

# THE EFFECTS OF MANGOSTEEN PELL EXTRACT (*GARCINIA MANGOSTANA* L) AND MINERALS AS FEED SUPPLEMENTS USAGE ON PERFORMANCE AND GUT HISTOLOGY OF SENTUL CHICKEN

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## Abstract

Mangosteen peel extract supplemented with Zn and Cu (MPEm) minerals can be used as a feed for herbal supplements to replace antibiotics for poultry because it contains xanthone, which functions as an antioxidant, anti-inflammatory and antibacterial. The aim of this study was to determine the effect of adding mineralized mangosteen peel extract in the ration on the performance and histological impact of sentul chicken intestines. This study used 100 DOC Sentul chickens, with a completely randomized design of five treatments and four replications. The ration treatments used were P0 (control without MPEm), P1 (control + 60 MPEm / kg ration), P2 (control + 120 mg MPEm / kg ration), P3 (control + 180 mg MPEm / kg ration), and P4 ( control + 240 mg MPEm / kg ration), given to Sentul chickens up to 12 weeks of age ad libitum. The variables observed were growth performance (feed consumption, final weight, ration conversion) and the impact on chicken intestinal histology. The results of statistical analysis showed the effect of treatment had a significant effect on body weight and ration conversion and histological condition of Sentul chicken intestines. Conclusion This study shows the addition of MPEm until 180 mg MPEm / kg ration has a positive impact on the performance of Sentul chickens and can be used as an alternative to antibiotics in the poultry sector.

**Key words:** Mangosteen Peel Ekxtract (MPEm), performance, feed supplement, histologi usus

## INTRODUCTION

Sentul, a native chicken of Ciamis Regency, can be a potential source to meet the animal protein needs of the Indonesian people. It has superior characteristics compared to other native chickens, due to its relatively fast growth and high egg production. With relatively fast growth so that it can be cut at a younger age, usually cut at the age of 8-12 weeks with body weights between 700 g - 1200 g. [1]. To spur growth in Sentul chicken breeders usually add synthetic antibiotics. Currently, synthetic antibiotics are banned because they can make the chicken meat produced becomes unsafe for consumption. Therefore, the use of synthetic antibiotics needs to be replaced with natural ingredients such as mangosteen

peel. Mangosteen peel contains natural antioxidant compounds called Xanthones [2]. Xanthones are classified as phenolic compounds which have a structure of 6 conjugated carbon atoms characterized by carbon double bonds giving them a stable structure. [3] Mangosteen peel is reported to contain as many as 68 types of xanthone compounds [4] which have many pharmacological functions, especially as natural antioxidants [5], antibacterial [6] and antihyperlipidemic [7] Xanton can be isolated and its benefits can be taken by appropriate extraction methods [8] one of which is maceration. Mangosteen peel extracted using the maceration method resulted in a total xanthone content of 27.7% [9]. Xanthone compounds as well as other sources of antioxidants have characteristics that are unstable, sensitive, easy to react and oxidized [10]. Research by [11] on mangosteen peel extract results from Gas Chromatography Mass Spectrometry

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(GCMS) analysis shows that mangosteen peel extract contains unsaturated organic acid methyl ester compounds that are easily oxidized, so it needs to be stabilized with mineral metal catalysts such as Cu and Zn. Cu and Zn supplementation has a role to temporarily activate the bioactive contained in the mangosteen peel extract which is reactive, thus making the ionization in the digestive tract higher and can be optimally utilized right on target. The need for mineral Cu in poultry is 5 ppm and mineral needs of Zn are 40 ppm. [12]. Mangosteen peel extract is classified into a type of phytochemical because it contains bioactive compounds derived from plants and has a good role in improving livestock productivity. [13] added that mangosteen peel extract has many properties, especially as an immunomodulator in increasing animal immunity [14]. The immunomodulatory potential of mangosteen peel extract is associated with its antioxidant compounds [15]. The xanthone compounds in the mangosteen peel extract at the optimal dose have an effective role in repairing intestinal villi structure in the process of absorption of feed nutrients [16]. Xanthone is reported to be able to maintain the health of the digestive and immune systems by actively working to improve the digestive tract [17] by improving the structure of the small intestine villi. The addition of 120 mg of mangosteen peel extract in broiler feed could reduce feed conversion by up to 1.04 compared to the control treatment which reached 1.70 [18]. The dosage determination in this study refers to research conducted by [16] with a dose of 122 ml / kg mangosteen peel extract, the ration has a positive effect on chickens, namely it can reduce LDL (Low Density Lipoprotein) and also increase HDL (High Density Lipoprotein) levels. Cu and Zn supplementation into mangosteen peel extract, it is hoped that it will provide higher activity in the digestive tract and can be utilized optimally right on target. The intestine is an organ that plays a role in the process of absorption of food substances. This absorption process takes place very intensively and occurs in the villi which plays a role in expanding the surface. The

tighter and wider the villi, the wider the absorption process so that more nutrients are absorbed. In accordance with [19] the longer the intestine, the larger the surface of the intestine, so that the number of villi that grows will increase. And this will be followed by an increase in the number of intestinal villi and the ability of the intestine to secrete digestive enzymes. Therefore it is necessary to do research with the aim of knowing the effect of using mangosteen peel extract supplemented by Zn and Cu minerals in the ration on performance and its impact on histology in the small intestine of sentul chickens.

## MATERIAL AND METHODS

The study used 100 DOC Sentul chickens with the average body weight of 27.8 grams (coefficient of variation 8.27%). The Sentul chickens were kept in the cage system until the age of 12 weeks, 20 pens were used, sized 90 cm x 90 cm x 60 cm (length x width x height). Each pen consisted of 5 chickens. The top of each cage unit is covered with wire ram to prevent the chickens from jumping out, then each house is given a 40 watt incandescent lamp for heating and lighting. Diets were prepared based on protein and metabolic energy requirements for the local chicken growth phase, i.e., 17% protein and 2750 Kcal/kg [20]. The feed ingredients of the basal diet were yellow corn (56.00%), rice bran (21.50%), fish meal (9.25%), soybean meal (12.00%), bone meal (0.75%), and CaCO<sub>3</sub> (0.50%). Mangosteen peel extract is made in the laboratory by maceration method using ethanol solvent for 2 days, then filtered and mangosteen peel filtrate is evaporated with a Rotary evaporator Bunchi R-300 with a temperature of 60°C which aims to separate 96% ethanol with mangosteen peel extract and then added with mineral Zn and Cu then dried in an oven with temperature of 80°C to get MPEm. Experiments were conducted using Completely Randomized Design, consisting of 5 treatments of MPEm, namely P0 (control without MPEm), P1 (control + 60 MPEm / kg ration), P2 (control + 120 mg MPEm / kg ration), P3 (control +180 mg MPEm / kg ration), and P4 (control +240 mg MPEm / kg

ration), and 4 replications. Data were analyzed using Varian Analysis and differences between treatments using Duncan Multiple Range Test. The measured parameters were growth performance (feed consumption, body weight and feed conversion) and histological effects of intestines of sentul chicken.

## RESULTS AND DISCUSSION

### The effect of adding MPEm on the growth performance of Sentul chickens

The effect of adding MPEm on feed consumption, body weight and feed conversion of Sentul chickens is shown in Table 1 and Figure 1.

Table 1 Effect of treatments MPEm on feed consumption, body weight and feed conversion

Variables	Treatments				
	P0	P1	P2	P3	P4
Feed consumption	2542.40 a	2331.00 a	2346.30 a	2243.15 a	2085.44 a
Body Weight	738.25 a	860.00 b	886.95 b	828.25 b	756.00 b
Feed conversion	4.04 a	3.16 b	3.11 b	3.12 b	3.08 b

Note: Similar superscripts in the same row show not significant difference ( $P > 0.05$ )

P0 (Only basal diet), P1 (basal diet + 60 mg MPEm), P2 (basal diet + 120 mg MPEm), P3 (basal diet + 180mg MPEm), P4 (basal diet + 240 mg MPEm)

From Table 1, it can be seen that the average feed consumption in various treatments ranges from 2085.44 - 2542.40 grams. The results of statistical analysis showed that the addition of MPEm to the ration did not have an insignificant effect ( $P > 0.05$ ) on feed consumption. This illustrates that the ration consumption in each treatment is in the same range even though there is a decrease in feed consumption but it is not significantly different, which means that the addition of MPEm up to the level of 240 mg / Kg of ration does not have a negative effect on feed consumption. The feed consumption value in treatment P1 - P4 was relatively lower than control treatment (P0). Mangosteen peel contains tannins which

cause a feeling of shock, thereby reducing feed palability [21]. The tannins in the mangosteen peel are thought to decrease the activity of enzymes in the digestive tract. Based on the research results, it turns out that the addition of MPEm does not reduce palatability, this is because the extraction of the active substance with ethanol solvent can reduce the tannin levels so that it can reduce the bitter taste and distinctive odor of mangosteen peel. This is in line with the opinion of [22] which states that various processes in mangosteen peel such as drying and soaking in solvents will reduce tannin compounds which can cause a bitter taste in mangosteen peel extraction products.

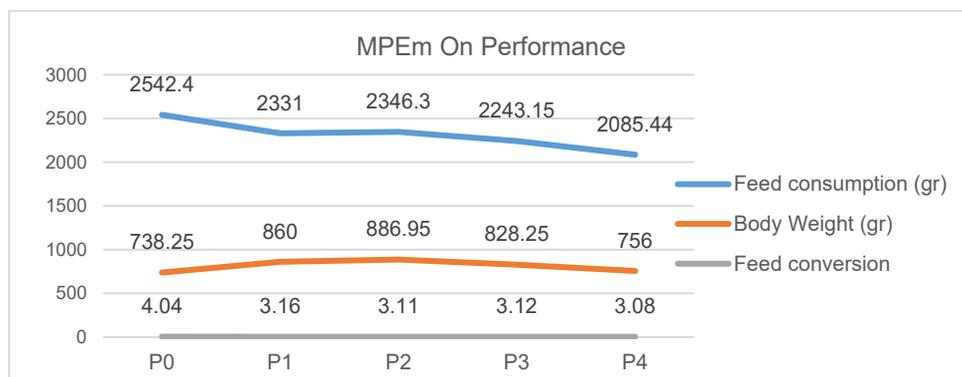


Fig. 1 The average treatment MPEm on Performance

The average body weight of Sentul chickens aged 12 weeks in various treatments ranged from 738.25 grams to 886.95 grams. The results of the analysis of diversity showed that the addition of MPEm had a significant effect ( $P < 0.05$ ) on the body weight. The addition of MPEm at the level of 60 - 180 mg / kg ration had a positive impact on body weight of Sentul chickens. This is due to the bioactive substances xanthenes that function as antioxidants which can convert free radicals into relatively stable compounds and stop the chain reaction from free radical damage so that it will have an impact on the growth rate of chickens [23]. While the supplementation of essential micro-minerals Cu and Zn in mangosteen peel extract plays a role in several enzyme systems, protein, carbohydrate and energy metabolism so that it helps the absorption of nutrients by the small intestine. The addition of MPEm at the right dose shows a good effect in producing body weight of Sentul chicken, this is because xanthenes in MPEm help in the digestive process by improving the structure of the small intestinal villi in the absorption process of feed nutrients and being able to suppress the growth of pathogenic bacteria in the intestine. so as to increase body weight growth [24]. Xanthone compounds in mangosteen peel also have the ability to act as an immunomodulator that can increase endurance [13].

The average conversion value of Sentul chicken ration in various treatments ranged from 3.08 to 4.04. The results of the analysis of diversity showed that the addition of MPEm in the ration had a significant effect ( $P < 0.05$ ) on the feed conversion value. the ration conversion values of treatment P1, P2, P3, and P4 were significantly lower than treatment P0. This indicates that the ration added to MPEm in the ration has decreased the ration conversion value so that the quality of the ration in the treatment is more efficient. Xanhtone compounds have a role in regulating the amount of feed consumption, influencing the microflora to reduce the activity of pathogenic bacteria in the absorption of feed nutrients and the immune response [25]. Meanwhile, the addition of Cu, Zn supplementation in mangosteen peel extract is able to control and improve the proper environmental conditions and make the microbial population in the digestive tract produce good ration conversion.

#### **Effect of addition of MPEm in the ration on intestinal histology.**

The intestinal histologic structures observed in this study included changes in the intestinal villi and degree of acidity. The results of the study on the effect of MPEm treatment on the impact on the histology of the small intestine of sentul chickens can be seen in Table 2 and Figure 2.

Table 2 Effect of adding MPEm in the ration on the histology of the small intestine

Variable	P0	P1	P2	P3	P4
No. of small intestine villi	36 a	35 a	41 b	41b	34 a
Height of small intestine villi ( $\mu\text{m}$ )	334.83 a	363.30 a	558.13 b	508.03 b	307.24 a
The width of the upper villi ( $\mu\text{m}$ )	118.81 a	121.86 a	189.14 b	177.59 b	106.97 a
The width of the lower villi ( $\mu\text{m}$ )	144.59 a	152.52 a	227.55b	200.58 b	169.95 a

Note: Similar superscripts in the same row show not significant difference ( $P > 0.05$ )  
 P0 (Only basal diet), P1 (basal diet + 60 mg MPEm), P2 (basal diet + 120 mg MPEm),  
 P3 (basal diet + 180mg MPEm), P4 (basal diet + 240 mg MPEm)

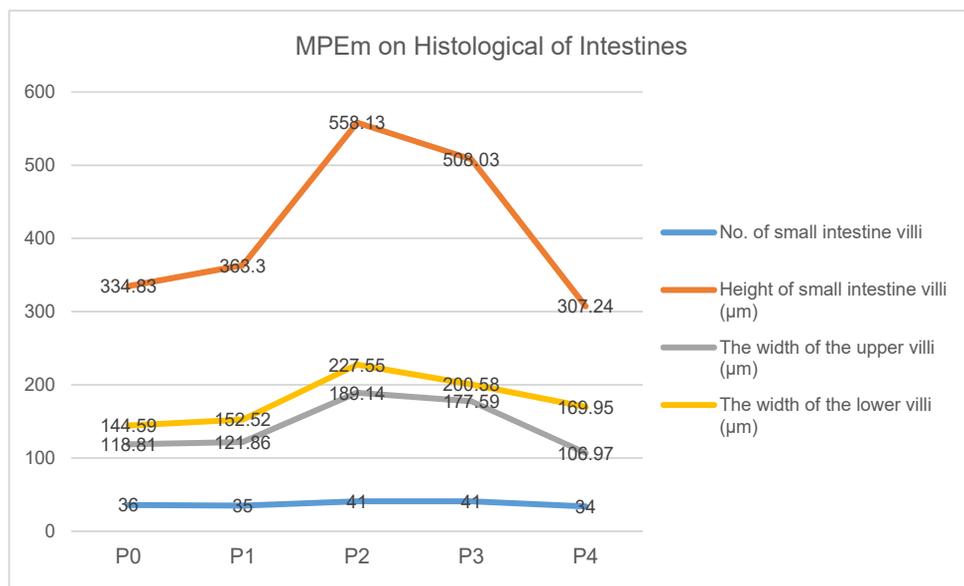


Fig. 2 The average treatment MPEm on Intestinal Histology

The results (Table 2) showed that the addition of MPEm in the ration seen from the histology of the intestine showed changes in villi. The addition of MPEm 120 mg/kg (P2) and 180 mg/kg (P3) resulted in the highest number of villi. This indicates a widening in the height and width of the villi, which indicates that the villi in the small intestine tend to be active. An increase in villi in P2 and P3 treatment will lead to an increase in digestion function and better nutrient absorption because the wider the area of nutrient absorption, the smoother the nutrient transport system throughout the poultry body [26]. The increase in the height and width of the intestinal villi in P2 and P3 treatment is thought to be due to the Xanthone compound being able to trigger an increase in feed protein synthesis so that it can trigger the proliferation of cells in the small intestine. As a result, the number and size of villi increases significantly, so that these nutrients can be utilized by the chickens for growth and tissue formation. The more nutrient absorption in the intestine will affect the width of the intestinal villi [27]. In accordance with the opinion of [28], which states that bioactive compounds such as xanthenes play a role in improving the size and height of the small

intestinal villi in the digestive tract of chickens. [29] reported that the higher the small intestinal villi, the more it will expand the surface of the small intestine villi which is useful for optimal nutrient absorption. This is indicated by the implications for feed consumption, body weight and feed conversion value in this study giving very good results, so it can be said that the performance of the chickens produced physiologically is healthy.

## CONCLUSIONS

1. By Using a dietary MPEm in the diet resulted had a significant effect on body weight and feed conversion and histological condition of Sentul chicken intestines. The addition of MPEm until 180 mg MPEm/kg ration had a positive impact on the performance and the number of villi and height of the small intestine villi of Sentul chickens.

2. The Mangosteen peel extract added with the minerals Zn and Cu (MPEm) can be used as a feed supplement to replace antibiotics in poultry.

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