Influence of Kiapu (*Pistia Stratiotes, L*) in Fermented Diet on Weight, Length of Intestine and Bacteria Population in Intestine of Selected Local Chicken

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ABSTRACT

The research entitled the effect of Kiapu (*Pistia stratiotes L*) in fermented diet on the relative weight and length of the intestine (duodenum, jejunum, ileum) and the total plate count (TPC) of E. Coli and Coliform of selected local chicken. Superior local chickens are native chickens that are the result of genetic quality improvement. The growth of ALPU (superior local chickens) chickens has requirements in the availability and adequacy of nutrition, especially the protein content in the ration. Poultry rations usually contain protein from animal and vegetable origin, while feeds from animal sources are expensive and considered less economical. The use of Kiapu as a mixture of ALPU feed ingredients is due to the high crude protein which reaches 23%. The aim of this research was to observe whether feeding on Kiapu in fermented feed affect the health of the superior local chicken digestive organs. The research was designed by completely randomized factorial design with 2 treatment factors consisting of feed treatment P1 (0%), P2 (20%), P3 (30%) and gender factors (male and female) consisting of 4 replications and 3 ALPUs of each. Data was analyzed using analysis of variance and DMR test. The results showed that different level of Kiapu in fermented diet did not affect the relative weight of the intestine and the relative length of the intestine in both male and female chickens. There was no *E. Coli* was detected in the intestine in all feed treatments both in male and female. However, the presence of Coliform bacteria was observed in all diet contained different level of Kiapu in both male and female chickens with a population range below normal, because it does not cause disturbances to the digestive organs of chickens.

Keywords: *Fermented diet, Kiapu, Local chicken, Intestine.*

1. INTRODUCTION

Free-range chickens can produce eggs and meat, however, have a shortage in production when compared to purebred chickens. The price of products from native chickens has a price that tends to be expensive, this is due to the lack of understanding of feed quality and genetics which results in the growth of free-range chickens being less than optimal. This makes native chickens an object for many researchers to improve the genetic quality of native chickens so as to produce superior local broiler chickens (SLMC).

SLMC is a chicken with improved genetic quality that has a lot of meat mass and reaches the production period at the age of 6 weeks. However, the growth of SLMC has important requirements in terms of nutrient availability, especially in terms of protein content in the ration. Protein needs must be met at the age of 0-3 weeks to reach 23% protein at 6-8 weeks by 20%, with a total metabolic energy requirement of 3200 kcal/kg [14]. Poultry rations are generally of animal and vegetable origin, however, with high prices they are considered less economical in order to make the chicken business more efficient, therefore, local-based protein feed is needed which can be used as SLMC feed.

Kiapu (*Pistia stratiotes, L*) is a local feed ingredient containing 23.57% crude protein so that it has the potential as poultry feed but has a crude fiber resistance of 8.8% to 11% [5]. Utilization of fermentation technology can be used to reduce the shortage of materials used and also increase their potency. This is in line with the statement Munira et al [13] that the fermentation process is able to change complex structures into simple ones so as to increase the nutritional value of a feed ingredient.

Feeding chickens in rations contains probiotics to maintain the balance of microorganisms in the digestive system [3]. The role of probiotics in poultry in the small intestine as the first organ where the process of digestion and absorption of digestive products occurs. In chickens, the small intestine is divided into three parts, namely the duodenum, jejunum, and ileum. The development of a healthy digestive tract is characterized by the addition of weight and length as well as the growth of intestinal villi which can optimize nutrient absorption. Based on these problems, a study was conducted on the effect of Kiapu

in a fermented diet on the relative weight and length of the intestine of SLMC.

2. MATERIALS AND METHOD

2.1. Place and Time of Research

The research was conducted at Field Laboratory of Animal Science, Faculty of Agriculture, University of Syiah Kuala, Darussalam, Banda Aceh. The research was conducted from September 2020 to January 2021.

2.2. Experimental Diets dan Design

This research used completely randomized factorial design with 2 treatment factors consisting of feed treatment P1 (Control giving 100% using commercial feed), P2 (Giving treatment based on organic Kiapu (*Pistia stratiotes, L*) as much as 20% and the addition of commercial feed as much as 80%), P3 (Treatment The provision of organic feed based on Kiapu (*Pistia stratiotes, L*) is 30% and the addition of commercial feed is 70%) and sex treatment factors (male and female).

Table 1. Fermented diet ingredients formulation

Ingredients	Percentage (%)
Kiapu	40
Bran	22
Soyben meal	25
Corn	12
Probiotic	1
Nutrient Content	
Nutrient Content	Percentage (%)
Protein	23
EM (kcal/kg)	2905
Crude fiber	10.2
Crude fat	5.53

Table 2. Kiapu fermented diet

Nutrient Content (%)	Test Method	Test Results
Protein	Kjeldahl	15,41
Crude fiber	Gravimetric	5,16
Fat	Gravimetric	5,34
Ash content	Gravimetric	1,76

Table 3. The composition and nutritional content of the treatment

Feed Ingredients	Treatment		
Ingredients	P_0	P_1	P_2
[1] RKN511	100	80	70
[2] PFBKi	100	20	30
Amount	100	100	100
Nutrient content based on calculations			
Protein (%)	23	23	23
EM (kcal/kg)	3200	3171	3141
Crude fiber (%)	5	5.02	5.03
Crude fat (%)	5	5.03	5.07

Information :

[1] Nutritional content based on the packaging of PT. Pokphand: 21% protein, 5% crude fiber, 5% fat, 0.09% calcium, 0.60% phosphorus and 8% ash content. RKN 511 (Commercial Ration)

[2] Nutrient content based on the results of the Banda Aceh Industrial Baristand Testing Laboratory (LABBA) (2017): Protein 15.41%, crude fiber 5.16%, fat 5.34% and ash content 1.76%. PFBKi (Kiapu-based fermentation treatment) Information :

RKN 511 : Commercial ration

PFBKi : Kiapu-based fermentation treatment

2.3. Statistical Analysis

The research results were analysed using excel data analyst program. A significant effect was carried out by the DMRT test. ANOVA analysis used the F test of 95% with an interval level (a = 0.05).

2.4. Parameter

The parameters in this research were the relative weight of the intestine (duodenum, jejunum, ileum), the relative length of the intestine (duodenum, jejunum, ileum) and the total plate count (TPC) of *E. Coli* and *Coliform.*

3. RESULT AND DISCUSSION

3.1. Relative Weight of the Intestines

The relative weight of the intestine is the weight of the separate parts of the intestine which include the duodenum, jejunum, and ileum divided by the total weight of the small intestine which aims to see the effect of gender and levels of Kiapu in fermentation on the relative weight of each part of the intestine. The results showed that there was no effect on the relative weight of the intestines of SLMCs fed fermented feed containing 20-30% Kiapu.

The results of this study are in accordance with previous research reported by Iriyanti et al [11] that stated symbiotic treatment with *Lactobacillus sp* bacteria has no effect in increasing the relative weight of the intestine in Sentul chickens. In addition, Houshmand et al [10] also reported that administering organic acids and probiotics to broilers with high or low protein levels did not affect the relative weight of the intestine. However, the positive result reported by Abdel-Fattah et al [1] that approved the administration of organic acids in the form of lactic acid

or citric acid increased in the relative weight of the small intestine of broilers.

Table 4. Relative weight of the intestine (%) of SLMC fed on fermented diet containing Kiapu

Parameter	Percentage of fermented diet		
	0%	20%	30%
A. Relative Weight of Male Intestine (%)			
Duodenum	28.33	35.67	36.05
Jejunum	30.95	33.30	28.03
Ileum	40.71	31.03	35.92
B. Relative Weight of Female Intestine (%)			
Duodenum	46.43	46.12	35.91
Jejunum	27.08	39.13	35.53
Ileum	26.49	48.29	28.56

The total number of chicken samples used was 20 for each treatment.

level of fermented Kiapu (*Pistia stratiotes, L*) on the relative weight of superior broiler intestines has not helped create the desired condition. This is evidenced by the relative weight of the intestine (duodenum, jejunum, and ileum) of SLMC fed on fermented diet containing Kiapu is similar to control (fed on commercial diet). These results indicated that the variation of the fermentation level of Kiapu (*Pistia stratiotes, L*) has not yet reached the desired condition. An increase in the relative weight of the intestine due to the creation of an ideal pH for LAB growth in the intestine, which can maximize nutrient absorption by villi growth and muscle thickening in the intestine due to fiber-containing feed. The use of probiotics in poultry feed aims to create an ideal pH condition in the digestive tract which aims to improve the quality of nutrient absorption, as well as play a role in suppressing pathogenic bacteria in the digestive tract and increasing the growth of beneficial microbes [4].

In addition, Satimah et al [16] stated that the addition of *Lactobacillus sp* in the feed increases the relative weight of the broiler duodenum. The addition of *Lactobacillus sp* as a probiotic will increase the absorption process by affecting the anatomy of the intestinal villi to be higher and wider so that it has a dense density and has optimal nutrient absorption [9]. In this study, the process did not work properly but there was a tendency to increase the percentage of weight in the parts of the intestine due to the crude fiber content in the ration which was difficult to digest, resulting in enlargement and thickening of the intestinal wall which ultimately increased intestinal weight [7].

3.2. Relative Length of Intestine

The relative length of the intestine is the calculation of the length of the parts of the intestine separately which include the duodenum, jejunum, and ileum of the chicken divided by the total length of the small intestine. In this study, SLC fed on fermented diet containing of Kiapu have no effect on the relative length of intestine.

Table 5. Relative length of the intestine (%) of SLMC feed on fermented diet containing Kiapu

Parameter	Percentage of fermented diet		
	0%	20%	30%
A. Male Relative Intestine Length (%)			
Duodenum	23.64	28.97	32.11
Jejunum	33.18	32.76	27.97
Ileum	43.18	38.27	39.92
B. Relative Length of Female Intestine (%)			
Duodenum	37.88	37.86	29.86
Jejunum	24.22	23.49	31.13
Ileum	37.90	38.65	39.01

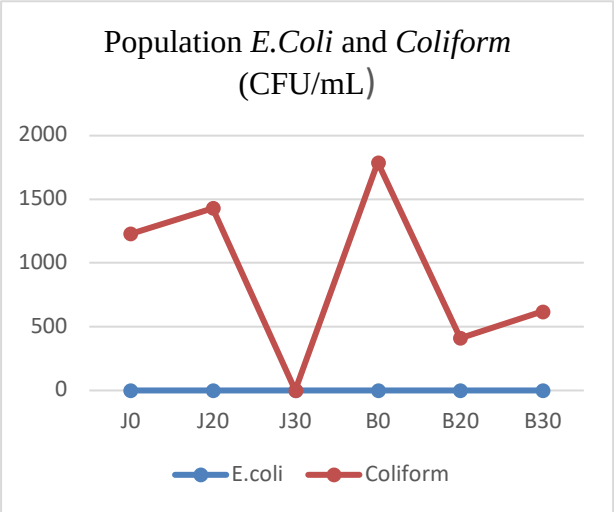
The total number of chicken samples used was 20 for each treatment.

The relative length of the intestine showed no effect on SLC fed on fermented diet containing Kiapu with different levels both on male and female chicken. This result is also supported by Houshmand et al [10] that stated chicken fed on different levels of protein in broilers with added probiotics or acidifiers did not affect the relative length of the small intestine. Other research showed that Sentul chicken fed on diet containing symbiotics (*Lactobacillus Sp)* did not affect the relative length of the small intestine [11]. However, a different matter was reported by Abdel-Fattah et al [1] using an acidifier in the form of lactic acid affects changes in the relative length of the small intestine in broilers.

It was clear that the length of the intestine is achieved due to the development of LAB in the intestine which affects the morphological conditions of the intestine by suppressing pathogenic bacteria which have an impact on increasing the quality of the villi and there is a change in the length of the intestine due to feed containing fibre. This has an impact on the absorption of nutrients increased and pathogenic bacteria found in the digestive tract can change the morphological condition of the intestine which can inhibit villi growth [18]. Other factors that can occur in influencing the length of the digestive tract are feed (shape, hardness, and solubility) and enzyme activity [20].

3.3. Total Plate Count (TPC)

Total plate count (TPC) is a method of calculating bacterial colonies cultured with agar media to observe the effect of fermented Kiapu (*Pistia stratiotes L*) feeding on *E. coli* and *coliform* in ALPU intestinal fluid related to digestive health of chicken. The present result showed that chicken fed on fermented diet containing Kiapu (*Pistia stratiotes L) until* 30% decreased the number of colonies of *E. coli* and *coliform* bacteria both in male and female chickens.



Graph 1. Population of *E. Coli* and *Coliform* of SLMC fed on fermented diet containing Kiapu.

Chicken fed on fermented diet containing Kiapu with different levels did not indicate the presence of *E. coli* in males or females. However, in the case of *Coliform*, it decreased the *Coliform* population to the control. Fuller [8] explained that the balance in the small intestine occurs due to the achievement of favourable microbial conditions that suppress the population of pathogenic bacteria by pushing the pathogenic bacteria out. The microbes in chicken intestines are very diverse and will become stable at the age of six weeks, the balance of the microbes in the intestine can be maintained by several factors, namely physical, chemical, and biological mechanisms through intestinal peristalsis by eliminating microorganisms and the interactions various types of bacterial species found in the intestine both symbiosis and antagonistically [2]. Infection of *E. coli* occur due to poor feeding and water of chicken and it will affect the morphology of the intestine which results in the condition of the small intestine. Probiotics in chicken rations suppress the growth of *E. coli* bacteria in the intestine and it does not have a detrimental effect on the small intestine ecosystem [6]. This was also conveyed by Millah et al [12] providing fermented Onggok feed reduced the amount of *Coliform* in the small intestine of broiler chickens. In addition, the number of pathogenic bacteria in the digestive tract exceeds the maximum limit cause inflammation of the small intestine of poultry and suppress the growth of microbes that can synthesize vitamins [17].

4. CONCLUSION

It was well known that chicken fed on fermented diet containing Kiapu showed that the treatment had no effect on the relative weight of the intestine and the relative length of the intestine in both male and female chickens. There was no *E. Coli* was detected in the intestine in all feed treatments both in male and female. However, the presence of Coliform bacteria was observed from all feed treatments containing Kiapu with different levels in both male and female chickens with a normal population range.

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