esculenta* extract in the study, it is suspected that the active compounds present in *Manihot esculenta* have not responded to the weight of laying hens' eggs so that they do not affect the weight of chicken eggs. *Manihot esculenta* contains active compounds in the form of flavonoids and phenolic [30]. Secondary metabolite compounds in cassava leaf extract are steroids, which have a function as a booster of the hormone estrogen in synthesizing vitellogenin. The vitellogenin resulting from the synthesis process is then induced by the hormone estrogen and transported to the oocyte through the blood to help follicle development, which in turn can affect the weight of the eggs produced [31]. However, in this study, it has not had a significant effect on the weight of broiler eggs produced.

3.2 Egg White Index

The results of the analysis showed that giving *Manihot esculenta* extract to laying hens did not have a significant effect (P>0,05) on the egg white index of laying hens. The average egg white index of laying hens produced in this study was in the range of 0,16-0,17. This is because the level of administration of each treatment giving *Manihot esculenta* extract does not

Table 1. The characteristics of layer eggs given *Manihot esculenta* extract

Parameter	Treatment			
	P0 (0 mg/bird)	P1 (50 mg/bird)	P2 (100 mg/bird)	P3 (150 mg/bird)
Egg Weight	63.53±4.97	62.46±3.46	60.40±5.53	59.58±1.88
Egg White Index	0.17±0.02	0.16±0.02	0.16±0.02	0.17±0.01
Egg Yolk Index	0.33^{a} ±0.06	0.36^{ab}±0.06	0.45^{b} ±0.04	0.41^{ab} ±0.07
Shell Thickness	0.24^{a}±0.04	0.28^{a} ±0.05	0.35^{b} ±0.06	0.39^{b} ±0.02
Z value	0.72^{a} ±0.10	0.79^{ab} ±0.14	1.03^{c} ±0.05	0.94^{bc} ±0.13
Egg Yolk Color	10.56±0.52	10.95±0.85	11.51±0.51	10.42±0.50

Information: Different superscripts in the same line showed a significant difference ($P < 0.05$) in the yolk index and very significant ($P < 0.01$) in eggshell thickness and Z value.

increase the nutritional content of the feed so it does not affect the egg white index. The content of compounds in *Manihot esculenta* extract consumed is absorbed by the small intestine in the same amount for the formation of egg whites.

Protein in feed is thought to break down based on the need for egg formation. Proteins based on their solubility will be absorbed by the magnum to synthesize egg white proteins in the form of ovomucin, ovalbumin, ovomucoid, ovoglobulin, and ovotransferrin. The same protein content in each feed is thought to cause the same amount of protein absorbed for egg formation, besides that the protein consumed must also meet the basic life and production of laying hens so that the egg white index value produced is the same for each treatment.

3.3. Egg White Index

The results of the analysis showed that giving *Manihot esculenta* extract to laying hens did not have a significant effect ($P>0.05$) on the egg white index of laying hens. The average egg white index of laying hens produced in this study was in the range of 0.16-0.17. This is because the level of administration of each treatment giving *Manihot esculenta* extract does not increase the nutritional content of the feed so it does not affect the egg white index. The content of compounds in *Manihot esculenta* extract consumed is absorbed by the small intestine in the same amount for the formation of egg whites.

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3.4. Egg Yolk Index

The results of the analysis showed that giving *Manihot esculenta* extract to laying hens had a significant effect ($P<0.05$) on the egg yolk index of laying hens The average egg yolk index of laying hens produced in this study was in the range of 0,33-0,45. Further test results showed that the treatment P0 was not significantly different from the treatment P1 and P3. Likewise, treatments P1, P2, and P3 are not different. However, P2 is significantly better than P0. This shows that the administration of *Manihot esculenta* extract gave a good response to the egg yolk index. This difference may be caused by the presence of active compounds contained in the extract of *Manihot esculenta* in the form of flavonoids and steroids which affect egg yolk height. Steroids are thought to be able to increase the function of the anabolic activity of liver cells by increasing the synthesis of vitellogenin which is a precursor of egg yolk, thus affecting the height of egg yolk. Flavonoids are thought to support these functions [32]. The presence of isoflavones in the form of flavonoids contained in *Manihot esculenta* extract has estrogenic activity so it can affect the egg yolk index.

3.5. Egg Shell Thickness

Giving *Manihot esculenta* extract to laying hens has a very significant effect ($P<0.01$) on the thickness of the eggshells of laying hens. The average thickness of broiler eggshells produced in this study was in the range of 0.22-0.39. Further test results showed that treatment P0 was not significantly different from treatment P1. Likewise, P2 and P3 are not significantly different. However, P2 and P3 are better than P0 and P1. It is seen that the addition of *Manihot esculenta* extract from 50-150 mg can increase the thickness of chicken eggshells. The increasing thickness of the eggshell was influenced by the content of calcium and phosphorus in the feed and the extract of *Manihot esculenta* which was absorbed by laying hens resulting in a good shell thickness. The content of calcium and phosphorus in feed plays a role in eggshell quality because in the formation of eggshells it is necessary to have sufficient

carbonate ions and Ca ions for the formation of eggshells.

3.6. Z value

Giving *Manihot esculenta* extract in feed has a very significant effect (P<0.01) on the Z value of laying hens eggs. The average Z value of laying hens produced in this study was in the range of 0.72-1.03. Further test results show that P0 is not significantly different from P1 (equivalent to B value). Similarly, P2 and P3 are not significantly different and both are equivalent to the value of A. However, P2 was significantly better when compared to P0 and P1, while P2 was not significantly different from P3. The results of the study on the Z value are in line with the egg yolk index obtained in this study, namely between 0.33–0.45 (equivalent to the value of A). Egg yolk index >43 equivalent to value AA, 0.30–43 equivalent to value A, 0.21–0.29 equivalent to the value of B and < 0.21 equivalent value C.

3.7. Equivalent Value

The results of the analysis showed that giving *Manihot esculenta* extract to laying hens did not have a significant effect (P>0.05) on the color of the egg yolk of laying hens. The average color of the egg yolks of laying hens produced in this study was in the range of 10.42-11.51. This is probably influenced by the content of carotene and xanthophyll compounds in the feed and the extract of *Manihot esculenta* is very small so it cannot increase the color of the egg yolk of laying hens. This was seen in the treatment that there was no increase in the color of the egg yolk of laying hens in the treatment of *Manihot esculenta* extract. Egg yolk color is influenced by substances contained in feed such as xanthophyll, beta carotene, chlorophyll, and chitosan.

4. CONCLUSION

Based on the results of the study, it can be concluded that the administration of *Manihot esculenta* extract at level 100 mg/bird has a significant effect on the egg yolk index, eggshell thickness, and Z value in laying hens. But it has no significant effect on egg weight, egg white index, and egg yolk color of laying hens.

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