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Phenotype analysis of growth traits of KUB chickens fed with fermented cattle feces

Franky M.S. Telupere

Department of Animal Science, Faculty of Animal Husbandry, Nusa Cendana University, Kupang Indonesia.

Email: kupangph@yahoo.com

ABSTRACT.

This research was conducted to analyze phenotypically the growth traits of KUB chickens consuming fermented cattle feces (FCF) feed. 120 head chicks were randomly placed in 4 treatments, i.e rations with 0% FCF (R0), 10% FCF (R1), 20% FCF(R2), and 30% FCF (R3). Each treatment consisted of 6 replications and each replication consisted of 4 chicks. The design used was a completely randomized design and the parameters studied were body weight, weight gain, feed consumption and feed conversion for the age period 0-8 weeks. The results showed that the R1 treatment was higher for all the parameters studied, but because the R0 treatment was not significantly different with the R2 and R3 treatments for both body weight at 8 weeks, and body weight gain for the period 0-8 weeks, so it can be said that KUB chicken can still grow well even if consuming feed containing 30% FCF. Feed consumption decreased in line with the increase in FCF level in the ration and R3 treatment had the best feed conversion ratio (2.95). Substitution of fermented cattle feces in commercial ration was able to reduce feed consumption, increse body weight and more efficient in feed consumption.

Keywords: Phenotype analisis, growth traits, KUB chickens, fermented cattle feces

INTRODUCTION

Business of raising native chicken is currently one of the promising efforts for breeders because the demand for native chicken products in the form of meat and eggs continues to increase from time to time. Raising native chickens has a promising and profitable prospect, as long as it meets the requirements of using seeds, vaccinating intensively and regularly, and using cheap and quality feed. There are various types of native chickens that can be cultivated by the people of Indonesia, one of which is the Kampung Unggul Balitbang (KUB) chicken.

Genetically, the KUB chicken is the result of crossing original Indonesian native chickens which was the result of a selection of female lines for six generations produced by the Agricultural Research and Development Agency, Ciawi Bogor (Udjianto, 2016). Furthermore, it was stated that KUB chickens had the advantage of containing 60% MX ++ genes, genes marking resistance to Avian Influenza (AI) attacks, egg production was quite high i.e daily egg production reaching 45-50% and at peak production up to 65%. Egg production per year reaches 160-180 eggs and the broodiness only 10% of the total population and age at first laying 22-24 weeks. Apart from the superiority in laying properties, KUB chickens also have good potential to produce meat.

The results of research on KUB chickens for both production and reproductive characteristics showed that KUB chicken performance was indeed better than native chickens. Putri, et al. (2020) reported that the growth of KUB chickens was better than Sentul chickens and Arab chickens. The BPTP East Java (2018) found that egg production, egg weight, egg laying frequency, hatchability, consumption and feed conversion were better, as well as incubation and low mortality. Sinurat, et al. (2017), found that BS_4 enzyme supplementation into the KUB chicken ration during the growing period could increase the feed efficiency.

The main limiting factor in the development of native chickens intesively is the high cost of feed, which is in the range of 60-70% of all production costs. One of the obstacles in intensive KUB chicken maintenance is the high cost of feed. Therefore, it is necessary to find other alternatives that can reduce feed costs. The use of fermented feed in chicken rations can actually increase the production and productivity of native chickens.

Telupere (2020) found that the use of fermented cattle feces in the basal ration up to 20% gave better results for egg production and egg weight of local chicken (Sabu and Semau chickens). The use of processed cattle feces in laying hens ration up to 20% according to Sweken (2015) which can increase egg production, egg weight, reduce FCR, and not cause health problems. In addition, the price of rations was 12 to 15 percent cheaper than commercial rations. According to Guntoro, et al. (2016), one of the alternative feed making techniques is using livestock waste such as fermented cattle feces as the main ingredient. Guntoro et al. (2013) found that fermented cattle feces with inoculants containing microbes from the termite digestive tract for 5 days can increase the protein content from 7-8% to 13-14% and reduce the crude fiber content significantly. Telupere (2020) found that the addition of fermented cattle feces in commercial rations up to 30% did not have a negative effect on the growth and production of Sabu and Semau native chickens. Based on the description above, this research was conducted to analyze phenotypically the growth traits of KUB chickens fed with fermented cattle feces.

MATERIALS AND METHODS

This study used 48 adult chickens as parents consisting of 8 males and 40 females obtained from KUB chicken breeders in Kupang City and its surroundings. The parents used in this study were more than 1 year old and for females used who had already laid eggs. The chickens are kept in individual cages and mating is done by artificial insemination. The eggs produced from the mating were hatched using a hatching machine and 120 day old chicks were obtained as research material. Feed and water were given *ad libitum*. Substitution of cattle feces in rations after the chicks were 2 weeks old.

The design used was a completely randomized design with 4 treatments and 6 replications for each treatment. The treatments given were 4 kinds of rations, namely rations containing 0% FCF (R0) as a control, rations containing 10% FCF (R1), rations containing 20% FCF (R2), and rations containing 30% FCF (R3). Each treatment was repeated 6 times and each replication consisted of 5 chicks. The composition of the research ration is presented in Table 1.

Table 1. The composition of the research ration*)

Sample	Dry matter	Crude Protein	Crude fat	Crude fiber	CHO	Gross Energy

	(%)	(%)	(%)	(%)	(%)	(Kcal/kg)
Cattle feces	93,428	7,239	2,808	33,821	63,830	3.291,38
FCT	92,816	10,930	1,480	16,866	55,024	3.013,32
R0	90,330	22,484	7,303	3,209	54,955	4.213,65
R1	90,397	21,887	6,489	8,379	53,767	4.054,27
R2	90,915	20,057	6,250	9,395	51,357	3.829,49
R3	91,366	19,163	4,998	10,198	51,140	3.651,72

FCF= Fermented cattle feces

*)Results Analysis of Laboratory of Feed Chemistry, Faculty of Animal Husbandry, University of Nusa Cendana

The variables studied were body weight at 0, 4, and 8 weeks, weight gain, feed consumption, and feed conversion for the age period of 0-4 weeks, 4-8 weeks, and 0-8 weeks. The data obtained were analyzed using analysis of variance (ANOVA). If the analysis of variance shows a significant effect, then further analysis is carried out using Duncan's Multiple Range Test. All data were analyzed using the SPSS 21 software package.

RESULTS AND DISCUSSION

During the study, both during the adjustment period and during the data collection period, there were no chickens that showed symptoms of illness. All chickens look lively, have good appetites, and have shiny clean feathers. Although at the beginning of the study the difference temperature in daytime (29^0C) and night time (21^0C) (temperature in the pen) was quite large, this did not affect the activity of the research animals both in consuming feed and their growth.

Body Weight

Body weight measurements were carried out at 0, 4, and 8 weeks. Body weights of research chickens from 0 to 8 weeks of age are presented in Table 2.

Table 2. Body weight of KUB chickens consuming feed containing fermented cattle feces at various age (g/head)

Treatments	DOC	4 weeks*)	8 weeks*)
R0	28.95±3.27	284.70±48.86^b	726.35±12992^b

R1	28.85±2,80	313.00±35.25[a]	793.40±96.88[a]
R2	29.25±2.51	278.95±36.19b[c]	709.80±107.88[b]
R3	28.83±2.70	259.90±21.93[c]	674.95±68.52[b]

*) Means in the same column with common superscript are not significantly difference [P>0.05]

Hatching weight (DOC) is the weight of chicks after hatching which are weighed before 24 hours. The results showed that the highest was found in treatment R2 (29.25 ± 2.51g), followed by R0 (28.95 ± 3.27g), R1 (28.85 ± 2.80g), and R3 was the lowest (28.83 ± 2.70g). The difference in the DOC weights may be due to the different weight of the hatching eggs. North and Bell (1990) stated that eggs with small weights will produce small chicks at hatching compared to eggs with large weights. Furthermore Lestari, et al. (2013) stated that the hatching weight is influenced by egg weight, where the higher the egg weight, the higher the hatching weight.

Although empirically there is a difference in the age weight of 0 weeks body weight, the results of statistical analysis showed that the treatment had no significant effect (P> 0.05) on the hatching weight. The body weight of 0 weeks in this study was higher than the DOC weight of Tolaki chickens (Herlina, et al., 2016), both those hatched using electric heat source hatching machines (26.47g) and combined heat source hatching machines (26.96g). The results of this study are not much different from those founded by Telupere (2020), in which Sabu and Semau native chickens that consume feed containing fermented cattle feces have an initial weight between 27.33 to 29.17g. N'dri (2018) found that the DOC weight of indigenous chicken was 26.00g lower than this study.

The body weight at the age of 4 weeks was quite varied where the chickens that consumed feed containing 10% fermented cattle feces had better body weight than other treatments. The body weight of 4 weeks in this study is higher than that reported by BPTP East Java (2018), i.e 178.22g in males and 167.62g in females. Suryana (2017) reported that the body weight of KUB chickens at 1 month age ranged from 400 to 455g, better than that found in this study. According to Eriko, et al. (2016), native chickens that are given commercial feed can produce body weight at 4 weeks of age of 331.33 g, while those fed a mixture of commercial feed and rice bran produce lower body weight. The results of this study were higher than those found by Rahayu, et al. (2010), i.e the body weight of free-range chickens aged 4 weeks was 253.00g.

Rajkumar, et al. (2017) found the body weight of Aseel chickens aged 4 weeks was only 142.4g which is much lower than this study, while Moherrery and Mizaei (2014) found that body weights of 4 week native chickens was almost the same as this study. The differences in the findings of several previous researchers were probably due to differences in the feed consumed, the rearing environment, and other growth support factors.

At the age of 8 weeks, the body weight of chickens consuming feed containing 10% fermented cattle feces (R1) was higher than other treatments (793.40g) followed by R0, R2, and R3 treatments was the lowest. These findings indicate that a ration containing 10% fermented cattle feces was more suitable for the growth of KUB chickens. The results of statistical analysis showed that the treatment had a significant effect ($P < 0.05$) on body weight at 8 weeks of age. Further test results showed that the R1 treatment was significantly higher than other treatments, but treatment R0, R2 and R3 were not significantly different ($P > 0.05$). Suryana (2017) reported that the body weight of KUB chickens aged 2 months was lower than this study, which is 650g for males and 555g for females. Generally, R1 treatment was better than others.

Biduran and Suasta (2006) state that the body weight of native chickens at 8 weeks varies greatly, ranging from 482.50g to 647g. Moherrery and Mizaei (2014) reported that the body weight of native chickens aged 8 weeks was 846g higher than this study. While Putri et al. (2020) found that body wight of KUB chicken, Sentul ckicken, and Arab chicken at 8 weeks of ages were 713.15±66.75g, 632.88±85.10g, and 591.20±55.11g, respectively. The variation in body weight of native chickens is caused by different types of native chickens, different maintenance systems and the feed given.

Weight Gain

One of livestock growth indicator is body weight gain. Chickens in the growth phase have rapid body weight gain and will decline towards adulthood and stop at adulthood. Data on body weight gain of KUB chickens consuming feed containing fermented cattle feces at various growth periods are presented in Table 3.

Table 3. Average body weight gain of KUB chickens consuming feed containing fermented cattle feces at various growth periods (g)

Treatments	Growth periods (week)		
	0-4*)	4-8*)	0-8*)

R0	255,75 ± 47,81[b]	441,65 ± 90,90[ab]	697,40 ± 129,23[ab]
R1	284,05 ± 35,14[a]	480,40 ± 65,14[a]	764,45 ± 96,93[a]
R2	249,70 ± 35,21[bc]	430,85 ± 75,54[ab]	680,55 ± 107,49[ab]
R3	231,75 ± 31,26[c]	415,05 ± 61,24[b]	646,80 ± 68,43[b]

*) Means in the same column with common superscript are not significantly difference (P>0.05)

The data in Table 3 showed that there was a slightly lower body weight gain at the beginning of the growth period and continues to increase with the age of the chickens. In the growth period of 0-4 weeks, R1 treatment had a higher body weight gain than other treatments. This situation persisted until the end of the study.

The results of the statistical analysis showed that the treatment had a significant effect on the increase in body weight 0 to 4 weeks. In this period, R1 treatment was significantly (P <0.05) higher than other treatments. Treatment R0 was significantly different from treatment R3 but not significantly different (P> 0.05) with treatment R2. There was no significant difference between the R2 and R3 treatment pairs. These findings indicated that there was a significant effect of the feed given on the body weight gain of the research chickens. The substitution of fermented catle feces (FCF) 10% in the ration was significantly better than the ration without FCF.

Growth period of 4 to 8 weeks, treatment R1 had a higher body weight gain rate and was significantly different from treatment R3. The treatment pairs R0, R2, and R3 were not found to be significant differences. The findings obtained in this study indicate that KUB chickens can grow well even in conditions of low feed nutrient levels. Another thing that can explain this situation is that chickens that consume BR2 feed even though it contains quite high protein and energy, however, have lower chicken needs so that the excess protein eaten is likely to be wasted through feces so that it does not produce better body weight gain.

Overall growth from 0 to 8 weeks of age, treatment R1 was better than other treatments. The results of statistical analysis showed that the treatment had a significant effect on body weight gain. Duncan's multiple range test showed that R1 was significantly higher than the other treatments, while there was no significant difference between other treatment pairs.

When viewed from the body weight gain per day, then R1 produces a body weight gain of 13.65 g/head/day, followed by R0 (12.45g/head/day), R2 (12.15g/head/day), and R3 (11.55g /head/day). The results of this study were higher than those reported by Urfa, et al. (2017)

where the body weight at the age of 8 weeks ranges from 451.3 to 512.0g. The body weight gain of chickens in this study was also better than that found by Mayora et al. (2018) that studied about performance of the starter on KUB chicken rationing with different crude protein.

Feed consumption

Feed consumption is calculated based on the difference amount of feed given and the amount of leftover feed within a certain time unit. In this study, the time periods used were 0-4 weeks, 4-8 weeks, and 0-8 weeks. The average feed consumption data is presented in Table 4.

Table 4. Average feed consumption of KUB chicken that consume feed containing fermented cattle feces at various growth periods (g/head)

Treatments	Growth periods (week)		
	0-4*)	4-8*)	0-8*)
R0	889.60±55.26[a]	1371.00±63.93[b]	2260.60±118.18[b]
R1	883.40±21.92[a]	1517.95±11.11[a]	2401.15±24.87[a]
R2	851.45.±31.74[a]	1284.30±50.05[c]	2135.7 ±47.75[c]
R3	698.50±46.56[b]	1220.65±26.82[c]	1919.15±33.24[d]

*) Means in the same column with common superscript are not significantly difference (P>0.05)

The feed consumption of research chicken was presented in Table 3 shows an increase in line with the increasing age of the livestock. This situation points to the healthy growth of the chickens. At the beginning of the growth period (period 0 to 4 weeks), the chickens that received the R0 treatment consumed the most feed and the lowest was the R3 treatment. The low feed intake in treatment R3 was probably due to the adaptation period of the chickens, where at the beginning of the feeding, it was seen that the chicks had decreased appetite, but this situation did not last long. Entering the 4th week, his appetite is normal so that his feed consumption has also returned to normal.

Growth period of 4 to 8 weeks, conditions began to change where R1 treatment had the highest feed consumption, followed by treatments R0, R2 and R3. It seems that the palatability of the R1 ration is better than the commercial BR2 (R0) diet. This situation persisted until the end of the study and the cumulative feed consumption showed no different. The results of statistical analysis showed that the treatment had a significant effect ($P < 0.05$) on feed consumption. Duncan's analysis proved that in the 0 to 4 week period, treatment R3

was significantly different (P <0.05) with treatment R), R1, and R2. The treatment pairs R0, R1, and R2 were not significantly different.

Growth period of 4 to 8 weeks, R1 treatment was significantly higher than other treatments. Treatment R0 was significantly different from treatment R2 and R3, whereas between treatment pairs R2 and R3 did not show a significant difference. This finding can be explained as follows, that the palatability of the R1 ration was better than the other treatments even though its nutritional content (protein and energy) was lower than the commercial ration R0. Chicken KUB seems to prefer rations with a slightly lower nutritional content. The absence of differences between R2 and R3 treatments indicated that the tolerance level of KUB chicken to fermented cattle feces in the ration up to 30% was still quite good.

If the ration consumption per head per day is calculated, the total ration consumption of the research chickens is as follows: 31.77g, 31.55g, 30.41g, and 24.95g for treatments R0, R1, R2, and R3 at the age 0-4 weeks. For the age period of 4 to 8 weeks, respectively 48.96g (R0), 54.21g (R1), 45.87g (R2), and 43.59 (R3) g. Cumulatively (0 to 8 weeks age period), the feed consumption of the research chickens per head per day was 80.73g (R0), 85.76g (R1), 76.28g (R2), and 68.54g (R3). The results of this study were higher than those reported by BPTP East Java (2018), i.e in the period of 0 to 4 weeks (350g/head), while for 4 to 8 weeks (1120g/head), and the cumulative 0 to 8 weeks (1470g/head). This difference may be due to the type of ration given and also to differences in the nutritional composition of the rations.

Feed Conversion

Feed conversion is calculated based on feed consumption and body weight gain. The feed conversion rate shows how much feed is needed to increase 1 kg of body weight. The average feed conversion data calculated at various growth periods are presented in Table 5.

Table 5. Average feed conversion of KUB chickens consuming feed containing fermented cow feces at various growth periods

Treatments	Growth Periods (week)		
	0-4	4-8	0-8
R0	3.47±0.24	3.08±0.15	3.25±0.13
R1	3.13±0.13	3.20±0.22	3.15±0.19
R2	3.43±0.30	3.00±0.35	3.13±0.29
R3	2.70±0.74	2.68±0.53	2.95±0.10

In the early growth period (0-4 weeks), the best feed conversion ratio were found in treatment R3, followed by treatments R1, R2, and R0. Growth period of 4-8 weeks, treatment R3 remains the best, followed by R2, R0 and R1. Overall (period 0-8 weeks), treatment R3 remains the best, followed by treatment R2, R1, and R0. The results of this study indicate that KUB chickens that consume feed containing 30% fermented cattle feces are more efficient in using feed. However, because feed conversion is a function of feed consumption and body weight gain, chickens that consume less feed have less weight gain than chickens that consume a lot of feed. This finding was better than Sami and Fitriani (2019) found that feed conversion of KUB chicken ranged from 3.14 to 4.98.

The results of the statistical analysis showed that the treatment had no significant effect (P> 0.05) on feed conversion rate. This proves that the obtained feed conversion rate in this study cannot be used as a benchmark because we have to look back at feed consumption and body weight gain. Judging from the increase in body weight and the amount of feed consumption of the best R1 treatment, but the body weight gain was not significantly different from treatment R2, therefore it can be concluded that KUB chickens can still tolerate feed containing fermented cattle feces up to 20% in commercial BR2 rations and not interfere with its growth. Sweken (2015) found tha the use of processed cattle feces in laying hens ration up to 20% can increase egg production, egg weight, reduce FCR, and not cause health problems. That is way, the use of fermented cattle feces up to 30% in this present study resulted the best feed conversion ratio and had no negative effect.

CONCLUSIONS

Chickens that consume feed containing 10% fermented cattle feces performed better performance than other level for parameters body weight, body weight gain, feed intake and feed conversion. The level of fermented cattle feces in the ration up to 30% can still provide good growth of KUB chickens based on the parameters studied. Substitution of fermented cattle feces in commercial ration was able to reduce feed consumption, increse body weight and more efficient in feed consumption.

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