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*by Artikel 5*

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**Submission date:** 01-Apr-2024 11:18AM (UTC+0700)

**Submission ID:** 2336604068

**File name:** 2021\_UTILIZATION\_WAHYU.pdf (507.1K)

**Word count:** 3241

**Character count:** 17063

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To cite this article: W Widodo *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **752** 012058

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# Utilization of White Curcuma (*Curcuma zedoaria*) in the Feed as an Effort to the Nutrition Digestibility Optimization of Super *Kampong* Chicken

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**Abstract.** This research aims for the utilization of white Curcuma (*Curcuma zedoaria*) in the feed as an effort to the nutrition digestibility optimization of super *Kampong* chicken from cross-breeding. Experimental Farm, Faculty of Agriculture and Animal Science, University of Muhammadiyah Malang was the place to conduct this research, starting from January to March 2019. The material was 100-day old chick (DOC) super *Kampong* chicken. The completely randomized design (CRD) was used with four treatments namely T0 (0% of white Curcuma), T1 (1% of white Curcuma), T2 (2% of white Curcuma), T3 (3% of white Curcuma), and five replications. Each flock had 5 chickens. Analysis of Variance (ANOVA) was used for data analysis. The values of dry matter digestibility were T0 (95.38%), T1 (92.80%), T2 (94.56%), and T3 (94.56%). The crude fat digestibility values were T0 (71.54%), T1 (71.26%), T2 (73.49%), and T3 (77.39%). The biological protein values were T0 38.69%, T1 36.39%, T2 40.26%, and T3 60.28%. Then, the values of nitrogen retention were T0 (0.35 g), T1 (0.34 g), T2 (0.36 g), and T3 (0.57 g). The conclusion was white Curcuma on the feed of super *Kampong* chicken from cross-breeding did not affect the digestibility of dry matter, crude fat, biological protein value, and nitrogen retention.

Keywords: Super *Kampong* Chicken, Curcuma zedoaria.

## 1. Introduction

Chicken is very well known among the public because chicken meat contains high nutritional. Chicken meat plays an important role in the nutritional needs of the community. One of the kinds of chicken is *Kampong* chicken (*Gallus gallus domesticus*) and it is native Indonesian chickens [1]. According to [2], the population of *Kampong* chickens in Indonesia was 310,521,059 million. Chicken meat consumption tends to increase from year to year, the total demand for chicken meat in 2019 is predicted to be 1.30 million tons.



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*Kampong* chicken has the advantages such as low in fat content, adaptable to various situations but growing slowly. While the advantage of broiler is their rapid growth but has high-fat content [3]. From the advantages and disadvantages of *Kampong* chickens and broiler, the first step taken to obtain a superior breed is crossing *Kampong* chickens with broiler namely super *Kampong* chicken with fast growth, low-fat meat, and disease resistance.

However, if the maintenance is wrong, it will affect the condition of the chickens. Health is one of the keys to the success of the super *Kampong* chicken business and adding natural herbs to feed is required. One of the natural herbs is white Curcuma which acts as a feed additive because it contains active substances, namely curcumin, curcuminoids, flavonoids, essential oils [4-5]. Essential oils play a role in pancreatic secretion, curcumin can launch bile secretion for rapid digestive reactions [6]. High absorption of nutrients will increase the digestibility of nutrients in feed.

Currently, research on white Curcuma as a feed additive to super *Kampong* chicken feed has not been widely published, so it is necessary to examine the effect of giving white Curcuma in the feed on nutrients digestibility of super *Kampong* chicken from cross-breeding. The problem of research was: what is the addition of white Curcuma in the chicken feed had to impact on the nutrition digestibility of super *Kampong* chickens?. The research purpose was to analyze the impact of the addition of white Curcuma in the chicken feed toward the nutrition digestibility of super *Kampong* chickens from cross-breeding.

## 2. Methodology

The research schedule was from January to March 2019 at the Close House Experimental Farm, Faculty of Agriculture and Animal Science, University of Muhammadiyah Malang. The material research was 100 DOC in 60 days maintenance period.

The variables were dry matter digestibility, crude fat digestibility, protein biological value, and nitrogen retention. Dry matter is the total feed substance without water in the feed ingredient. The dry matter digestibility was determined by heating the sample using an oven. Digestibility of dry matter (DMD) can be measured by calculating according to the formula:

$$DMD (\%) = \frac{(DM \text{ consumption} - \text{excrete } DM)}{DM \text{ consumption}} \times 100$$

Crude fat (ether extract) is all feed compounds that can dissolve in organic solvents. The determination of the value of crude fat was carried out by doing a proximate analysis of the treated feed. Crude fat digestibility (CFD) can be measured by calculating according to the formula:

$$CFD (\%) = \frac{(CF \text{ consumption} - \text{excrete } CF)}{CF \text{ consumption}} \times 100$$

The protein biological value is the percentage of protein in the feed that was digested by chicken and the amount used for growth and maintenance. The way of observation was:

Protein Biological Value (PBV) = (N intake - N excrete - N endogenous) / (N intake) x 100%

Information: N intake = nitrogen content of feed consumption (g), N excrete = excrete nitrogen content (g) and N endogenous = excrete nitrogen content from fasted chicken (g)

Nitrogen retention is a method for measuring the protein absorbed by the body and the quality of feed protein. The method of observation was by calculating research data by the following formula:

Nitrogen retention = N intake - N excrete

Information: N intake = nitrogen content of feed consumption (g) and N excrete = excrete nitrogen content (g)

The experimental method by completely randomized design (CRD) was used in this research with 4

treatments and 5 replications. The treatments consisted of: T0 = feed with 0% of white Curcuma, T1 = feed with 1% of white Curcuma, T2 = feed with 2% of white Curcuma, and T3 = feed with 3% of white Curcuma. The data were analyzed by Analysis of Variance (ANOVA), then by the least significant difference test (LSD) to determine the best treatment.

### 3. Result and Discussion

The analysis of variance was used for calculating the effect of white Curcuma in the chicken feed on the nutrition digestibility of super *Kampong* chicken from cross-breeding as in Table 1 below.

**Table 1.** Data of white curcuma in chicken feed on nutrition digestibility of super *kampong* chicken

Treatments	Variables of Nutrition Digestibility			
	Dry Matter(%)	Fat (%)	Protein Biological Value (%)	Nitrogen Retention (g)
T0	57,23±28,61 <sup>a</sup>	71,54±35,77 <sup>a</sup>	38,69±19,34 <sup>a</sup>	0,35±0,17 <sup>a</sup>
T1	55,68±27,84 <sup>a</sup>	71,26±35,63 <sup>a</sup>	36,39±18,19 <sup>a</sup>	0,34±0,17 <sup>a</sup>
T2	59,10±29,55 <sup>a</sup>	73,49±36,74 <sup>a</sup>	40,26±20,13 <sup>a</sup>	0,36±0,18 <sup>a</sup>
T3	64,21±32,10 <sup>a</sup>	77,39±38,69 <sup>a</sup>	60,28±30,14 <sup>a</sup>	0,57±0,28 <sup>a</sup>

The same letter in the same column shows no difference, while different letters mean there was a difference.

Nutrition digestibility is defined by calculating the portion of nutrition that is not excreted, assuming the nutrition has been absorbed by chicken, and as coefficient or percentage. The difference between the nutrients contained in the feed and the nutrients in the excrete is part of the nutrients that are digested [7-8]. Based on Table 1 above, the dry matter digestibility has obtained an average of 59.05%. This showed by [9] the white Curcuma can secrete enzymes in the digestive tract optimally so that the digestibility of dry matter increases. Good quality nutrients also play in this process, following the statement of [7] that high digestibility and fast digestion rates will increase feed consumption. According to [9] bioactive substances contained in herbs are also able to stimulate the pancreas to secrete pancreatic juice which contains digestive enzymes such as amylase, lipase, and protease.

The results showed white Curcuma in the feed had no significant effect on the dry matter digestibility of super *Kampong* chickens ( $P>0.05$ ). The white Curcuma contains active substances, namely curcumin, curcuminoid, flavonoids, essential oils as antibacterial agents [10-11]. Essential oils play a role in the secretion of the pancreas in the digestive organs, which causes the digestive organs to work properly. However, essential oils were thought to had not been able to make the digestive tract better so that it has no significant effect on the dry matter digestibility.

The white Curcuma did not affect the dry matter digestibility of super *Kampong* chicken because the effect of temperature and humidity in the chicken close house from the beginning until the end of maintenance is relatively the same. The role of chicken close house temperature and humidity can affect the consumption during maintenance was the same. This research was supported by [12], feed with the addition of *Zingiber zerumbet* did not affect the dry matter digestibility of super *Kampong* chickens. The dry matter digestibility values were T0: 66.36%, T1: 68.81%, T2: 69.61%, and T3: 69.38%. The feed used in this study has the same content so that the dry matter digestibility of the chickens was the same. According to [13] the nutrition digestibility depends on the quality of the feed nutrition so that it affects the growth of microorganisms. [14] stated one of the factors was the high digestibility of the feed, the feed nutrition must be absorbed in the digestive tract and the feed nutrition is not entirely available for chicken, partly excreted again through excrete.

Based on Table 1 above, crude fat digestibility was average was 73.42%. There were values for each



treatment, namely T0: 71.54%, T1: 71.26%, T2: 73.49%, and T3: 77.39%. The addition of white Curcuma in the chicken feed had no significant effect ( $P > 0.05$ ) on the digestibility of crude fat. The essential oils and curcumin in white Curcuma play a role in the secretion of the pancreas and the secretion of bile which can cause rapid digestive reactions, high absorption of nutrition, and increase the digestibility of nutrients in feed [15]. Unfortunately, the addition of white Curcuma containing essential oils in the feed was not optimal to stimulate digestive tract enzymes.

The other reason was chickens have a preference for feed, odor, taste, and texture of feed can affect the level of palatability. The white Curcuma has a slightly pungent distinctive aroma and taste and will affect palatability. If palatability decreases, it will affect feed consumption. [16] stated some of the factors that affect digestibility were physical forms, feed, feed composition, and comparison of other nutrients. The level of nutrition digestibility can also be affected by the balance of nutrients in the feed, species, amount of feed, and environmental temperature. The bitter taste and pungent aroma of white Curcuma cause low digestibility according to [17]. On the other hand, the results of research conducted [3] showed feed with the utilization of Zingiber zerumbet had an effect on the digestibility of crude fat.

Based on Table 1, the protein biological values of the super *Kampong* chickens have averages of T0 (38.69%), T1 (36.39%), T2 (40.26%), and T3 (60.28%). The addition of white Curcuma in the feed had no significant effect ( $P > 0.05$ ) on protein biological value. The absorption of nutrients in chickens can be seen from the consumption of feed protein with excreting protein. Protein was not wasted through excreting indicates the protein was used for chicken growth and was completely absorbed. [18] stated the higher the feed protein, the longer the absorption of protein and the more balancing of essential amino acids compose it so that the protein biological value was relatively high. The actual protein absorption calculation was measured using nitrogen intake minus nitrogen excrete and corrected by the endogenous nitrogen value to determine the actual protein digestibility. Endogenous nitrogen was nitrogen comes from mucosal cells, eroded during the digestion process. [19] showed the addition of ginger in the feed of super *Kampong* chicken had the average protein biological value was 56.72% to 60.06%. That was not different in each treatment, this showed protein absorption was good so that the protein biological value of super *Kampong* chicken protein was not different from previous studies.

The white Curcuma contains a variety of chemical compounds including curcumin as antibacterial, antiprotozoal, antiviral, anti-carcinogenic, and anticoagulant properties that can inhibit the growth of pathogenic bacteria such as *E-coli*, *Staphylococcus aureus*, *Vibrio comma*, *Micrococcus luteus*, and *Enterococci faecalis* and to help the enzymatic digestive metabolic process [19-20]. Increasing digestive enzymes and suppressing the growth of pathogenic bacteria will accelerate the process of digestion and absorption of protein [12]. Unfortunately, the curcumin in the white Curcuma was not sufficient to stimulate digestive enzymes so that the protein biological value of super *Kampong* chicken protein still was not significant.

The higher the protein content in the feed, the biological nitrogen value will increase so that protein is utilized by the body optimally. By [21] biological nitrogen value was influenced by the protein content of the feed, protein quality, nitrogen content, and essential amino acids, namely histidine, lysine, methionine, tryptophan.

Based on Table 1, nitrogen retention values of super *Kampong* chickens were T0 (0.35 g), T1 (0.34 g), T2 (0.36 g), and T3 (0.57 g). [22] stated the addition of ginger flour in the feed of super *Kampong* chickens has an average nitrogen retention values of about 0.53 g to 0.61 g, this showed the absorption of feed protein was well absorbed and used for growth. The addition of white Curcuma had no significant effect ( $P > 0.05$ ) on nitrogen retention. The results of this study were following [22], stated the addition of ginger flour in the feed of super *Kampong* chickens had no significant effect on nitrogen retention. The white Curcuma contains curcumin for increasing digestive enzymes but was not sufficient to stimulate digestive enzymes [23-24] so that the nitrogen retention value of super *Kampong* chicken protein was not significant.

The white Curcuma in the feed has no significant effect because the protein content of the feed was the same treatment so that the resulting nitrogen retention was the same. This was following [25] stated

by increasing feed nitrogen consumption, nitrogen retention will be positive, which means optimal protein absorption. Positive nitrogen retention indicates the treated feed protein was utilized by the body for optimal protein absorption.

#### 4. Conclusion

This research had the conclusion, the addition of white Curcuma had no significant effect on the dry matter digestibility, crude fat digestibility, the value of protein biological, and nitrogen retention in the super *Kampong* chicken from cross-breeding.

#### Acknowledgments

Gratitude is devoted to the Ministry of Research and Technology and Higher Education, for funding this research by the PTUPT program. Gratitude also goes to the Animal Science Department, Agriculture and the Animal Science Faculty University of Muhammadiyah Malang, and the Directorate of Research and the Community Service University of Muhammadiyah Malang for the opportunity to carry out this research.

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