Addition of Calphyto (Calcium phytobiotics) as a Feed Additive In Vivo to the Relative Weight of Internal Organs Anas javanica Phase Layer

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Abstract

Research on the addition of calphyto (calcium phytobiotics) as feed additives was carried out in vivo on 120 mojosari laying ducks when entering the age of 24 weeks (layer phase). Ducks are divided into 24 flocks, each flock consists of 5 ducks. Statistical data analysis in this study used Variation Analysis (ANOVA) then continued Duncan's Multiple Distance Test (UJBD) if the research data showed significant differences between treatments. Through the Complete Randomized Design (RAL) pattern, there are 6 treatments and 4 tests where there are differences in treatment in each feed given, consisting of P0 = basal feed, P1 = basal feed + 0.25% zinc bacitracin, P2 = basal feed + 0.25% calphyto, P3 = basal feed + 0.50% calphyto, P4 = basal feed + 0.75% calphyto, and P5 = basal feed + 1% calphyto. The variables measured are the relative weight percentage of organs in mojosari laying ducks including the percentage of gizzard, heart, liver, lymph, and pancreatic weights. The final results of the study found that the addition of calphyto as a feed additive showed influence on the variable percentage of the relative weight of the gizzard (P>0.05) of the laying ducks of the mojosari layer phase by P0 = 2.04±0.17a; P1 = 2.67±0.43b; P2 = 2.03±0.16 b, P3 = 2.38±0.49 b; P4 = 2.38±0.14 b; P5 = 2.12±0.10 b. However, the variable percentage of heart, liver, lymph, and pancreas weights did not show any noticeable influence (P<0.05).

Keywords: Calcium Phytobiotics Mojosari laying ducks Relative weight

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1. Introduction

Body weight gain is the most important parameter that is the benchmark for successful livestock rearing management which is closely related to the relative weight of the digestive organs. Digestive organs including the gizzard, heart, liver, spleen, pancreas and so on are fundamental organs in the digestive system of livestock. When the feed nutrition given to livestock is sufficient and can be maximized properly, there will be an increase in the relative weight of the digestive organs so that...
weight gain can be achieved [1]. Feed plays a very large role both for basic life, growth and breeding of livestock so that the quality and quantity of feed given must be in accordance with the balance of livestock needs. Especially in laying ducks whose nutritional content is focused on the parameters of calcium, phosphorus, crude protein, crude fiber and metabolic energy. Calcium is important for laying ducks as a material for bone formation and egg cages. Calcium transport is related to the presence of a calcium-binding protein called CaBP to be carried into intestinal mucosal cells, then distributed to target tissues, especially bones and meat [2]. Therefore, feed additives are needed to help maximize nutrient absorption. Feed additives are known as non-nutritive ingredients that are added to feed or small quantities can suppress the prevalence of enteric pathogens in the digestive tract so that it can spur growth and increase production performance. The use of feed additives by utilizing compounds in herbal plants is highly recommended because it can avoid side effects caused such as the use of antibiotics. Antibiotics in livestock result in antibiotic resistance to bacterial populations and give rise to residues in livestock products which are very dangerous when consumed by humans [3].

The approach to phytobiotics as feed additives shows benefits as antioxidants, maximizing digestive tract function, and boosting the body’s immunity [4]. Phytobiotics also called phytochemicals are secondary metabolite compounds in herbal plants including flavonoids, phenols, curcumin, essential oils and so on that have various effects on plants, animals and humans. Several types of herbal plants that are recorded to contain secondary metabolite compounds include turmeric (Curcuma longa), ginger (Zingiber Officinale), kencur (Kaempferia galanga L.), betel leaves (Piper betle Linn), and so on are currently starting to be used as feed additives in animal feed. Many studies state that essential oils in herbal plants have the potential to inhibit the growth of pathogenic organisms by damaging the cell wall which is a means of getting in and out of the ingredients needed for cell development, thus causing changes in the composition of the cell wall constituents. The decline in the population of pathogenic organisms will have an impact on the increase in non-pathogenic organisms that help increase the metabolic process of nutrients in the body of livestock, thus affecting the work activity of giblets, namely the results of carcasses in the form of gizzards, liver, heart, spleen and pancreas. Through the addition of Calphyto (calculus phytobiotics) as a feed additive in the feed of laying ducks mojosari layer phase is expected to have a positive effect on the weight of internal organs [5].

2. Method

The research was carried out from August to October 2022 at Mr. Narko’s farm which was addressed on Jl Raya Sawahan, Prembangan Hamlet, Sawahan Village, Turen, Malang, East Java. The livestock used are 24-week-old Mojosari laying ducks at the beginning of maintenance, totaling 120 heads divided into 24 flocks in litter cages, each flock divided into 5 heads. Every day ducks are given basal feed from breeders and control feed with the addition of the antibiotic zinc bacitracin as negative control and phytobiotics with a percentage of 0.25% - 1% of the amount of feed given. The needs of facilities during the study include feed and drinking stations on each flock, hanging scales, analytical scales, temperature and humidity sensors, cutting equipment, trash bags, plastic clips and label paper. The field research method was carried out with a Complete Randomized Design (RAL) with 6 treatments and 4 tests. The treatment used in the study was basal feed as positive control, the addition of zinc bacitracin as negative control, and the addition of Calphyto (Calcium phytobiotics) as a feed additive with the following composition.

P0: basal feed
P1: feed + zinc bacitracin 0.25%
P2: feed + calcium phytobiotics 0.25%
P3: feed + calcium phytobiotics 0.50%
P4: feed + calcium phytobiotics 0.75%
P5: feed + calcium phytobiotics 1%.

The parameters measured in this study are the weights of internal organs consisting of gizzard, liver, heart, spleen and pancreatic weights. Microsoft excel is used for data analysis then continued with fingerprint analysis (ANOVA) using the Complete Randomized Design (RAL) method.
treatments and 4 tests, if the results obtained have an influence between treatments (F count > F table) then a Duncan's Multiple Distance Test (UJBD) is carried out. The mathematical model of the Complete Randomized Design (RAL) is:

\[ Y_{ij} = \mu + \tau_i + \varepsilon_{ij} \]

Description: \( Y_{ij} \) = Observation value on i-th treatment and j-th test, \( \mu \) = General mean value, \( \tau_i \) = Influence of i-th treatment, \( \varepsilon_{ij} \) = Effect of experimental error of i-th and jth treatment, i = Treatment (1, 2, ..., 6), j = Deuteronomy (1, 2, ....,4)

Table 1. The nutritional content of feed and phytobiotic calcium used

<table>
<thead>
<tr>
<th>Nutritional Content</th>
<th>Basal Feed Amount (%)</th>
<th>Calcium Phytobiotics Amount (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>89.73*</td>
<td>95.90*</td>
</tr>
<tr>
<td>Crude protein</td>
<td>15.82*</td>
<td>5.66*</td>
</tr>
<tr>
<td>Crude fat</td>
<td>4.33*</td>
<td>0.34*</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>7.00*</td>
<td>15.12*</td>
</tr>
<tr>
<td>Ash</td>
<td>20.37*</td>
<td>57.09*</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.72**</td>
<td>6881 ppm**</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.20**</td>
<td>2032 ppm**</td>
</tr>
<tr>
<td>EM</td>
<td>3040 cal/g***</td>
<td>2032 cal/g***</td>
</tr>
</tbody>
</table>

Information:
Superscript (*) Laboratory analysis results of the Kediri Regency Food Security and Animal Husbandry Service
Superscript (**) Analysis results of the Central Laboratory of the University of Muhammadiyah Malang
Superscript (***) Analysis results of the Malang City Healthy Animal Laboratory

Research begins with the creation of a research plan, the preparation of research equipment and the sanitation of the cage. Mojosari laying ducks are put in cages and then adapted to the cage for one week and kept for 60 days. Feed is given as much as 160 grams / head which has been adjusted to nutritional needs and drinking water is given continuously but still controlled. Data collection of feed residues is carried out every morning and evening before feeding. On the last day of maintenance is carried out slaughter in ducklings when it has reached the age of 32 weeks to obtain data on the weight of internal organs. Weighed ducks on each flock then averaged to determine the live weight of the ducks before slaughter. Furthermore, 2 ducks are randomly taken on each flock for slaughter using a sharp knife on the carotid artery, jugular vein and esophagus. Dipped ducklings in hot water to facilitate feather removal, cut duck carcasses, take internal organs by separating them from the carcass, separate and weigh each part of the internal organs including the gizzard, heart, liver, spleen and pancreas to obtain data on the relative weight of each organ.

3. Result and Discussion

The results of the study on the addition of calphyto as a feed additive to the weight of the internal organs of the mojosari laying duck including the gizzard, heart, liver, spleen and pancreas are presented in Figure 1. The combination of calcium and phytobiotics is important for poultry because it has a function and role that can help support productivity. In the starter and grower phases, calcium is important for bone formation and when entering the layer phase it is needed in the formation of egg shells. Calcium transport is related to the presence of a calcium-binding protein called CaBP to be carried into intestinal mucosal cells, then distributed to target tissues, especially bones and meat [2]. The combination of herbal plants that are used as feed additives mostly consists of turmeric (Curcuma longa), ginger (Zingiber Officinale), kencur (Kaempferia galanga L.), betel leaf (Piper betle Linn) contains chemical compounds as antioxidants, anti-inflammatory, antibacterial, increasing feed efficiency by
increasing the release of digestive enzymes from the pancreas and liver, especially trypsin, amylase, and bile so that it can support improved livestock production performance [4].

Turmeric has known to have superior compounds in the form of curcumin, besides affecting the color pigment of egg yolks and shank, it can also be used as an antioxidant. As with other poultry, laying ducks are susceptible to stress due to extreme weather changes, feed, bacterial invasion which causes oxidative stress reactions so that curcumin activates the antioxidant enzymes glutathione peroxidase and superoxide dismutase. In addition, although curcumin does not have a strong bacterial killing effect, it can significantly inhibit bacterial growth, inhibit the formation of bacterial biofilms and prevent bacteria from binding to the host [6]. The content of active compounds in ginger including gingeron, gingerol, alkaloids, Brunel, volatile oils, flavonoids, shogaols, gingerdiol and terpenoids shows a positive effect on the palatability and digestive system of livestock through increasing the secretion of gastrointestinal enzymes including lipase, disaccharidase and maltase so as to suppress feed conversion. Furthermore, these compounds can act as antioxidants to counteract free radicals [7]. Kencur contains essential oil with the largest component in it is ethyl-p-methoxy cinnamate (C₁₂H₁₄O₃) which shows its activity as an antibacterial by destroying the permeability of cell membranes and reducing intracellular ATP concentrations, DNA and protein concentrations [8]. Antibacterial properties are also found in betel leaves which contain several compounds such as phenols, flavonoids, tannins, dichloromethane, and ethanol [9].
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Figure 1. Average Value of Weight Percentage of Internal Organs of Mojosari Laying Ducks.

Description: (a) average value of gizzard percentage, (b) average value of heart percentage, (c) average value of liver percentage, (d) average value of spleen percentage, (e) average value of pancreatic percentage

The gizzard (ventriculus) is also called the gizzard, which is a digestive organ that connects the proventriculus organs, composed by a horned structure that is strong and thick muscles and functions in the process of mechanical digestion. The muscles in the gizzard are affected by the shape and type of feed ingested. The grit grains in the gizzard function to help the digestive process by reducing feed particles through muscle contraction before being channeled into the intestine to be digested [10]. The percentage of gizzard weight is obtained from a comparison between gizzard weight and live weight of ducks, then multiplied by 100%. The results showed that there was a significant (P<0.05) effect (P<0.05) (Figure 1a) of the addition of calphyto to the gizzard weight. The mean percentage of gizzard weight of Mojosari laying ducks obtained included $P_0 = 2.04\pm0.17$, $P_1 = 2.67\pm0.43$, $P_2 = 2.03\pm0.16$, $P_3 = 2.38\pm0.49$, $P_4 = 2.38\pm0.14$, and $P_5 = 2.12\pm0.10$. The average weight percentage of mojosari laying ducks is still relatively high compared to the broiler gizzard weight percentage of 1.49±0.22 - 1.65±0.16% [11]. The high percentage of gizzard weight of Mojosari laying ducks is because the feed ingredients given mostly include kebi and karak containing high crude fiber of 7% and a larger particle size compared to broiler feed, forcing gizzards to work harder which has an impact on getting bigger muscles and gizzard size.

The heart is a vital organ that plays an important role in the circulatory system, the average results of the percentage of heart weights of mojosari laying ducks were sequentially obtained 0.65±0.07 (P3), 0.65±0.04 (P0), 0.65±0.07 (P2), 0.71±0.05 (P5), 0.73±0.07 (P4), and 0.71±0.05 (P1) statistically showed no real influence (P>0.05). The average heart weight percentage of mojosari laying ducks is almost the same as the average percentage of heart weights of hybrid ducks which ranges from 0.63±0.06 to 0.75±0.07 [12]. Heart weight is influenced by several factors such as duck body weight, strain, gender, age and duck activity [12]. At the time of the study the ambient temperature ranged from 28 °C to 30 °C. Very active livestock and high ambient temperatures can cause the occurrence of a homeostatic process in which the frequency of heart rate will increase. This condition requires more blood to supply oxygen so that the formation of heat in the body increases, then the cattle will spread body heat through increased peripheral circulation in an effort to maintain body temperature in the normal range [13].

The liver is located at the anterior end of the body and has a conformation according to the internal conditions of the body and is divided into the right and left lobes. Apart from functioning as a detoxifier, the liver is involved in various functions including the metabolism of fats, carbohydrates, proteins, minerals, and vitamins. The liver is also used as the main storage site for fat-soluble vitamins such as A, D, E, K, and vitamin B12, glycogen as well as several minerals such as Fe and Cu [14]. Analysis of variance on the average value of liver weight percentage of Mojosari laying ducks did not show a significant effect on the feed additive given (P>0.05). However, P2 gave the best results of 3.80 ± 0.53 compared to other treatments. The average percentage results are 3.60 ± 0.88 (P0), 3.50 ± 0.77
The percentage of the liver weight of Mojosari laying ducks has the same value when compared to hybrid ducks which have a percentage of 3.23 ± 0.52 to 3.62 ± 0.94 [12]. The content of the compounds in the feed additive as described above can improve and optimize the performance of the digestive tract so that it can lighten the liver's work so that the liver weight shown is relatively the same. Active compounds such as gingeron, gingerol, alkaloids, Brunel, volatile oils, flavonoids, shogaols, gingerdiol, and terpenoids present in ginger can increase the secretion of gastrointestinal enzymes including lipase, disaccharidase, and maltase [7] can help increase absorption in the intestine so that the liver's performance is not too high. heavy. It should also be noted that liver weight is also influenced by several factors such as body weight, strain, maintenance management, and livestock activity [15].

The percentage of spleen weight obtained during the study of P0 = 0.04±0.01, P1 = 0.06±0.01, P2 = 0.05±0.01, P3 = 0.05±0.01, P4 = 0.06±0.02, and P5 = 0.05±0.01 showed no noticeable differences between treatments (P>0.05). The spleen includes an organ whose size depends on the amount of blood, its task is to take antigens in the blood that bind to lymphocytes. The larger the spleen, the more antigens are accommodated, as a result of which free lymphocytes in the blood decrease while the H / L ratio increases. Giving feed additives contained flavonoid compounds can increase the number of lymphocytes as a result of growth and development in the lymph. On the other hand, bacterial infections also affect the enlargement of the spleen because the increasing number of lymphocytes occurs as a response to the body’s resistance [16]. Curcumin content in turmeric has a kind of phenolic pigment as an active component so that it can be an anti-inflammatory and antioxidant that binds free radicals and boosts the immune system through increased proliferation of B and T lymphocytes in the spleen. Curcumin is known to activate the expression of cytokines IL-2 and IFN-α as polypeptide factors that are secreted and released by T lymphocytes (CD4+ or CD8+) functioning in regulating cell activity that plays a role in the immune system [17].

Based on statistical analysis in Figure 1, it shows that feeding additives does not show any noticeable influence (P>0.05). The average percentage values of the pancreas were successively obtained results of 0.22±0.03 (P5), 0.22±0.04 (P3), 0.22±0.05 (P4), 0.23±0.05 (P0), 0.25±0.05 (P2), and 0.28±0.04 (P1). The administration of a 0.25% feed additive gives the best results in helping the pancreatic system to secrete pancreatic sap so that it produces digestive enzymes such as lipolytic, amylytic, and proteolytic enzymes. Furthermore, the pancreas can secrete the hormone insulin by pancreatic beta cells so that it can suppress glycemic levels [18]. Gingerol in ginger contributes positively to secreting digestive enzymes in the pancreas, giving it as a feed additive as much as 2% in broiler feed can increase feed consumption [19].

4. Conclusions

Research on the addition of Calphyto (Calcium phytobiotics) as a feed additive to the feed of laying ducks mojosari layer phase carried out in vivo showed a noticeable influence (P<0.05) on the percentage of relative gizzard weights, but on the percentage of heart, liver, lymph, and pancreas weights did not show any influence (P>0.05).

5. References


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