

Effect of Red Betel Leaf Extract (*Piper crocatum*) on Digestive Organ and Ileal Villi Developments in Broiler

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Abstract— The purpose of research was to evaluate effect of red betel leaf extract (RBLE) as feed additive on characteristics of intestine and villi in broiler chicken. The method was in vivo experiment by using Completely Randomized Design. One hundred and sixty eight day old chicken strain Cobb allocated into 4 treatments and 6 replications. The treatments consisted of T0= basal feed (control). T1=basal feed + 0.5% RBLE. T2=basal feed + 1% RBLE. and T3=basal feed + 1.5% RBLE. The measured variable were villi number, villi height, crypt depth, weights and percentages of liver, spleen, gizzard, small and large intestine. The data were analyzed with ANOVA and continued with Duncan’s multiple range test. The results showed that there were no significant different (P>0.05) effect of treatment toward intestine and villi characteristics. Conclusion of this research was addition of RBLE up to 1.5% does not cause a negative effect on characteristics of intestines and villi in broiler chicken.

Keywords— Red betel. feed additive. intestines, villi, broiler.

I. INTRODUCTION

The use of feed additive, particularly of antibiotic growth promoter (AGP), has gotten a lot of attention from researcher and farmers point of view. It is because AGP helps to enhance production performance of broiler. It is also improves immunity and decreases mortality. However, in a country like Indonesia just recently government recognizes negative effect of such AGP and starts to ban from beginning of January 2018.

Antibiotic replacer, particularly from natural products such as plant extract, then becomes intensively investigated. Active substances from plant which is known as phytobiotic from medicinal plant is also a choice. One of those plants is betel leaf. There are at least 3 species found in Indonesia, namely green, black and red betel. All of betel leaf species, red betel leaf contain more flavonoid [1]. Flavonoid is one of polyphenolic substances which has antibacterial and antioxidant effects [2].

As antibacterial agent, flavonoid might change balance of microbes in the intestines, including development of villi. The use of herb extract found to increase villus height but not crypt depth [3]. Increase villus height might relate to more efficient absorption of nutrients in broiler. This experiment aimed to evaluate the use of red betel leaf extract on intestine and villus characteristics in broiler.

II. MATERIALS AND METHODS

A. Materials

Materials used in this research were 168 DOC strain Cobb with average initial body weight of 43.66±2.18g. The chicks have been already vaccinated in the hatchery. Twenty four unit cages were used, each has size of 1m² equipped with feeder and drinker, lamp. The room is heated by using gasolec heater during brooding period. The formula and nutrient content of basal diets were described in the following Table:

TABLE 1. Formula and nutrient content of basal feed

Raw materials %	Starter	Finisher
Yellow Corn	56	60
Soybean meal	24.99	24.99
Meat bone meal	9.60	9.60
Limestone	4.60	4.60
Di-calcium phosphate	0.12	0.12
Fish meal	4	0
Sodium bicarbonate	0.072	0.072
Lysine	0.12	0.12
Salt	0.10	0.10
Premix	0.40	0.40
Nutrient content		
Moisture (%)	10.36	10.63
Crude protein (%)	23.50	20.10
Crude fiber (%)	2.81	3.18
Crude Fat (%)	4.55	4.13
Metabolizable energy (Kcal/kg)	3870	3839

Basal feeds were formulated to meet nutrient requirements provided by Cobb nutrition management guide. The basal feeds were divided into 2 types: starter feed (1-21 days) and finisher feed (22-35 days).

The extraction of red betel leaf was carried out according to the previous method [4]. Red betel leaf powder was macerated for 24 hours with ethanol 70%. Ratio of red betel with ethanol was 1:6. After that red betel leaf was extracted in the microwave oven for 10-15 minutes at controlled temperature 40°C and then cooled down until reach room temperature. After that the liquid extract of red betel leaf was obtained by filtering with sterile muslin cloth.

B. Experimental Design

The birds were allocated into 4 treatments and 6 replications per treatment, each replication used 7 birds. They were reared for 35 days. The experimental design was completely randomized design with the treatments given were:

- T0 = basal feed
- T1 = basal feed + 0.5% red betel leaf extract (RBLE)
- T2 = basal feed + 1% red betel leaf extract (RBLE)
- T3 = basal feed + 1.5% red betel leaf extract (RBLE)

C. Variables Observed

At achieving 35 days old, one broiler in each experimental unit was sampled, and slaughtered. Then, organs consisted of liver, spleen, gizzard, small and large intestines were taken out. Each organ was weighted and the length was measured.

Ileal part of small intestine was also cut of about 1 cm length from the end. The sample was then gently sprayed by using syringe containing NaCl Physiology of 0.01% to get rid of the intestinal content without disturbing the villi. Sample was then simmered in 10% formaldehyde solution in a pot film container [5]. Observation was done by using Olympus BX51 DIC microscope and helped with software Image Raster. Villus number and height, surface area and crypt depth were measured according to [6] method.

D. Statistical Analysis

All data obtained in this research analyzed with one way analysis of variance (ANOVA) and continued with Duncan's Multiple Range Test (DMRT) if there were significant differences.

III. RESULTS AND DISCUSSION

The results of red betel extract addition in broiler feed to weights and percentages of digestive organs is showed in Table 2. In addition, the effect on villus characteristics is showed in Table 3.

A. Effect of Red Betel Leaf Extract (RBLE) on Weights and Percentages of Digestive Organs.

The statistical calculation results showed that the effect of RBLE did not significantly influence digestive organ development (weight and length). In the previous report, gizzard and small intestine percentages were not changed by alfalfa meal until 6% in feed [7]. Similarly, [8] also reported no significant changed in gizzard, liver and proventriculus of broiler fed soy isoflavone containing feed. This might suggest that RBLE and other flavonoid component of plant or plant extract need higher percentage to induce development of digestive tract.

TABLE 2. Effect of red betel extract on weights and percentages of digestive organs

Treatment	Liver		Gizzard		Small Intestine		Large Intestine	
	Weight (g)	%	Weight (g)	%	Weight (g)	%	Weight (g)	%
T0	42.44 ± 6.4	2.85 ± 0.5	29.2 ± 4.2	1.95 ± 0.3	78.7 ± 25.9	5.24 ± 1.7	3.74 ± 2.4	0.25 ± 0.2
T1	2.62 ± 0.4	2.62 ± 0.4	31.7 ± 3.6	1.88 ± 0.1	79.5 ± 6.4	5.35 ± 0.7	2.28 ± 0.6	0.15 ± 0.1
T2	2.81 ± 0.4	2.81 ± 0.5	30.9 ± 4.1	2.18 ± 0.5	78.3 ± 10.8	4.98 ± 0.5	2.52 ± 0.4	0.16 ± 0.1
T3	2.30 ± 0.4	2.30 ± 0.4	29.7 ± 7.5	1.77 ± 0.5	65.2 ± 22.2	3.80 ± 1.3	3.30 ± 1.0	0.19 ± 0.1

TABLE 3. Effect of red betel extract addition on villus characteristics

Treatment	Villus number	Villus height (µm)	Surface area (µm ²)	Crypt depth (µm)
T0	134.67 ± 17.75	710.26 ± 88.12	1769.80 ± 172.74	169.40 ± 33.13
T1	155.67 ± 6.947	583.88 ± 99.03	1423.10 ± 264.89	159.56 ± 32.48
T2	146.83 ± 8.352	641.98 ± 136.33	1623.18 ± 360.56	155.77 ± 18.75
T3	147.33 ± 18.32	607.12 ± 129.78	1438.29 ± 307	156.60 ± 38.54

B. Effect of Red Betel Leaf Extract (RBLE) on Intestinal Villus Characteristics.

The result of analysis of variance showed that RBLE extract did not influence ileal villus characteristics (villus number, height, surface area and crypt depth). Viscosity is one of important factors which is able to change villus number and hence stimulate growth of villi higher. The correct viscosity would make nutrients in the intestinal lumen becoming maximum [9].

Increase villus height in the small intestine might also be due to the present of active substances which are able to suppress or kill pathogenic bacteria. Increasing percentage of RBLE in feed might increase intake of active substances, but it could not able yet to change villus characteristics. Crypt depth is usually related to nutrient utilization which potentially could be absorbed. Enlargement of surface area of villi is a healthy digestive tract response by increasing height and number of

villi. The lower the villi causes less ability to actively absorbed nutrient, while increasing crypt tends to decrease activity of enzyme secretion [10]. After being absorbed, nutrient would be circulated by lymph and blood to support growth and animal productivity [11]. The use of phytogetic feed additive in broiler [12] did not change villus characteristics, similarly alfalfa meal has also been reported not to change ileal villus characteristics, but significantly enhanced duodenal and jejunal villus characteristics in geese [7]. Further research is still needed, because improvement of digestive and histomorphology of intestine would positively affect performance and productivity of poultry.

IV. CONCLUSION

Based on research results, it could be concluded that addition of red betel leaf extract (RBLE) up to 1.5 % in broiler diet did not affect digestive organ development including villus characteristics.

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