Giving Combination of Alkaline Water and Organic Calcium Sources Towards Liver Health Indicators in Broiler Chicken

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Abstract

The purpose of this study was to determine the liver health in broiler chickens which were fed with additional organic calcium sources combined with alkaline water. The material used was 240 broilers with an average body weight of 195.25 ± 6.85 g. The study used a completely randomized design with a 2x3 factorial pattern, the first factor was 3 levels of alkaline water, namely 0% (A1), 10 mL (A2) and 20 mL. (A3), and the second factor is 2 levels of organic calcium sources, namely eggshell flour (B1) and shellfish (B2). Each treatment was repeated 4 times, each filled with 7 heads. Parameters measured were serum glutamate okasaloacetate transminase (SGOT), serum glutamate pyruvate transminase (SGPT) and relative liver weight. The results showed that the combination of alkaline water and organic calcium sources showed an interaction with SGOT, while the relative weight of the liver and SGPT had no interaction. The conclusion is that the combination of alkaline water levels up to 20 mL and organic calcium sources (eggshell and shellfish flour) is not harmful to broiler liver.

Keywords: alkaline water, broiler chickens, liver indicators and sources of calcium

Introduction

Broiler chicken is a cheap source of animal protein, compared to other meats. The advantage of broiler chickens is their very fast growth, so they can be sold before 5 weeks of age, with an average weight of 1.5 kg (Situmorang, 2013). The increase in body weight of broilers can reach 4 times the initial weight of 48.3 g, so that in the maintenance period of 5 weeks the weight of broilers can reach a standard of 2 kg (Rasyaf, 2007). Factors that affect the final body weight of broilers include; genetics, gender, protein ration, temperature, housing management and sanitation (Hasan, 2013). Feed is the most costly factor in broiler farming, namely 60-70% (Budiansyah, 2010). To spur growth, optimal quality and quantity of feed is needed because the quality of feed affects body weight gain.

Egg shells can be given as a feed ingredient because they are not dangerous and in eggshells there are still many substances and minerals that are needed by the body of the poultry. Macro minerals such as (Ca, P, K, Cl, S, Na and Mg) and micro minerals (Fe, I,

Zn, Cu, Mn, Co, Se and Mo) are needed by livestock in sufficient quantities. Egg shell is one of the livestock wastes which is a problem for the community and food processing industry made from eggs. Many minerals found in egg shells are calcium. Based on the results of the analysis in the Laboratory of Nutrition and Feed Science, Faculty of Animal Husbandry and Agriculture, Diponegoro University (2020), eggshell flour contains 85.6% calcium carbonate and 0.66% calcium phosphate. Alkaline water (alkaline pH water) is good for use because it has a redox potential value or has good antioxidant content and has smaller water molecules than ordinary water so it is easily absorbed by the body. According to Catur and Sukohar (2016) that alkaline water helps in the acid buffering process in the body where alkaline water makes cells to destroy free radicals that are harmful to the body. Provision of alkaline drinking water (alkaline pH) with a pH above 7 is assumed to affect the body's condition of broiler chickens on nutrient digestion and growth. Administration of alkaline water (alkaline pH) is intended to compare with the condition of the natural digestive tract. Minerals are an important component in metabolism and immune function in broiler chickens. Lack of minerals in chickens can cause bone loss (Wahju, 2004). Grit is one of the additional ingredients for chicken rations consisting of small stones, lime, granite fragments, shells or other materials and has slightly hard particles (Khalil, 2003). The purpose of grit is to help the digestive process and is a source of minerals such as calcium and phosphorus which are needed to form egg shells and maintain the strength of chicken bones.

The liver is an important organ in the body that has a major function in the process of metabolism and detoxification of toxins that enter the body (Andriyanto et al., 2014). The liver functions as a synthesis of various protein components, urea cholesterol and other important substances for the body as well as the formation of bile salts and detoxification of toxins (Kahar, 2017). Liver cell damage can be identified from the cell structure histopathologically or through substances produced by the liver in the form of enzymes secreted into the blood such as serum glutamate okasaloacetate transminase (SGOT) and serum glutamate pyruvate transminase (SGPT) (Widyamanda et al., 2013). Serum Glutamic Pyruvate Transaminase (SGOT) or called aspartate aminotransferase (AST) is an enzyme found in liver cells that functions to convert aspartate and alpha-ketoglutarate compounds into oxaloacetate and glutamate and vice versa (Nasution, 2015). The SGPT enzyme is an enzyme that is commonly found in the liver, especially in the mitochondria (Candra, 2013).

The purpose of this study was to determine the liver health in broiler chickens given the addition of an organic calcium source combined with alkaline water against SGPT, SGOT and relative liver weight.

Materials and Methods

Livestock, rations and equipment

240 broilers were kept for 35 days. Day old chick (DOC) was kept from 0–14 days of age and was fed ad libitum and given drinking water. At 10 days of age the chickens were transferred to cages that had been labeled according to the treatment in each cage randomly. Provision of drinking water during different treatments, namely given alkaline water with different levels, namely AIBI (ration + eggshell flour + 0 ml alkaline), AIB2 (ration + egg shell + 10 ml alkaline), AIB3 (ration + egg shell + 20 ml

alkaline)) and A2B1 (ration + shellfish flour + 0 ml lye), A2B2 (ration + shellfish flour + 10 ml lye), A2B3 (ration + shellfish flour + 20 ml lye).

The addition of organic calcium-based feed, namely eggshell flour and grit flour (clamshell) on the ration was made in the form of crumble and alkaline water pH 8.5 with different levels. The feed ingredients used to make rations are egg shells, clam shells, corn, rice bran, soybean meal, MBM, premix, lysine and methionine. The rations were arranged in an iso energy of 3,001.8 kcal / kg and protein of 21.18%. The equipment used includes a blender, a digital scale with a capacity of 5 kg, a 5 mL syringe, a 3 mL vacuum tainer, a coolbox and a thermohygrometer.

Chickens that were 5 weeks old were taken blood and liver samples. Blood sampling was carried out a day before the end of the chicken rearing period, blood and liver samples were taken from 1 chicken representing each treatment so that a total of 24 samples were taken. Blood was drawn through a branchial vein on the wing, 3 ml of blood was drawn and then the blood was put into a vacuum tube containing anti-coagulant ethylene diamine tetra acid or EDTA which had been labeled according to the treatment code. The vacuum tube was then put into a cooling box filled with ice, then taken to the Semarang Regional Health Laboratory for SGOT and SGPT analysis using the spectophotometric method. Measurement of liver weight was carried out using analytical scales. To determine the relative weight of the liver, it was obtained from the weight of the liver divided by the live weight of the chicken multiplied by 100%.

The data is processed using the variance test at the 5% level and if there is a significant difference, Duncan's multiple test is carried out at the 5% level (Gasperz, 1991).

Results and Discussion

The results of the study using alkaline water and organic calcium sources had a significant effect (P <0.05) on SGOT, but not on SGPT and relative liver weight. Data on the number of SGPT, SGOT and relative liver weight can be seen in Table 1.

Table 1. Effect of treatment on SGOT, SGPT and relative liver weight in broiler chickens

Variable	Treatment					
	A1B1	A1B2	A1B3	A2B1	A2B2	A2B3
SGOT (IU/L)	1,50 ± 0,35^{a}	0,97 ± 0,28^{bc}	1,07 ± 0,20^{b}	0,89 ± 0,07^{c}	1,05 ±0,13^{bc}	2,08 ± 0,09^{a}
SGPT (IU/L)	249,6 ± 21,15	227,07 ± 20,39	230,83 ± 19,96	249,27 ± 21,08	247,75 ± 18,32	235,28 ± 17,94
Bobot Hati (%)	2,25 ± 0,30	2,16 ± 0,24	2,15 ± 0,17	1,92 ± 0,16	2,11 ± 0,11	2,07 ± 0,10

The mean value of each parameter column with different superscripts shows a significant difference of P <0.05.

Grit is a mineral source material which generally comes from marine animals in the form of milled shells and has a high carbonate content and the calcium content in shellfish is 38%. According to Fauziah (2013), grit flour has great potential in livestock production and growth. Grit helps the digestive process and is a source of minerals such as calcium and phosphorus which are needed to form egg shells and maintain the strength of chicken bones. According to Safitri (2014), eggshell flour is the result of polluting egg shells containing organic calcium. The function of calcium is for body growth, especially in bones because the performance of broiler chickens is not only seen from the meat. Santia et al. (2019) stated that the addition of microparticle eggshell flour to the ration is a source of organic calcium that is easily absorbed.

Alkaline water is water that is alkaline which has a pH above 7. Water with an alkaline pH, if consumed and enters the body in an acidic condition, can change the conditions in the body to alkaline so that it can deactivate the activity of bacteria and fungi (Kholid, 2011). The use of alkaline water is very good because it has a redox potential value which has smaller water molecules than ordinary drinking water. The function of alkaline water is to balance the acid-base conditions in the body to become stable. Conditions that are too alkaline are also not good for the digestive tract because they can increase the growth of pathogenic bacteria so that addition without alkaline water can effectively affect the digestive process. Alkaline water is rich in hydrogen, which in the ionization process of hydrogen ions is very potential as a destroyer of pathogenic bacteria that cannot stand low pH. Jin et al. (2006) reported that hydrogen in alkaline water can improve health by preventing disease by pathogenic bacteria.

The results showed that the application of alkaline water and organic calcium sources had a significant ($P < 0.05$) effect on SGOT and had no significant effect on SGPT. According to Selvamet et al. (2010) low SGOT values indicate that the liver is functioning properly and is not damaged. It is possible that SGOT and SGPT levels in the blood can describe the level of liver health and the level of feed toxicity consumed by broiler chickens. According to Candra (2013) that SGOT and SGPT normally remain in liver cells, if the cells are damaged, they enter the blood and the levels increase. According to Sugiharto et al. (2018) that the levels of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in chickens are 260 U / L and 1.02 U / L. Egg shells can be given as animal feed ingredients because they are not dangerous and in eggshells there are still many substances and minerals that are needed by the body of the poultry. Santia et al. (2019) stated that adding a mixture of feed ingredients using eggshell flour as a source of organic calcium is easier to absorb because it has a high bioavailability in chickens.

The results showed that the administration of alkaline water and organic calcium sources had no significant effect ($P > 0.05$) on the relative weight of the liver. According to Suprijatna et al. (2008) stated that the function of the liver is to produce bile, neutralize toxins, store energy that is easy to use (glycogen) and break down the remaining protein into uric acid and creatinine to be excreted through the kidneys. The results of statistical tests showed that A2B1 and A2B3 treatments were different from those of A1B1, A1B2, A2B2 and A1B3 treatments. This shows that the addition of organic calcium sources in the ration does not affect the percentage of broiler liver weight. This indicates that the liver is in normal condition or there is no damage. The normal percentage of broiler chicken livers is 2.16% of body weight (Suyanto et al.,

2013). There was no difference in the percentage of broiler chicken liver in this study, it is suspected that the addition of an organic calcium source in the ration did not have a significant effect on the liver weight of broiler chickens. The presence of SGPT in normal conditions in the blood occurs due to normal regeneration of liver cells. According to Salam et al. (2014) stated that the SGOT and SGPT enzymes can be used as indicators of livestock health such as damage to cells in the liver due to feeding or feed additives. SGPT and SGOT enzyme activities are two transaminase enzymes produced mainly by cells. Liver cell damage disorders cannot always be observed clinically because liver tissue has a high tissue regeneration ability (Subronto, 1984).

Conclusion

The results showed that the addition of alkaline water with a high pH with a combination of organic calcium sources indicated that there was an interaction between the treatment and the AST concentration, except for the SGPT concentration and the relative liver weight.

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