

# The Effect of Nutrigold Feed Supplements in Rations on the Number of Microbes, Intestinal Histology and Blood Lipid Profile of Superior Native Chickens Balitbangtan (KUB)

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## Abstract

Local chickens have high nutritional content, low cholesterol, and less fat, compared to broilers. The addition of *Nutrigold feed supplement* in commercial rations is expected to suppress the growth of pathogenic microbes, improve the intestines, and blood lipid profiles of KUB chickens. Using a completely randomized design (CRD), with 4 treatments and 5 replications, and each treatment unit is filled with 5 chickens. The treatment of *Nutrigold feed supplement* in the ration: A = 100% commercial ration + 0% *Nutrigold feed supplement*; B = 99% commercial ration + 1% *Nutrigold feed supplement*; C = 98% commercial ration + 2% *Nutrigold feed supplement*; and D = 97% commercial ration + 3% *Nutrigold feed supplement*. The variables observed were the number of *Escheria coli* and *colliform*, villus height, villus width, crypt depth, and blood lipid profile. The provision of 3% *Nutrigold feed supplement* in the ration, can reduce the number of *Escherichia coli* (5.745 Cfu/g) and *colliform* (6.135 Cfu/g), and can increase the of villus height (897.177  $\mu\text{m}$ ), villus width (211.747  $\mu\text{m}$ ) and crypt depth (202.545  $\mu\text{m}$ ), as well as can improve the blood lipid profile of KUB chickens. It can be concluded that the provision of 3% *Nutrigold feed supplement* in the ration can reduce the number of *Escheria coli* and *colliform*, and can increase the height and width of the villi, and the crypt depth, can improve the blood lipid profile of KUB chickens.

**Keywords:** bacteria, crypt, nutrigold feed supplement, blood lipid profile, commercial ration, villi

## 1. Introduction

Chicken meat is consumed by the community to need for animal protein. The increase in population from year to year and supported by public awareness of the importance of consuming animal protein from poultry meat, has caused the need for chicken meat to increase. In 2020, poultry meat production was 3,683.20 tons, and increased in 2022 to 4,253.53 tons [6]. The increasing demand for local chicken meat, because this chicken meat has a distinctive taste and is popular with the public. The type of local chicken that can meet the need for animal protein sources is the Superior Village Chicken Balitbangtan (KUB).

KUB chicken is an innovation of a new variety of local chicken resulting from the invention of the Agricultural Research and Development Agency [18]. This chicken has advantages including: efficient feed consumption, resistant to disease, lower mortality rate, daily egg production, and higher meat production compared to other native chickens. KUB chicken as a meat producer, body weight at 10 weeks of age is 830.55 g, and meat protein content is around 17.50% [14]. Constraints in seed factors, feed quality, and inappropriate feed provision can reduce production.

The cost component of production is around 60-70% of feed costs. Efforts to find alternative feed ingredients with the criteria of cheap prices and not competing with human needs. Utilization of insects as a source of high-quality, efficient, and continuously available animal protein [20]. Alternative feed that can replace as a source of protein is maggot. Maggot (*Hermetia illucens*) contains 40-50% protein, and essential amino acids [21]. Maggot contains lauric acid and chitin, acts as an antimicrobial to improve the work of the digestive tract, increase the immune response and health of livestock, and stimulate the antibody response of livestock [8]. Furthermore [2], maggot has inhibitory activity against *Escherichia coli*, *Salmonella* sp., and *Pseudomonas aureginosa* bacteria.

Efforts to improve the quality of maggots as feed can be mixed with spirulina and turmeric "*Nutrigold feed supplement*". Spirulina contains natural phytochemical compounds, which are useful for improving meat color due to the presence of *Zeaxanthin*, while turmeric contains *curcuminoid* compounds which act as antioxidants and can improve digestion, body tissue, and maintain endurance. Herbal plants such as turmeric can reduce the growth of *Escherichia coli* colonies [19]. The  $\beta$ -carotene content in turmeric can stimulate the gallbladder by neutralizing the acidic conditions in the intestinal tract, thereby reducing fat emulsion, and reducing fat formation. Supplementation maggot flour of up to 15% has no effect on low density lipoprotein (LDL), while rations without maggot flour supplementation and 10% maggot flour supplementation have an effect on high density lipoprotein (HDL) in the blood of female joper chickens [9]. The provision of "*Nutrigold feed supplement*" in rations is expected to reduce the number of pathogenic microbes, increase intestinal villi and crypts, and improve the blood lipid profile of KUB chickens.

## 2. Materials and Methods

### 2.1. Materials

The experiment used 20 colony cages, and 100 KUB chickens (1 week old) with homogeneous body weight. The ration used was CP 511B from PT. Charoen Pokphan Indonesia, and “*Nutrigold feed supplement*” in crumble form to facilitate mixing in the ration. Nutrient content CP 511B and “*Nutrigold feed supplement*” rations (Table 1), and nutrient content of treatment rations (Table 2).

**Table 1. Nutrient Content of CP 511B Ration and *Nutrigold Feed Supplement***

Nutrient content	<i>Nutrigold Feed Supplement</i>	
	<i>Nutrigold Feed Supplement</i>	CP 511B
Energiy (GE)	6203 Kcal/kg <sup>1)</sup>	3961 Kcal/kg <sup>1)</sup>
Moisture Content	3.7% <sup>1)</sup>	14% <sup>2)</sup>
Ash	4.9% <sup>1)</sup>	8% <sup>2)</sup>
Crude Protein	54.3% <sup>1)</sup>	20% <sup>2)</sup>
Crude Fiber	6.7% <sup>1)</sup>	5% <sup>2)</sup>
Crude Fat	33.6% <sup>1)</sup>	5% <sup>2)</sup>

Description:

<sup>1)</sup> Animal Nutrition and Feed Laboratory, Faculty of Animal Husbandry Udayana University, 2023

<sup>2)</sup> PT. Charoen Pokphand, 2013

**Table 2. Nutrient Content of Treatment Rations**

Nutrient content	Treatment <sup>1)</sup>				Standard SNI (2023)
	A	B	C	D	
Energy (GE) Kcal/kg	3961.00	3983.42	4005,84	4028,26	-
Moisture Content (%)	14	13.90	13.80	13.60	14
Protein (%)	20	20.34	20.68	21.02	20
Fat (%)	5.0	5.29	5.57	5.86	3.0
Fiber (%)	5.0	5.02	5.04	5.05	7.0
Ash (%)	8.0	7.97	7.94	7.91	8.0

Description:

<sup>1)</sup> A = 100% commercial ration + 0% *Nutrigold feed supplement*; B = 99% commercial ration + 1% *Nutrigold feed supplement*; C = 98% commercial ration + 2% *Nutrigold feed supplement*; and D = 97% commercial ration + 3% *Nutrigold feed supplement*

## 2.2. Method

### Experimental Design

Using a completely randomized design (CRD) with 4 treatments and 5 replications. The treatment of *Nutrigold feed supplement* in commercial rations: A = 100% commercial ration + 0% *Nutrigold feed supplement*; B = 99% commercial ration + 1% *Nutrigold feed supplement*; C = 98% commercial ration + 2% *Nutrigold feed supplement*; and D = 97% commercial ration + 3% *Nutrigold feed supplement*.

### Observed Parameters

The pathogenic bacteria observed were *Escheria coli* and *Colliform* bacteria, using the Total Plate Count (TPC) method. Determination of villus height, villus width and crypt depth, using the paraffin method and Hematoxylin-Eosin staining [17]. Cholesterol levels by analyzing the blood of KUB chickens at the age of 8 weeks using the Lieberman Burchad method [12]. Determination of LDL and HDL, using the CHOD-PAP Enzymatic Colorimetric Test method [5], while for determination of triglycerides using the enzymatic calorimetry test method [4].

### Data Analysis

Data were analyzed using variance, if there were significant differences between treatments ( $P < 0.05$ ), then continued with Duncan's multiple range test [16].

## 3. Results and Discussion

*Escheria colli* is commensal in poultry and its presence in feces is very high [14]. Giving 3% *Nutrigold feed supplement* in KUB chicken rations can reduce the number of *Escheria coli* and *Coliform*. This is because *Nutrigold feed supplement* contains phytochemical compounds, acting as antibacterials that can work by denaturing bacterial proteins through absorption involving hydrogen bonds, so that the protein is coagulated and the cell membrane undergoes lysis and changes the permeability of the bacterial cell membrane. The antibacterial activity of herbal plants can be associated with the content of phytochemical compounds [7]. The action of active ingredients in herbal plants can inhibit pathogenic bacteria and endotoxin microbes in the intestine, increase pancreatic activity to produce metabolism, and better nutrient utilization. Herbal plants such as turmeric can reduce the growth of *Escheria colli* colonies [19]. Evidence of antibacterial action in *Nutrigold feed supplement* can increase nutrient absorption, by expanding the surface of the villi and intestinal crypts of KUB chickens. The villi and crypts function in nutrient absorption.

**Table 4. Number of *Escherichia coli* and *Colliform* Bacteria in KUB Chickens of 8 Weeks old With Nutrigold Feed Supplement in Rations**

Variable	Treatment <sup>1)</sup>				SEM <sup>3</sup>
	A	B	C	D	
<i>Escheria coli</i> (Cfu/g)	3.65 x 10 <sup>6</sup> <sup>a2</sup>	1.10 x 10 <sup>6</sup> <sup>b</sup>	7.33 x 10 <sup>5</sup> <sup>c</sup>	5.75 x 10 <sup>5</sup> <sup>c</sup>	0.055
<i>Colliform</i> (Cfu/g)	5.35 x 10 <sup>6</sup> <sup>a</sup>	5.10 x 10 <sup>6</sup> <sup>a</sup>	4.93 x 10 <sup>6</sup> <sup>a</sup>	1.38 x 10 <sup>6</sup> <sup>t</sup>	0.04

**Description:**

- <sup>1)</sup> A = 100% commercial ration + 0% *Nutrigold feed supplement*; B = 99% commercial ration + 1% *Nutrigold feed supplement*; C = 98% commercial ration + 2% *Nutrigold feed supplement*; and D = 97% commercial ration + 3% *Nutrigold feed supplement*
- <sup>2)</sup> Numbers in the same row followed by different letters indicate significant differences (P<0.05)
- <sup>3)</sup> SEM: *Standard Error of the Treatment Means*

In this study, the administration of 3% *Nutrigold feed supplement* in KUB chicken rations resulted in villus height, villus width, and crypt depth of respectively 897.177; 211.747; and 202.545  $\mu\text{m}$  (Table 5). This is due to the presence of phytochemical compounds in *Nutrigold feed supplement*, especially  $\beta$ -carotene or provitamin A which will be converted into vitamin A, which plays a role in the differentiation of epithelial cells and maintaining the digestive organs. Vitamin A that has been formed is perfectly absorbed through the digestive tract and carotenoids are released by the action of pepsin in the stomach and by various proteolytic enzymes in the upper intestinal tract. The increase in villus height is an expression of the smoothness of the nutrient transport system throughout the body and increased absorption function, due to the expansion of the absorption area which benefits the host [3]. Increasing the height of the villi and the width of the villi are associated with a wider surface area of the villi, for nutrient absorption into the blood stream [10]. The ratio of the height of the villi and the depth of the crypt is an indication of the wider area for nutrient absorption [15]. The higher the villi and the deeper the crypt in the small intestine, the wider the area of nutrient absorption, so that more nutrients will be absorbed, and produce better livestock growth. KUB chickens in this study showed that they were healthy because they were supported by good blood lipid profile results. Villus height, villus width, and crypt depth of the intestines of KUB chickens aged 1-8 weeks, treatment A (Figure 1) and treatment D (Figure 2).

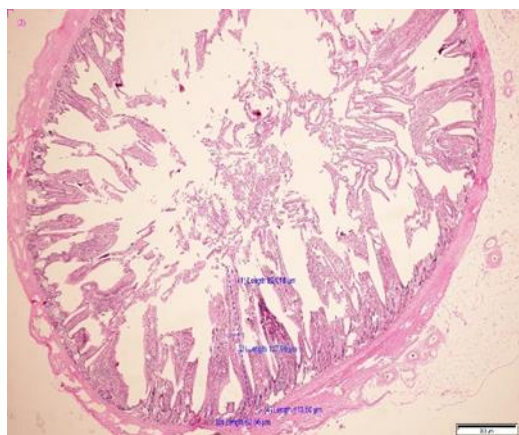


Figure 1. Treatment A

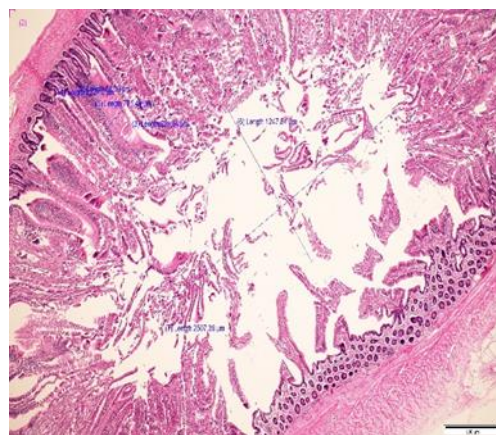


Figure 2. Treatment D

Table 5. Villi Height, Villi Width, and Crypta Depth of KUB Chickens of 8 Weeks Old with *Nutrigold feed supplement* in Rations

Variable	Treatment <sup>1)</sup>				SEM <sup>3)</sup>
	A	B	C	D	
Villi Height (µm)	847.360 <sup>b2</sup>	864.315 <sup>t</sup>	868.217 <sup>b</sup>	897.177 <sup>a</sup>	9.142
Villi Width (µm)	122.327 <sup>d</sup>	144.127 <sup>c</sup>	170.847 <sup>b</sup>	211.747 <sup>a</sup>	2.716
Crypta Depth (µm)	133.810 <sup>b</sup>	144.537 <sup>t</sup>	170.007 <sup>ab</sup>	202.545 <sup>a</sup>	14.903

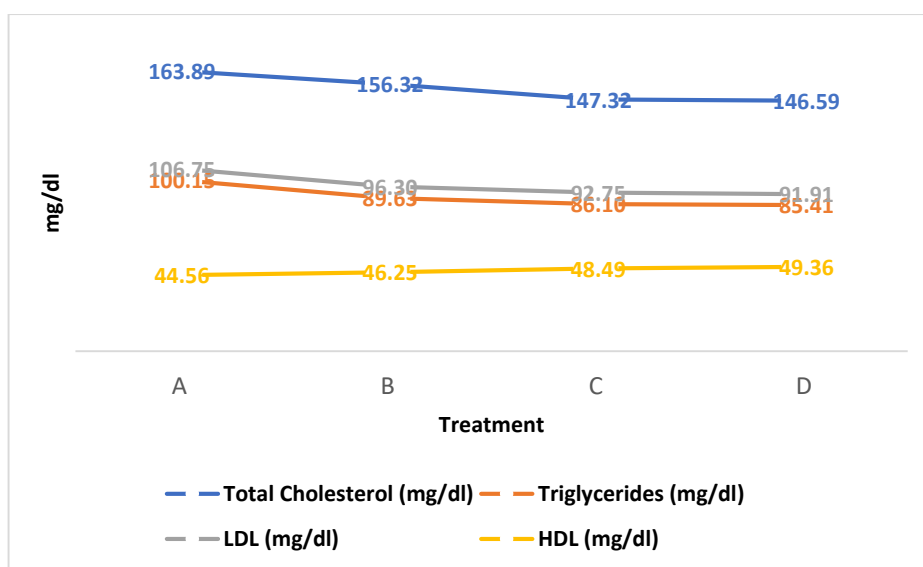
Description:

- <sup>1)</sup> A = 100% commercial ration + 0% *Nutrigold feed supplement*; B = 99% commercial ration + 1% *Nutrigold feed supplement*; C = 98% commercial ration + 2% *Nutrigold feed supplement*; and D = 97% commercial ration + 3% *Nutrigold feed supplement*
- <sup>2)</sup> Numbers in the same row followed by different letters indicate significant differences (P<0.05)
- <sup>3)</sup> SEM: *Standard Error of the Treatment Means*

Decreased concentrations of cholesterol, triglycerides, and LDL (Table 6), due to reduced lipogenic enzyme activity and increased excretion of bile acids in the feces. Natural phytochemical compounds in *Nutrigold feed supplements* act as inhibitors of the HMG-CoA reductase enzyme, thereby decreasing cholesterol synthesis. When cholesterol is transported from the intestine to the liver, HMG-CoA reductase, which is responsible for converting acetyl-CoA to mevalonate in cholesterol synthesis, will be inhibited, thereby reducing the production of cholesterol synthesis by the liver. *Nutrigold feed supplements* as antioxidants can stabilize free radicals, by complementing the lack of electrons possessed by free radicals and inhibiting the chain reaction of free radical formation. Natural phytochemical compounds act as antioxidants and have beneficial effects on the serum fat profile of mice [11]. Consumption of herbal plants containing natural phytochemical compounds significantly reduces cholesterol and triglyceride levels and increases vitamin E levels in plasma [1]. The provision of *Nutrigold*

*feed supplement* in KUB chicken rations can increase HDL by 49.360 mg/dl (Table 6). HDL is called good cholesterol, in the body it functions to clean excess cholesterol in the blood and bring cholesterol back to the liver to be excreted from the body, and prevent damage to blood vessel walls due to fat accumulation. HDL promotes the reverse cholesterol transport pathway and prevents the formation of oxidatively modified LDL. HDL provides part of the anti-atherogenic effect, by returning excess cholesterol in the blood vessels to the liver to be excreted with bile.

The diagram of the relationship between treatment and blood lipid profile, namely the increasing provision of *Nutrigold feed supplement* in the ration, the total cholesterol, triglycerides, and LDL decreased but on the contrary, there was an increase in HDL in the blood of KUB chickens (Figure 3).



**Figure 3. Diagram of the Relationship between Treatment and Blood Lipid Profile**

**Table 6. Blood Lipida Profile of KUB Chickens of 8 Weeks Old with *Nutrigold Feed Supplement* in Rations**

Variable	Treatment <sup>1)</sup>				SEM <sup>3)</sup>
	A	B	C	D	
Total Cholesterol (mg/dl)	163.892 <sup>a2)</sup>	156.317 <sup>b</sup>	147.317 <sup>c</sup>	146.592 <sup>c</sup>	1.218
Triglycerides (mg/dl)	100.153 <sup>a</sup>	89.625 <sup>b</sup>	86.098 <sup>c</sup>	85.405 <sup>c</sup>	0.606
LDL (mg/dl)	106.754 <sup>a</sup>	96.300 <sup>ab</sup>	92.748 <sup>b</sup>	91.906 <sup>b</sup>	3.906
HDL (mg/dl)	44.562 <sup>b</sup>	46.250 <sup>b</sup>	48.495 <sup>a</sup>	49.360 <sup>a</sup>	0.673

**Description:**

- 1) A = 100% commercial ration + 0% *Nutrigold feed supplement*; B = 99% commercial ration + 1% *Nutrigold feed supplement*; C = 98% commercial ration + 2% *Nutrigold feed supplement*; and D = 97% commercial ration + 3% *Nutrigold feed supplement*
- 2) Numbers in the same row followed by different letters indicate significant differences (P<0.05)
- 3) SEM: *Standard Error of the Treatment Means*

**4. CONCLUSION**

From the research results it can be concluded that the provision of of 3% *Nutrigold feed supplement* in KUB chicken rations, can reduce the number of *Escheria coli*, *Coliform*, increase the height of the villi, the width of the villi, the depth of the crypts, and improve the blood lipid profile of KUB chickens.

**Suggestion**

It can be suggested to farmers, reduce the growth of pathogenic bacteria and increase intestinal histology, as well as improve the blood lipid profile of KUB chickens, by using 3% *Nutrigold feed supplement* in commercial rations.

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**Conflict of Interest**

All authors declare no conflict of interest in this research.

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