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APPLICATION OF HERBAL FEED ADDITIVE IN THE RATION TO GET ASUH MEAT OF SENTUL CHICKEN

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Abstract

Sentul chicken is a specific local chicken from the Ciamis region in West Java and can be used for egg and meat production. The continuous use of antibiotics for maintenance to prevent and treat diseases in Sentul chickens can cause residues in chicken meat. To reduce the use of antibiotics, it is necessary to find natural antibiotics derived from herbal plants such as mangosteen peel extract (MPE), containing xanthone compounds like antioxidants, which used to prevent free radicals. The study aimed to determine the effect of adding MPE in rations as a feed additive to get ASUH chicken meat. This study used 100 days-old Sentul chicks that were kept for 12 weeks in the litter system. The design used was CRD with 4 treatment levels of MPE, 41 ml/kg ration, 81 ml/kg ration and 122 ml/kg ration and repeated 5 times. The results showed that the addition of MPE in the ration could have a positive impact on the growth of Sentul chickens and internal organs to produce healthy chicken meat, low in cholesterol so that safe for consumption.

Key words*: feed additive, mangosteen peel extract (MPE), Sentul chicken, ASUH meat.*

INTRODUCTION

Sentul chicken is a specific local chicken from Ciamis region in West Java and a dual- purpose type that can utilized for eggs and meat production. They can adapt to the environment, and it remains productive even though their diets are low of quality. The fur is arranged neatly on its chest like dragon scales, and the colour of its scales is grey, white or yellow (Sartika and Iskandar, 2008; Widjastuti et al., 2017). In another way, this bird is very good to genetically improve chicken meat breeds, because has a compact body and white skin colour. Efforts can be made so that chickens can produce optimally, usually by using antibiotics. The use of antibiotics continuously for maintenance to prevent and treat disease in Sentul chicken can lead residues in chicken meat. One alternative method is the use of herbs, one of which is the mangosteen peel. Mangosteen skin is the biggest component of mangosteen fruit with a yield of 65% (Chaovanalikit et al, 2012). It contains a secondary metabolic mixture that is xanthones, and the most abundant content is alpha mangostin (Dermawan et al., 2019). The nutritional content contained in mangosteen peel is 62.05% water, 1.01% ash, 0.63% fat, 0.71% protein, 1.17% total sugar, and 35.61% carbohydrates. The inclusion of mangosteen peel in the diet is a problem because of its antinutrient content in the form of tannins. High tannin content will inhibit the absorption of feed and chicken growth. To reduce tannin levels in the mangosteen peel, extraction procedures must be carried out. Extraction is the process of separating solid or liquid materials with the help of solvents. The process of extracting the peel of mangosteen fruit to obtain antioxidant substances usually use a maceration process, which is a simple extraction method to extract simplified containing soluble chemical components in the solvent fluid (Do et al., 2014). Mangosteen peel contains xanthones of 107.76 mg per 100 g. In addition, mangosteen peel functions as an antitumoral, anti-inflammatory, antiallergic, antibacterial, antifungal and antiviral agent (Gondokesumo et al., 2019) as well as being able to improve the blood lipid profile (Watanabe et al., 2018). Xanthone compounds as antioxidants can be used to prevent free radicals. Free radicals are compounds which contain one or more unpaired electrons, so they are very reactive, and xanthone can improve the structures of intestinal villi in the process of nutrient absorption. In accordance with the

opinion of Velmurugan, and Citarasu (2010) antibacterial herbs are able to suppress the growth of pathogenic bacteria in the intestine. These free radicals can cause metabolite disorders and cause stress to livestock. The emergence of stress in poultry can be a trigger for the emergence of various diseases. This will affect the disruption of the consumption process and result in a decrease in meat quality. From some research results it can be calculated, the needs for antioxidant in the ration is considered based on the content of polyunsaturated fatty acids, every 1% of polyunsaturated fatty acids required 30 IU/kg of vitamin E rations as antioxidant or 30 ppm in the form (DL-α-Tocopheryl acetat) (Lesson and Summers, 2005). Based on the calculation of antioxidant requirements in the ration which is equivalent to vitamin E (DL-oc-Tocopheryl acetate) around 80 ppm, assuming xanthone content in mangosteen peel extract 97.68 ml/100 ml (Erlina, 2008), so the need for mangosteen peel extract in the ration is around 81 ml/kg ration (80 ppm xanthones).

The addition of MPE to Sentul Chicken ration is expected to improve health and growth in livestock, as well as produce high final body weight which can further produce ASUH chicken meat. The aim of the study was to determine the effect of adding MPE in rations as a feed additive to get ASUH chicken meat.

MATERIALS AND METHODS

Experimental design

This study was designed in Completely Randomized Design (CRD). The study used 100 days old chicks of Sentul divided into 4 groups and each group is repeated 5 times. Each cage contains 5 chickens which maintained until the age of 12 weeks. The coefficient value of variation of initial body weight of chicken equal to 9.47. The treatment consisted of the use of mangosteen peel extract (MPE), ie: P0 = 0 ml MPE/kg ration; P1 = 41 ml MPE/kg ration (40 ppm xanthones); P2 = 81 ml MPE/kg ration (80 ppm xanthones); and P3 = 122 ml MPE/kg ration (120 ppm xanthones) The feed and water were provided *ad libitum*. The local ingredients used to produce the diets and the energy metabolism and protein needs were formulated based on Widjastuti (1996) diet formulation for Sentul chicken. The feed ingredients of the ration comprised of yellow corn (56.00%), rice bran (21.50%), fish meal (9.25%), soybean meal (12.00%), bone meal (0.75%), and $CaCO_3$ (0.50%). Rations were prepared based on protein and metabolic energy requirements for the local chicken growth phase, ie. 17% protein and 2850 kcal/kg.

Chicken Slaughter Process

Each cage unit is randomly taken 1 chicken at the age of 12 weeks, so the total number of chickens is 20. Chickens to be slaughtered are fastened for 12 hours. Weigh the weight of chickens at the age of 12 weeks as life weight.

Processing of MPE (modification of Rismana et al., 2014)

Extraction of mangosteen peel is done by maceration with 96% ethanol solvent for 2 x 24 hours, the Maserat is then filtered and the obtained filtrate is concentrated with a rotary evaporator to get the thick mangosteen peel extract, then the sample is extracted dried using a freeze dryer to obtain mangosteen peel extract and as were done in the research Central laboratory of the University of Padjadjaran.

Small Intestine Morphometry

Jejunum samples were collected from the small intestine of Sentul chicken in each treatment group. The samples were washed in physiological NaCl, then fixed in Bouin solution for 2 days. The samples were dehydrated in alcohol with different concentrations for 30 min each i.e. 70, 80, 90 and 100%. Afterward, the samples were cleaned using xylol and alcohol 100% 3 times for 5 and were then infiltrated in an oven at please explain using xylol and paraffin solutions in the ratio of 3:1. 1:1, 0:1 in sequences for 15 min. Samples were prepared using standard paraffin embedding procedures by sectioning at 6-8 cm thickness and kept for 1 day. The samples were then stained by Haematoxylin-Eosin. In the end, the sample was covered with a mounting agent and viewed under the microscope and then counted the number of villi, villi height and width.

Data analyses

Analysis of variance was applied to the data using statistical package program of SPSS version 19. Significantly different means were separated by a Duncan's multiple comparison

test at 0.05 levels. The variables observed were carcass weight, abdominal fat, meat cholesterol content, and effects on liver, gizzard and chicken intestine.

RESULTS AND DISCUSSIONS

The effect of adding mangosteen peel extract (MPE) in the ration on final weight, carcass weight, abdominal fat, and cholesterol of Sentul chicken meat can be seen in Table 1 and Figure 1.

Table 1. The average of final weight, carcass weight, abdominal fat weight, and meat cholesterol

Variable	P0	P1	P2	P3
Final weight (g)	713.25 a	818.00 b	836.75 b	808.25 b
Carcass weight (g)	405.50 a	540.25 b	579.50 b	561.75 b
Abdominal fat weight (g)	2.20 a	2.38 a	2.50 a	2.55 a
Meat cholesterol (mg/100g)	63.47 a	59.09 a	59.20 b	54.35 b

Note: The same letter to the line shows no significant difference.

Final Weight

The results of statistical analysis (Table 1) show the final weight that the addition of mangosteen peel extract increases the final weight, this is because the xanthones content in MPE can work optimally as an antioxidant and prevent free radicals in Sentul hen's body. In accordance with the opinion of Zaboli et al. (2013) antioxidants convert free radicals into relatively stable compounds and stop the chain reaction from free radical damage that will have an impact on the growth rate of chickens. MPE supplementation at optimal dosages can help in the digestion process by improving the structure of intestinal villi in the process of absorption or absorption of feed nutritive substances and able to suppress the growth of pathogenic bacteria in the intestine, according to the opinion of Velmurugan and Citarasu (2010) which states that mangosteen skin contains xanthone compounds as antioxidants, antiviral, antifungal and antimicrobial which is thought to be able to improve the structures of intestinal villi in the process of absorption of nutrients and able to suppress the growth of pathogenic bacteria in the intestine so as to increase body weight growth. This condition causes the surface area of the small intestine villi to become wider so that the absorption of nutrients can take place well. The anti-bacterial properties of MPE can affect the walls and cell membranes of pathogenic bacteria undergoing protein denaturation and eventually their growth is inhibited. The growth of pathogenic bacteria which is blocked will increase the bacterial population so that the digestibility and absorption of nutrients becomes more maximal which in turn will increase the final weight

Carcass Weight

Average carcass weights can be seen in Table 1. The results of the analysis showed that the MPE in the ration were significant difference ($P<0.05$) to the carcass weight. This is in line with the Final weight which is also significantly affected by the increased use of MPE in the ration. Widjastuti et al. (2019) stated that the carcass production closely related to the final weight, the more the life weight increased, the carcass production also increased. Antioxidant compounds in MPE can convert free radicals into compounds that are relatively stable and can stop chain reactions from damage caused by free radicals that will have an impact on the growth rate of chickens, ultimately increasing the final weight and carcass weight (Zaboldi et al., 2013).

Abdominal fat

The average abdominal fat can be seen in Table 1. The average abdominal fat Sentul chicken research results ranged from 2.20 grams to 2.55 grams. The results of the analysis showed that the addition of MPE in the ration did not significantly affect abdominal fat ($P>0.05$). The resulting abdominal fat weight is related to ration consumption. Statistical results showed that the addition of MPE in the ration did not have a significant effect ($P>0.05$) on feed consumption. The addition of mangosteen peel extract does not reduce palatability, this is due to the existence of MPE extraction treatment with ethanol solvent which can reduce tannin levels so that the bitter taste and distinctive odor of mangosteen peel decreases. Consumption of the same ration between treatments proved that energy consumption and crude fat content consumed were relatively the same, so there was no excess energy accumulated in the form of abdominal fat.

Another reason that causes abdominal fat content is relatively the same is because Sentul chicken aged 12 weeks in a period of rapid growth. At this age, fat has not formed much because the absorbed food substances are still used first for pure growth, or in other words all the protein consumed is still concentrated for growth so that very little protein is piled up as abdominal fat.

Meat cholesterol

From Table 1 it can be seen that the content of Sentul chicken meat cholesterol decreases with the addition of MPE in the ration. Cholesterol reduction in the treatment of P1, P2 and P3 is desecrated. This is caused by bioactive xanthone and polyphenol compounds which can inhibit or suppress the HMG-CoA reductase enzyme which acts as a catalyst for the process of cholesterol biosynthesis and prevents increased secretion of bile salts thereby inhibiting cholesterol formation. According to Reynertson (2007) the addition of the right MPE can reduce inflammation and be able to capture free radicals or oxygen compounds effectively and will ultimately inhibit cholesterol synthesis. According to Adriani et al. (2014), compound xanthone is able to inhibit the process of cholesterogenesis in the squalene stage before it becomes cholesterol by inhibiting the synthesis of endogenous cholesterol and inhibiting the enzyme HMG Co-A reductase which acts as an intermediary for the synthesis of mevalonate which eventually becomes cholesterol. Polyphenol compounds in the addition of MPE can reduce total cholesterol levels by polyphenols bind to cholesterol so that cholesterol is absorbed slightly, while the remaining cholesterol that is not absorbed is secreted through feces (Yokozawa et al., 2002). The saponin content in MPE is also lipophilic which is able to dissolve fat and emulsion which can reduce chicken blood cholesterol due to hypercholesterolemia (Adriani et al., 2018).

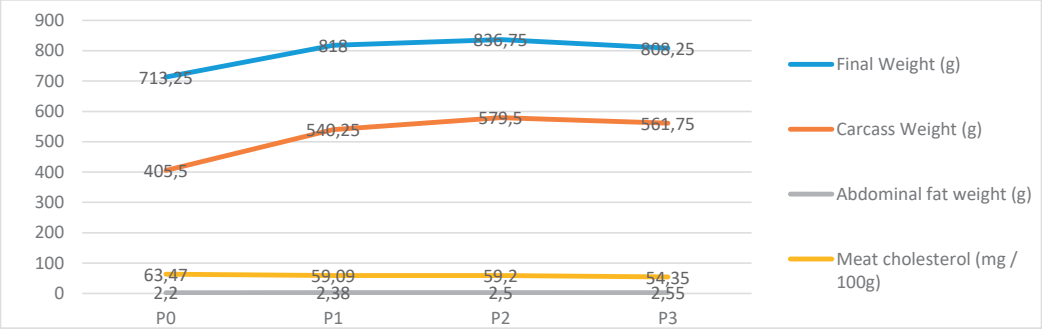

Figure 1. Average of final weight, carcass weight, abdominal fat weight, and meat cholesterol

Effects of addition of MPE on average liver, gizzard and jejunal morphometry of Sentul chicken

The results of average liver, gizzard and jejunal morphometry are presented in Table 2 and Figure 2.

Table 2. Effect of MPE on liver, gizzard and jejunal morphometry in Sentul chicken

Variable	P0	P1	P2	P3
Gizzard weight (g)	23.25 a	23.55 a	26.75 a	28.00 a
Heart weight (g)	28.25 a	26.22 a	25.95 a	25.35 a
Number of villi (unit)	31 a	35 b	40 b	42 b
Villi height (µm)	400.32a	493.27b	467.97b	486.02b
Top width (µm)	133.30a	153.09b	171.02	177.78b
Bottom width (µm)	143.04a	179.45b	253.26b	200.58b

Note: The same letter to the line shows no significant difference.

There was no significant (P>0.05) effect of using MPE as feed additive in the diet of Sentul chicken on liver weight and gizzard weight. This is because the levels of crude fiber and tannin on the mangosteen peel after undergoing

the extraction process decreases the crude fiber thereby reducing the work of the gizzard and the liver. According to Dedi Setiadi et al. (2012), the size of the gizzard is influenced by its activity. Gizzard muscle activity will occur when foods containing high crude fiber into it. The results of the study of adding MPE in the basal ration had a significant effect (P<0.05) on the number of intestinal villi. The P2 and P3 treatments had the most number of villi. This shows that there is a widening in the width of the upper and lower surfaces of the villi, thus indicating that the performance of the villi in the small intestine tends to be active which is found in the treatment group receiving MPE at the level of 81-122 ml/kg ration. The condition is caused by xanthones in P2 and P3 treatments which have an effective role in stimulating the development of intestinal villi size so that it affects the process of intestinal activation in digestion and absorption of nutrients. Increasing the villus width and the number suggests an increased surface area capable of greater absorption of available nutrients.

In accordance with the opinion of Natsir et al. (2016) and Rahmawati (2016), poultry feed containing herbs will affect the height and number of intestinal villi.

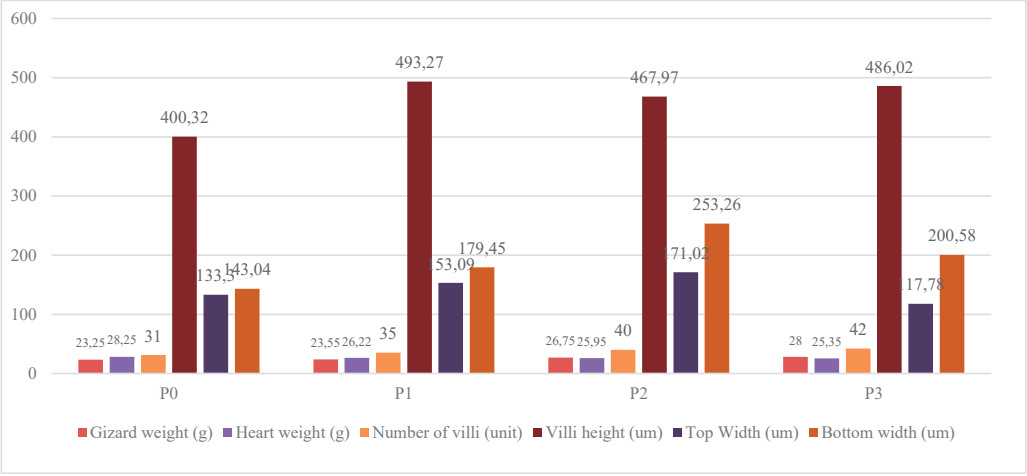

Figure 2. Effect of MPE on liver, gizzard and jejunal morphometry

CONCLUSIONS

The addition of MPE until 122 ml/kg in basal ration significantly affected the quality carcasses of Sentul chicken at 12 weeks and MPE can be natural antibiotics from herbal for Sentul chicken.

The addition of MPE in the ration could have a positive impact on the growth of Sentul chickens and internal organs so as to produce healthy chicken meat, low in cholesterol, so that it is safe for consumption.

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