Effect of Kiapu *(Pistia Stratiotel* L*)* in Fermented Diet on Feed Consumption, Final Body Weight, Feed Conversion, Feed Efficiency and Cholesterol Content of Breast and Leg Muscle on Selected Local Chicken

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ABSTRACT
The purpose of present study was to examine the effect of Kiapu *(Pistia stratiotes* L*)* in fermented diet on feed consumption, final body weight, feed conversion, feed efficiency and cholesterol content of breast and leg muscle on selected local chicken (SLC). Fermented diet containing different levels of Kiapu were fed on male and female of SLC. The treatment of different Kiapu percentages in the organic diet consisted of P1 (0%), P2 (20%), and P3 (30%). Each treatment consisted of 4 replications and each replication consisted of 3 SLC. All chickens were reared for 7 weeks and provided with feed and drinking water ad libitum. In the present study, the parameters measured were feed consumption, final body weight, feed conversion, feed efficiency and cholesterol content of breast and leg muscle on male and female SLCs. Cholesterol content of SLC muscles was measured by spectrophotometer with a commercial kit. Data were analyzed by analysis of variance. The result of present study clearly indicated that difference level of Kiapu in fermented diet significantly increased ($P<0.05$) the value of feed consumption, body weight, feed conversion and feed efficiency. There was a correlation between the percentage of Kiapu and sex SLCs. The effect of 20% Kiapu in fermented diet increased final body weight, feed conversion, feed efficiency of male chicken was better than other treatments. However, there was no significant effect of Kiapu in fermented diet on the cholesterol levels in both breast (M. Pectoralis) and thigh (M. Gastrocnemius) muscles of SLCs. In conclusion, it was observed that 20% of Kiapu in fermented feed improved the final body weight, feed conversion, feed efficiency of male and female SLC without affecting cholesterol content on muscles.

Keywords: Kiapu *(Pistia stratiotes* L*), Fermented feed, Local chicken, Performance, Meat quality*

1. INTRODUCTION

Local chicken is very popular with the Indonesian people, because of its distinctive taste that is different from other types of chicken and has a large consumption demand.. However, empowerment program of local chicken has been constrained by low productivity due to genetic factor and the rearing management system. Currently, the main program for improving the genetic quality of local chickens has been carried out through selection and cross-breeding programs. One of the local chickens produced by selection process with a genetic quality improvement approach has been carried out in University of Syiah Kuala, Banda Aceh which called superior local meat chicken (SLC). This chicken has faster growth characteristics than pure local chickens without any selection program. SLC can be slaughtered faster at 6-8 weeks of age as commercial meat chicken [1]. The main program for increasing productivity of SLC in the future will continue to be carried out with better maintenance management system, appropriate feeding and disease prevention.

To increase interest in SLC rearing, it is necessary to develop a special feed technology for SLC which is cheaper than commercial feed, prepared from local materials and able to stimulate faster growth. One of local sources for poultry feeding formulation is Kiapu (*Pistia*

stratiotes L). Kiapu is floating aquatic plants that usually grow in tropical, sub-tropical and warm temperature areas around the world especially Indonesia. It has a high protein content and available quite a lot in rice fields or watery areas as weed plants. One of the important conditions for growing ALPU chicken is the number of available nutrients, especially protein. Protein requirement of ALPU at the age of 0-3 weeks is 23% and 6-8 weeks is 20%. In addition, a metabolic energy requirement of ALPU chicken is 3200 kcal/kg. In general, ALPU chicken feed protein consists of animal protein (fish meal) and vegetable protein (soybean meal) which are relatively expensive. In the future, it is less economical to reduce the level of profit in chicken farming by using vegetable protein as an innovation by using alternative feed from local ingredients to substitute for soybean meal and fish meal. One of the sources of local feed ingredients which are high in protein and easy to obtain and known is sufficient, one of which is kiapu (*Pistia stratiotes* L). However, it is important to observe the effect of Kiapu as an alternative source of feed protein for ALPU chicken so that it can be maximally utilized by local chicken farmer in future.

2. MATERIALS AND METHOD

This research was conducted at Field Laboratory of Animal Science, Faculty of Agriculture, University of Syiah Kuala, Darussalam, Banda Aceh. This research was done from September 2020 to January 2021. This research used a factorial completely randomized design with 2 factors, consisting of feed treatment factor (P1, 0%, P2 20%, and P3 30%) and sex factor (male and female). Data were analyzed using SPSS analysis. If the research data indicates a significant effect, it will be further tested using the DMRT test. The parameters were observed in this study consists of feed consumption, body weight, feed conversion and feed efficiency and cholesterol content of skeletal muscle.

3. RESULT AND DISCUSSION

3.1. Feed Consumption

Feed consumption is the amount of feed consumed at a certain time to meet the nutritional needs of chickens (g/bird). The purpose of the feed consumed is used to maintain SLC body condition, muscle contraction, growth and production. Total amount of feed consumption of SLC influenced by several factors including environmental temperature, chicken breed, body size, the level of production and protein-energy contents [2]. The results of research by [3] found that feed consumption and body weight gain of live chickens aged 5-8 weeks reared at 34 °C were 93.6 and 22.29 g/bird compared to those reared at 21 °C, which was 16.9 and 16.45 g/bird. The average daily feed intake of SLC during the observations of 1 and 7 weeks of age was shown in Figure 1 and 2.

Tabel 1. Total Feed Consumption (TFC) of SLCs supplemented with Kiapu in fermented diet at 1 and 7 weeks of age

Selected Local Chicken	% Kiapu in Fermented Diet	TFC at 1 week of age (gram/d)	TFC at 7 weeks of age (gram/d)
Male	0% (1)	14,28	31,21
	20% (2)	16,41	31,30
	30% (3)	16,67	31,17
Female	0% (1)	16,48	31,00
	20% (2)	14,91	31,34
	30% (3)	15,98	31,17

The total number of chickens used in the study was 20 chicken for each treatment.

It was showed that supplementation of 20-30% Kiapu ini fermented diet did not affect total feed consumption of SLC at 1 and 7 weeks of age. It indicated that supplementation of Kiapu in fermented diet did not change diet palatability and the amount of feed consumed by SLC containing Kiapu was the same as in the commercial diet treatment. Accordance to research using weed plants as chicken diet, [4] stated that 12% of fermented Kiambang *(Salvinia molesta)* as a feed supplement significantly increased the consumption of meat local chicken. It was due to Kiambang reduced crude fiber content in diet which is easier to digest. In addition, it was explained by [5] that the use of additives derived from plants including aquatic plants containing protein increases the palatability of feed and is preferred by chickens. Supplementation of Kiapu in fermented diet decreased total crude fiber content less than 5% resulted in an increase in feed consumption and body weight gains due to increasing the activity of digestive enzymes [6]. The present result indicated that feeding the fermented diet containing Kiapu on SLC both in male and female did not reduce total consumption of SLC and there was no negative effect on the growth of SLC. In chicken, fermented diet is an effort to improve the quality of nutritional value by breaking down hard structures physically, chemically and biologically [8]. Feeding on fermented diet of chicken resulted the complex structure of diet material becomes simpler and increase digestibility more efficiently and total feed consumption of chicken [9, 10].

3.2. Final Body Weight of SLC

Body weight is a result of the SLC to digest diet which is converted into body weight, as a standard indicator of production and growth. Body weight gain is produced from the synthesis of body protein derived from

protein consumed. It was well known that SLC growth process of SLC relatively higher than native chickens [11, 12]. Chicken growth includes growth in the shape and weight of the building tissues (bones, tendons, brain, heart and all body tissues except fat by an increase in the number of cells and cell enlargement influenced by feed consumption [13]. It was well known that supplementation of 20% Kiapu tended to increase final body weight both on female and male SLC at 1 week and 7 weeks of age.

The main factors influence body weight growth of SLC were the amount of feed consumption and the protein and energy content in feed, because protein and energy have an important effect in influencing the growth process. Other factors that affect body weight are species, type of production, strain, ambient temperature, sex, season, and maintenance management [14]. Final body weight of SLC at 1 and 7 weeks of age indicated that supplementation of 20-30% Kiapu in fermented diet supported the achievement of body weight equivalent to body weight in chickens fed on commercial diet. The results of this study are in line with the opinion of [15] that the growth of local chickens could be stimulated by feeding a fermented diet containing local ingredients as a source of nutrients.

Table 2. Final Body Weight (FBW) of SLCs supplemented with Kiapu in fermented diet at 1 and 7 weeks of age

Selected Local Chicken	% Kiapu in Fermented Diet	TFC at 1 week of age (gram/d)	TFC at 7 weeks of age (gram/d)
Male	0% (1)	38,17	39,87^{a}
	20% (2)	39,89	40,19^{b}
	30% (3)	36,93	37,06^{a}
Female	0% (1)	35,48	39,75^{b}
	20% (2)	36,82	39,60^{b}
	30% (3)	37,61	34,35^{a}

The total number of chickens used in the study was 20 chicken per treatment. Superscripts with different letters show a significant difference (P<0.05).

A significantly effect on body weight of SLC was observed at 7 weeks of age by feeding 20% of Kiapu in fermented diet both in female and male chicken. This indicated that the 20% supplementation of Kiapu in fermented diet resulted in a better balance of nutrients and feed palatability than other treatments. In line with previous study that feeding on fermented diet based on Kiapu changed smell, palatability and digestibility of total diet [16, 17]. This data indicated that maximum amount of Kiapu in fermented diet fed on SLC was 20%.

3.3. Feed Conversion dan Efficiency

It was well known that there were two important parameters to assess feed quality on chicken growth, namely; feed conversion (FCR) dan feed efficiency rates (FER). FCR is the ratio of the amount of feed consumed to body weight growth, feed conversion is a term that is widely used to determine the efficiency of using feed in producing weight gain. Feed conversion shows the amount of feed that is converted into one unit of body weight gain and the lower the feed conversion value, the better the feed efficiency [18]. FER is an indicator that really needs to be considered as a parameter to assess the effectiveness of feed on production components (eggs and meat).

Tabel 3. Feed conversion and feed efficiency rates of SLCs supplemented with Kiapu in fermented diet at 1 and 7 weeks of age

Selected Local Chicken	% Kiapu in Fermented Diet	FCR		FER	
		1 week of age	7 weeks of age	1 week of age	7 weeks of age
Male	0%	2,62^{a}	1,37^{a}	0,38	0,73
	20%	2,88^{a}	1,36^{a}	0,35	0,73
	30%	3,16^{b}	1,47^{b}	0,32	0,63
Female	0%	3,25^{b}	1,36^{a}	0,31	0,73
	20%	2,83^{a}	1,38^{a}	0,35	0,72
	30%	2,98^{ab}	1,59^{b}	0,35	0,63

The total number of chickens used in the study was 20 chicken per treatment. Superscripts with different letters show a significant difference (P<0.05).

Supplementation of 30% Kiapu in fermented diet had a significantly effect (P<0.05) on feed conversion of SLC at both in 1 week and 7 weeks of age but did not affect feed efficiency. This phenomenon due to a difference in the amount of feed consumption and weight gain of SLC fed on fermented diet contained Kiapu. The feed conversion rate will increase if the ration and protein content was balanced formulated in diet. The rate of feed conversion is determined the difference between the ratio of feed consumption to body weight gain of chicken [19]. In term of diet quality, feed efficiency also be used to measure the ability of a nutrient contained in feed to serve maintenance and production requirements of chicken. Increase in feed efficiency is important parameter to measure the ability of chicken utilizing the feed consumed to produce body weight and certain production; production of meat and eggs [20, 21, 22]. Fermenting chicken feed and supplementation of local material as a protein source increased the available total

nutrients, improved digestibility and provided natural probiotic of chicken [8]. In this study difference in value of feed conversion at 1 week and 7 weeks of age due to growth rate of SLC growth decreased while feed consumption continues to increase. It was clear that fermented diet contained 20-30% Kiapu increasead body weight and lead to better feed conversion. The conversion process of nutritional value of SLC also influenced by the ability of nutrients in fermented diet contained Kiapu. Increase in feed conversion is also due to activation of digestive enzymes and hormones on chicken fed on fermented diet [23].

3.4. Cholesterol Content of Breast and Thigh Muscles

Cholesterol level is one of the goals of special attention for the community today, based on previous research proving that high cholesterol levels are the main factor in coronary heart disease, so that meat with low cholesterol levels is preferred by the public. This research carried out the addition of fermented kiapu-based organic feed *(Pistia stratiotes* L) which is expected to reduce ALPU meat cholesterol levels. The following is a table of cholesterol levels in the chest muscle *(M. Pectoralis)* and thigh muscle *(M. Gastrocnemius)* SLC.

Table 4. Cholesterol content in breast and thigh muscles of SLC fed on fermented diet contained Kiapu at 7 weeks of age

Selected Local Chicken	% Kiapu in Fermented Diet	Breast Muscle (*M. Pectoralis*)	Thigh Muscle *(M. Gastocnemius)*
Male	0%	410,50^{d}	251,90^{bc}
	20%	166,40^{a}	160,45^{a}
	30%	211,80^{b}	200,90^{b}
Female	0%	397,20^{d}	271,90^{c}
	20%	362,90^{cd}	273,20^{c}
	30%	347,30^{c}	244,20^{bc}

The total number of chickens used in the study was 20 chicken per treatment. Superscripts with different letters show a significant difference (P<0.05).

4. CONCLUSION

In conclusion, it was observed that 20% of Kiapu in fermented feed improved the final body weight, feed conversion, feed efficiency of male and female SLC without affecting cholesterol content on muscles.

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The resultsof present study indicated that the use of protein sources from aquatic plants that are high in protein content such as Kiapu *(Pistia stratiotes L*) in local chicken feed will be very effective when combined with fermented diet. Supplementation of 20-30% Kiapu in fermented diet stimulated local chicken weight gain and improved the quality of breast and thigh muscle by reducing cholesterol content. There was no negative effect on changes in the feed consumption of selective local chicken fed on fermented diet contained Kiapu.

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