The Use of Mangosteen Leaf Flour (*Garcinia mangostana* L) on Weight, Egg Yolk Index and Egg White Index of Layers

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Abstract. This study aims to determine the use of mangosteen leaf flour on egg weight, egg yolk index and egg yolk color. 100 laying hens were used, with 5 treatments and 5 replications and filled with 4 tails for each replication. The treatment used was as follows: R0 = Basal diet 100%, R1 = Basal diet 99% + TDM 1%, R2 = Basal diet 98% + TDM 2%, R3 = Basal diet 97% + TDM 3% and R4 = Basline diet 96% + TDM 4%. The design used was a completely randomized design and if there was a significant difference, the duncan test was continued. Variables: egg weight, egg yolk index and egg white index. The results obtained are egg weight, egg white index but it not significant effect and egg yolk index have a significant effect. It was concluded that application of mangosteen leaf flour to a level of 4% had an effect on the yolk index but the weight of eggs and egg whites gave the same effect.

Keywords: Layer Chicken · Mangosteen Leaf Flour

1 Introduction

Eggs are one of the animal products known as food sources of high quality protein with a complete amino acid composition. Chicken eggs are livestock products that are most often consumed by the community. An egg, humans get almost all the nutritional substances that are fairly balanced in composition and easy to digest, such as high quality protein and amino acids, fats and vitamins and minerals [1].

The mangosteen plant is a plant that is often cultivated in Southeast Asia. This plant provides many benefits for humans, because it turns out that the mangosteen plant contains many anti-oxidants and other active compounds that are very good for warding off free radicals in the body. The content of the mangosteen plant contains many active compounds, such as the fruit (contents), the skin of the fruit, the skin of the mangosteen stem, and the leaves are very useful for maintaining health [2]. The active chemical compounds in mangosteen include: flavonoids, xanthones, tannins, terpenoids and saponins [3]. Mangosteen leaves contain flavonoid compounds and tannins [4]. The administration of flavonoid compounds did not cause negative effects on livestock. Mangosteen leaf is a waste from the mangosteen tree that is rarely used by the public but has great

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benefits because in the mangosteen leaf there are still many compounds such as Xantone and Flavonoid that can ward off free radicals in the body, contain antibiotics and natural dyes. This is what is expected to be beneficial for the production performance of laying hens. Mangosteen stems contain active compounds such as alkaloids, flavonoids, triterpenoids, steroids and glycosides [2]. Mangosteen leaves contain flavonoid compounds and tannins [4]. Utilization of these active compounds has a function as anti-microbial, antioxidant, antifungal and can even reduce heat for broilers with high air temperatures.

Animal feed or rations can be developed by adding several elements or compounds to the feed, including the addition of mangosteen leaf flour. The addition of mangosteen leaves in the ration is expected to increase the composition of substances and elements in the ration so that it is expected that daily egg production and egg quality will be better. Based on the description above, a research will be conducted on "The Effect of Addition of Mangosteen Leaf Powder (*Garcinia mangostana* L) in the ration on the quality of broiler egg yolks.

2 Materials and Methods

2.1 Materials

Preparation of Treatment Materials (Mangosteen Leaf Flour).

The manufacture of mangosteen leaf flour in this study can be seen in Fig. 1:

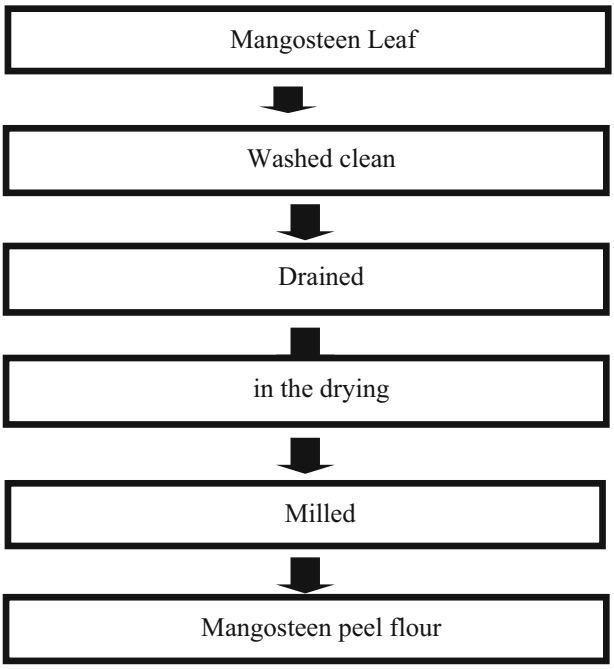

Fig. 1. The process of making Mangosteen Leaf Flour (TDM)

Table 1. Nutritional Content of Treatment Ration

Treatment Ration	PK (%)	SK (%)	LK (%)	Ca (%)	P (%)	EM (Kcal/kg)
R0	17.98	5.38	7.64	1.64	1.06	2780,10
R1	17.98	5.69	7.62	1.64	1.06	2784.10
R2	17.98	6.01	7.60	1.64	1.05	2788,10
R3	17.97	6.32	7.58	1.64	1.05	2792.10
R4	17.97	6.64	7.56	1.64	1.05	2796.10

The research took place at the Dharma Gunawan Livestock Company, which is located in the Kayuwatu area, Mapanget District, Manado City. The livestock that will be used in this study are 100 laying hens at the leyer phase aged 405 days.

The cage used in this study was a battery cage with a size of 37 × 40 × 30 cm, each cage was occupied by 4 chickens. Each cage unit is equipped with a place to eat and a place to drink from a paralon pipe. Before the cage is used, first wash it thoroughly with water. The equipment used is a digital scale to measure egg weight, *Roche Yolk Color Fan* to measure egg color, a glass table to place the eggs to be observed, and calipers to measure egg height, yolk height, white and yolk width.

2.2 Method

The research method used was a completely randomized experimental method (CRD) consisting of 5 designs and 5 replications so that there were 25 treatment units, where each unit consisted of 4 laying hens so that 100 chickens were used. Each replication (experimental unit) used 4 laying hens with the following rations: R0 = Basal diet 100%, R1 = Basal diet 99% + TDM 1%, R2 = Basal diet 98% + TDM 2%, R3 = Basal diet 97% + TDM 3% and R4 = Basline diet 96% + TDM 4%.

Experimental procedures in research using mangosteen leaf flour in laying hens rations are preparation of research cages, manufacture of mangosteen leaf flour and preparation of treatment rations. The ration is an important factor in efforts to increase the production of laying hens, a good arrangement is the key to success in an effort in one place (Table 1).

2.3 Variable

The variables that are monitored in this study include:

Egg Yolk Weight
Yolk weight is measured by weighing each yolk. Measurements were made by weighing the egg weight (g) after being separated from the egg white. Use a digital scale as shown in the picture.

Table 2. Mean Effect of Treatment of Mangosteen Leaf Flour on egg weight, Egg White Index, and Egg Yolk Index.

Variable	Treatment				
	R0	R1	R2	R3	R4
Egg weight (g/egg)	59.85	59.83	60.55	59,80	60,16
Egg white index	0.10	0.10	0.10	0.10	0.11
Egg yolk index	0.39^{a}	0.39^{a}	0.41^{b}	0.41^{b}	0.42^{c}

Note: Different superscripts in the same line are significant ($P < 0.01$)

Egg Yolk Color
The measurement of the yolk color score is carried out by matching the color of the yolk with the standard color found on the egg yolk fan, the score ranges from 1–15 from pale to thick.

Egg Yolk Index
IKT calculation is the ratio of egg height to egg yolk diameter. The egg yolk height and diameter were measured with a caliper. Yuliansyah et al. [5] suggested that the higher the protein and fat content in the feed, the higher the egg yolk index. The yolk index was calculated by measuring the height and diameter of the yolk with a caliper.

2.4 Data Analyses

The data obtained from the study, will then be tabulated using data analyzed using statistical analysis using Analysis of Variance (ANOVA) from Completely Randomized Design (CRD) using 5 treatments and 5 repetitions. The data obtained were analyzed using Microsoft excel. Followed by Duncan's multiple distance test on the variables that showed significant differences.

3 Results and Discussion

Data from research on the use of mangosteen leaf flour in laying hens rations on egg white index, egg yolk index and yolk color can be seen in Table 2.

Egg Weight
Based on the data from Table 2 Egg Weight, it can be seen that the effect of using mangosteen leaf flour on egg weight can be seen in the range of 59.83–60.55 g/grain. The results of the analysis of variance showed that the effect of using mangosteen leaf flour in the ration at the level of 1%–4% did not have a significant effect ($P > 0.05$) on the weight of laying hens. This means that the use of mangosteen leaf flour in the ration at the level of 1%–4% has not made a difference to the weight of the eggs. This is because there is a balance in the food in the rations of each treatment, so that the ration treatment does not affect egg weight. Yuwanta [6] stated that egg weight is influenced by the quality of seeds and the quality of the ration given, in addition to other factors. Latifah

[7] stated that the small size of poultry eggs is strongly influenced by the protein and amino acid content in the feed. North and Bell [8] stated that eggs produced from new hen laying eggs or young brooders are smaller than eggs produced from older broods.

Egg White Index

Based on the data in Table 2, it can be seen that the average index of egg white given the mangosteen leaf flour treatment with a level of 0%–4% is 0.10–0.11. Quality requirements for consumption eggs according to the Indonesian National Standard (SNI) 3926–2008 with an index of egg white quality I 0.050–0.174, quality II 0.092–0.133, quality III 0.05–0.091. While the index of egg yolk quality I was 0.458–0.521, Quality II was 0.394–0.457 and quality III was 0.330–0.339 [9]. This shows that the results of the study produce an index of egg white on the Quality I standard, which is between 0.050–0.174. Thus, the observations are still within a definite range. The egg white index is the ratio between the average height of eggs and the short range of egg whites.

The results of the analysis showed that the treatment ration with the use of mangosteen leaf flour up to 4% in the ration of laying hens had no significant effect ($P > 0.05$) on the egg white index. This shows that offering mangosteen leaf flour can have the same effect on the egg white index. Argo et al. [1] stated that egg white or albumin is a description of ration protein, so the index value of egg white given from the protein content of the given ration has anti-bacterial properties and has phytochemical compounds that can inhibit the growth of pathogenic bacteria in the digestive tract such as allicin and scordinin compounds. Which functions as an inhibitor or destroyer of various fungal and bacterial growths so that the use of mangosteen leaf flour can help absorb protein so that livestock needs are met [10]. Protein from feed ingredients that contain protein can affect egg viscosity, the higher the egg, the higher the egg white index and egg white integrity quality. The factor that affects the egg white index is the nutrition of the ration [5].

Egg Yolk Index

Based on the data in Table 2, it can be seen that the average index of egg yolks given the mangosteen leaf flour treatment with a level of 0%–4% is 0.39–0.42. Fresh eggs have an egg yolk index of 0.33–0.55 with an average of 0.42. The standard egg yolk index is as follows: 0.22 = poor, 0.39 = average and 0.45 = high [11]. This indicates that the yolk index produced meets the egg yolk index standard in the range of 0.39–0.42. This is because the mangosteen leaf contains active sulfur saponins which can kill bacteria in the digestive tract so that the absorption of nutrients is more optimal.

The analysis of diversity showed that the treatment ration with the use of mangosteen leaf flour up to 4% in the ration of laying hens had a very significant effect ($P < 0.01$) on the egg yolk index. The yolk index value is influenced by storage time [12]. The longer the eggs are stored (since they were laid) the yolk index decreases, due to the increase in yolk size due to the movement of air from the egg white to the yolk. Egg yolk index is influenced by protein, fat and essential amino acids contained in the ration [4, 13]. Mangosteen leaves contain flavonoid compounds that do not cause negative effects on livestock.

4 Conclusions

The application of mangosteen leaf flour to a level of 4% had an effect on the yolk index but the weight of eggs and egg whites gave the same effect.

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