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The Effect of Combination of Calcidifier (CaCO3 and *Averrhoa bilimbi* L.) to External and Internal Egg of Isa Brown Laying Hens

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ABSTRACT
The research purpose is to carry out the possible effect combination between CaCO3 and *Averrhoa bilimbi* L. (calcidifier) on external and internal egg of isa brown laying hens. 80 one-day-old isa brown laying hens were randomly allocated to 5 dietary treatments and 4 replicates. Five treatments used for research were dietary with control (T0), basal diet + calcidifier 0.1% (T1), 0.2% calcidifier (T2), basal feed + 0.3% calcidifier (T3), basal feed + calcidifier 0.3% (T4). Data were statistically analysed using SAS University version 4.0 red hat (64-bit) and the differences among treatment means ($p<0.05$) were determined using Duncan multiple range test. The results showed that using calcidifier presented no significant difference ($p < 0.05$) on external in contrast were significant different on internal egg quality ($p > 0.05$). To sum up, the used of calcidifier in feed gives a positive result on the laying hens.

Keywords: *Acidifier, Averrhoa bilimbi L, External, Internal egg*

1. INTRODUCTION

Hazards or hazards related to food safety of livestock origin include livestock diseases, food borne diseases and chemical contaminants and toxic substances including antibiotic contamination [1]. The presence of antibiotic residues in food of animal origin is closely related to the use of antibiotics for the prevention and treatment of livestock diseases and their use as feed additives. The thing of concern is that there is a mixture of feed additives in the ration that is carried out by breeders who cannot guarantee the accuracy of the dosage so that it can cause antibiotic residues in food from livestock [12][13]. Limitation or even prohibition of the use of antibiotics has been carried out, the role of antibiotics in feed as a feed additive can be replaced by several other feed additives such as probiotics, phytobiotics and acidifiers [11].

Acidifier is a feed additive composed of organic acids which has a function more or less the same as antibiotics but has a much lower risk factor than antibiotics because acidifiers will not contaminate livestock products such as eggs. Acidifier can work as a bacteriostatic by suppressing the population of pathogenic bacteria and maintaining the population of non-pathogenic bacteria so that the absorption of nutrients can run optimally [8]. In recent years, poultry feed has grown as well, with the addition of an acidifier as an additive, the acidifier can be in various forms such as citric acid, lactic acid and others. Acidifier is an organic acid that functions to improve digestibility by increasing the performance of digestive enzymes, lowering pH in the intestine and maintaining the balance of microbes in the digestive tract [10].

Calcium (Ca) is an essential mineral compound needed by laying hens for the process of forming bones and eggshells, the source of calcium for laying hens most often used in feed is calcium carbonate (CaCO3) which has been mixed in the form of a premix or has been mixed with other minerals such as Phosphor.Laying hens are one of the animal protein contributing livestock commodities that are capable of producing highly nutritious products. Animals that are able to produce highly nutritious products. Eggs are one of the animal food ingredients with the best nutritional quality [6]. There are three important factors that need to be considered in livestock business, namely seeds, feed, and management. Feed is the most costly factor, which is around 60-80% of all production costs [2]. One of the efforts to increase the efficiency of feed use is by using antibiotics [3]. The use of antibiotics or feed additives that are not according to the recommendations can cause residues in the animal products produced [4]. One way to overcome this problem is to use local (organic) feed additives or natural antibacterials [1].

The potential of star fruit (*Averrhoa bilimbi L.*) can be used as a natural acidifier because it functions as an acidifier which is used as an additive for poultry to maintain the pH of the digestive tract and create a pH condition that is suitable for digestion of food substances that enter the digestive tract and suppress pathogenic microbes and promote the growth of beneficial microbes [5]. Based on the description above, it is necessary to

research the effect of adding a Calcidifier in the feed on egg weight, egg index, eggshell weight, eggshell thickness and egg air cavity depth.

2. MATERIALS AND METHODS

Experimental design: A total of 80 kg ISA brown chicken. Treatments were as follows with control (T0), basal diet + calcidifier 0.1% (T1), 0.2% calcidifier (T2), basal feed + 0.3% calcidifier (T3), basal feed + calcidifier 0.3% (T4). The laying hens were allowed ad libitum access to feed and water through a self-feeder and nipple drinker throughout the experimental period. Preparations were made in making calcifiers in several stages. The initial process in making calcifiers is cleaning the starfruit fruit that will be used from the stem. After cleansing from the stem, the starfruit fruit was mashed using a juicer or blender without adding water. The next step was pouring starfruit juice and calcium carbonate in a ratio of 1: 2 onto a tray. 1 for starfruit juice and 2 for calcium carbonate. Stir calcium carbonate and starfruit juice until homogeneous Then the mixture is transferred to aluminum foil in the form of a container. After transferring the mixture of starfruit juice and calcium carbonate is dried using an oven with a temperature of 70-800C. The last stage is the dry calcidifier / ground to get the calcidifier in the form of flour which is ready to be mixed into the feed.

2.1. Data analyses

Data were statistically analysed using of SAS University version 4.0 red hat (64-bit) with code and the differences among treatment means ($p<0.05$) were determined using Duncan's multiple range test according to [4] method.

Table 1. Ingredient and nutrient composition of the diet

Feed nutrient	**(%)**
Maize	49,5
Rice bran	15,3
Concentrate	29,6
Palm Kernel Meal	5,1
Premix	0,5
	100
Dry matter (%)	87.00
ME (Kcal/kg)	2773
Ash (%)	9.00
Crude protein (%)	17.21
Fat (%)	6.00
Crude fibre (%)	3.00

*vitamin premix (per kg of diet); vitamin A 12,500 IU; Vitamin D3, 2,500; Vitamin E 20 IU; Vitamin K3 2.5 Mg; Vitamin B_1 2Mg; Vitamin B_2 5 Mg; Vitamin B_6 3Mg; Vitamin B_{12} 0.012 Mg; Niacin 35 Mg; Pathonenic acid 12Mg; Folic Acid 1Mg;

**Mineral premix (Per kg of diet); Fe 70 mg, Zn, 90 mg; CU, 10 mg; Mn, 80 mg.

3. RESULT AND DISCUSSION

Based on the results of research that has been done, the average effect of the treatment of the egg white index in Table 3 shows the treatment of T0 (0.43), T1 (0.43), T2 (0.43), T3 (0.43), and T4 (0.41) in mm. According to [5] the standard egg white index varies between 0.05 - 0.174 depending on storage time, storage temperature, and feed nutrition. The results of data analysis stated that the addition of calcidifier in the feed had a very significant effect (p <0.01) on the color of the yolk. Addition of calcidifier to feed at the level of 0.4% (T4) gives the highest yield in egg yolk. The increase in the color of the yolk is thought to be due to the role of the calcidifier in the treatment feed which has a different addition level. Another factor is the content of xanthophyll and β-carotene which affects the thickness of the egg yolk found in starfruit. [7] causes the diversity of egg yolk color in addition to being caused by the amount of xanthophyll content and also β-carotene in the feed, it is also caused by differences in strain, individual diversity, and fat in the feed [6].

The use of an acidifier can be given singly or in combination with other substances such as phytobiotics, so that the use of animal feed acidifiers can be combined with essential minerals such as calcium, where if the acidifier is used together with calcium the organic compounds from the acidifier can break the complex bonds of these minerals so that minerals It breaks down into a simpler form so that it can be absorbed by the body of the livestock easily, the minerals are easily absorbed by the body of the livestock and the increase in nutrient digestibility due to the use of an acidifier can be used by livestock to maintain the metabolic system of the livestock body [15]. Acidifier can be combined using calcium carbonate, where calcium carbonate is commonly found in egg shells, shells of marine organisms, snails and charcoal.

The effect of adding a calcidifier on egg weight is shown in Table 2. Based on the data in the table. 3 it can be seen that the average treatment results from the smallest to the largest are T0 (55.74), T4 (57.95), T1 (57.96), T2 (58,10), and T3 (59.69) in egg weight. The average weight of the eggs from the study was 57.89 grams per egg. Good quality feed in terms of protein, amino acid and linoleic acid content will affect egg weight, because good quality feed will produce large eggs [4]. SNI 3926-2008 explains that the eggs consumed are classified based on the color of the eggs according to the strain and weight of the eggs, large (> 60 grams), medium (50-60 grams) and small (<50 grams). All treatments have a moderate SNI egg weight value, namely 55.74; 57.95: 57.96; 58.10 and 59.69 in grams. Egg weight is influenced by many factors, including genetics, maturation stage, age, drugs and food

substances in feed, especially amino acids and linoleic acid and [5]. [6] [13] also states that the most important factor in feed that affects egg weight is protein, especially the content of amino acids because more than 50% of the dry weight of eggs is protein. High protein in feed will affect the synthesis of albumen and egg yolk. This indicates that egg size is influenced by protein and amino acid intake when the chicken is growing.

Table 2. Effect of calcidifier (CaCO3 and *Averrhoa bilimbi L.*) in feed on the internal egg quality

Item	T0	T1	T2	T3	T4	SEM	*p* value
Egg yolk index	0.43^{bc}	0.43^{b}	0.43^{c}	0.43^{b}	0.41^{a}	0.016	0.15
Egg yolk colour	8.35^{a}	8.53^{a}	9.03^{ab}	9.88^{b}	10.0^{b}	0.24	0.11
Egg yolk volume (ml)	14.83^{a}	16.05^{ab}	15.50^{ab}	16.43^{b}	16.08^{ab}	0.43	0.22
Albumin volume (ml)	30.45^{a}	33.83^{b}	34.63^{b}	35.05^{b}	34.85^{b}	0.129	0.129

$^{a-b}$ Means within row followed by different superscript differ at $p<0.05$

Table 3. Effect of calcidifier (CaCO3 and *Averrhoa bilimbi L.*) in feed on the external egg quality

Item	T0	T1	T2	T3	T4	SEM	*p* value
Egg weight (g)	55.74^{a}	57.96^{b}	58.10^{b}	59.69^{b}	57.95^{c}	1.04	0.012
Egg index (%)	78.74^{a}	79.76^{a}	80.16^{ab}	79.13^{b}	79.10^{b}	0.11	0.03
Egg shell (g)	7.07^{a}	7.41^{ab}	7.64^{ab}	7.64^{b}	7.38^{c}	0.36	0.06
Eggshell thickness (mm)	0.23^{a}	0.24^{ab}	0.26^{bc}	0.27^{cd}	0.28^{d}	0.016	0.11

$^{a-b}$ Means within row followed by different superscript differ at $p<0.05$

The results showed an increase in the P3 treatment with an average egg weight that was owned, namely 59.69 ± 0.65. The results showed that the treatment feed had a very significant effect (P <0.01) on the weight gain of egg laying hens. This is due to the acidifier content in the calcidifier which can optimize nutrient absorption. [4] the acidifier content also plays an important role in increasing egg production where organic acids such as citric acid can increase enzymatic processes and can lower digestive pH so that absorption of nutrients such as calcium and phosphorus can occur optimally. These nutrients will be absorbed by the small intestine and then transferred to the bloodstream and lymph, which will be circulated throughout the body to meet the body's needs [14]. Good nutrition absorption will support the daily needs of livestock so that daily productivity increases. This is also supported by a statement from [5] which states that feed is a factor that can affect egg weight, especially protein, amino acid and linoleic acid content as well as the content of the ratio of Ca and P. Vitamins are used to increase livestock productivity and increase body metabolism.

The effect of adding a calcidifier on the egg index is shown in Table 2. Based on the data in the table. 2 it can be seen that the average treatment results from the smallest to the largest are T0 (78.74), T4 (79.10), T3 (79.13), T1 (79,76), and T2 (80.16) in percent units. The results showed an increase in T2 treatment with an average egg index that was 80.16 ± 0.26. The results showed that the treatment feed had no significant effect (P> 0.05) on the addition of the egg index of laying hens. This is thought to be due to the small difference in calcidifier application, so that the content of vitamins, minerals and amino acids is relatively the same. The content of vitamins, minerals and amino acids is used in the process of metabolism, health and egg formation. If the percentage content is given at almost the same percentage, the egg production will not show a big difference. The addition of 0.15% -035% premix mineral did not have a significant effect on egg production. The effect of adding a calcidifier on eggshell thickness is shown in the Table. 2. Based on the data in the table. 2 it can be seen that the average treatment results from the smallest to the largest are T0 (0.23), T1 (0.24), T2 (0.26), T3 (0.27), and T4 (0.28) in mm.The results showed an increase in the P4 treatment with an average thickness of the eggshell that was 0.26 mm. The results showed that the treatment feed had a very significant effect (P <0.01) on the addition of eggshell thickness of laying hens. This is presumably due to the addition of a calcidifier in the basal feed. Calcidifier made from calcium carbonate mixed with starfruit juice. In addition to meeting the needs of livestock, mineral needs are also used for the formation of egg shells so that livestock conditions and productivity are not disturbed. Ca content affects the color of the yolk, the index of the yolk and the thickness of the eggshell. The need for calcium and phosphorus in laying hens is very high

4. CONCLUSION

To sum up, the used of calcidifier in feed gives a positive result on the laying hens.

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