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Phenotype of the Production Characteristics of Broiler Chickens Fed Feed Containing Fermented Cow Feces

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ABSTRACT

Cow feces was a potential waste as an alternative feed ingredient for poultry. The purpose of this study was to study the phenotypic growth characteristics of broiler chickens fed feed containing fermented cow faeces such as body weight, ration consumption, body weight gain, and ration conversion. This study used 160 DOC broiler chickens. The feed given to broiler chickens is CP11 chicken feed given during the adjustment period at the age of 0-2 weeks, at the age of 3-6 weeks, the feed given is CP11 mixed with fermented cow feces flour as much as 0%, 5%, 10%, 15%. The experimental design used was a Completely Randomized Design with 4 treatments and each treatment was repeated 5 times. Each replication consisted of 8 chicks. The results showed that fermented cow feces can replace commercial feed up to a level of 15% because it can produce good growth and reduce the feed conversion rate of broiler chicken.

Keywords: phenotype; production characteristics; broiler chickens; fermented cow feces

INTRODUCTION

Superior meat chickens called broiler chickens are very popular among Indonesian people because the meat has a good taste and high nutritional content. Broiler has the characteristics of fast growth, efficient use of rations, short harvest period, good meat production, a good stockpile of meat, and smooth skin [Risnajati, 2012]. Apart from that, Suprijatna et al., [2008] added that some of the characteristics of broiler chickens are calm, large body shape, the fast growth of chickens, feathers close to the livestock body, white skin, and low egg production.

A crucial problem in raising broiler chickens is feed, which apart from being the largest production component where around 80% of production costs are for feed, feed prices also continue to increase due to dependence on imported raw materials. If there is no effort to find alternative solutions to the problem, then the broiler chicken business will only be carried out by companies that have large-scale businesses, while local farmers will not be able to do it. The high cost of raw materials for poultry feed, which is dominated by imported ingredients, demands that their efficiency values be continuously increased [Anshory et al., 2017]. So it is necessary to look for alternative feed that is easy to obtain.

One type of feed is cow feces which is a very potential waste as an alternative feed ingredient for poultry. In order for cow feces to be used for poultry at more than the 5% level, the nutritional content of feces needs to be increased through fermentation. Fermentation technology is a technique for storing substrate by confining microorganisms and adding minerals to the substrate which are incubated at a certain time and temperature [Nuraini, et.al., 2016].

Guntoro, et al [2016] stated that one technique for making alternative feed is to use livestock waste such as cow faeces as the main ingredient which has been fermented. Guntoro, et al. [2013] stated that fermented cow feces with inoculants containing microbes could increase the protein content from 7-8% to 13-14% and significantly reduce the crude fiber content.

The use of cow feces for chicken feed has been studied for quite a long time, including research on the use of fermented cow feces on native chickens and KUB chickens which have been carried out by Telupere [2020; 2021], and the results showed that substitution of fermented cow feces of up to 30% in commercial rations has no negative effect on growth and egg production. Other research on the use of fermented cow feces up to 15% in free-range chickens did not cause a significant decrease in egg productivity and no increase in FCR [Guntoro, et al., 2016]. Several studies have been conducted on both local native chickens and superior native chickens and the results were quite encouraging. However, the use of fermented cow feces in broiler rations has not been carried out, therefore this research has been carried out to determine the phenotypic appearance of the production characteristics of broiler chickens that consume feed containing fermented cow feces.

MATERIALS AND METHODS

This study used 160 DOC broiler chickens. The feed given to broiler chickens was CP11 during the adjustment period at the age of 0-2 weeks, at the age of 3-6 weeks the feed given was CP11 mixed with fermented cow feces as much as 0%, 5%, 10%, 15%. Feed and drinking water are provided *ad libitum*.

TABLE 1: Formula and nutritional content of trial rations.

Feed ingredients	Teratments [%]			
	R0	R1	R2	R3
Feed CP11	100	95	90	85
Fermented cow feces	0	5	10	15
Crude protein	21.61	20.55	19.31	18.57
Cride fiber	4.13	5.18	5.28	6.34
Crude fat	5.51	5.30	4.98	4.78
EM[kcal/kg]	3.070	3.061	3.015	2.958

Source: *Feed Chemistry Laboratory, Faculty of Animal Husbandry, University of Nusa Cendana.

This research was experimental research and the experimental design used was a Completely Randomized Design with 4 treatments and each treatment was repeated 5 times. Each replication consisted of 8 chicks. The treatments tested were:
R0 = basal ration + 0% fermented cow feces [FCF] as a control
R1 = 5% basal ration + 10% FCF
R2 = 10% basal ration + 20% FCF
R3 = 15% basal ration + 30% FCF

Procedure for making fermented cow feces:
- Provide fresh cow manure and Probiotics [Pro-L]
- Cow faeces are aerated for 1 day to reduce the water content
- Put 10 kg of cow feces in a closed drum
- Mix the feces with 200 ml of probiotics and incubate for 7 days
- Remove cow feces and dry in the sun until completely dry then mash.
- Fermented cow feces are mixed with CP11 feed and then made into pellets.

The variables examined in this study include the following: body weight from 0-6 weeks old, feed consumption, body weight gain from 0-6 weeks, and feed conversion rate. The data obtained were analyzed using analysis of variance [ANOVA]. If the results of the analysis of variance showed a significant effect, further analysis will be carried out using Duncan's Multiple Range Test. All data analysis was performed using the SPSS 21 software package.

RESULTS AND DISCUSSIONS

Effect of treatment on body weight

Body weight is related to body weight gain. According to Leeson and Summers [2005] stated that body weight gain was strongly influenced by ration consumption so ration consumption during the study indirectly affected the resulting body weight. The average effect of treatment on the body weight of broilers in this study can be seen in Table 2.

TABLE 2: Average broiler body weight from 0 to 6 weeks of age [g/head].

Age [week]	Treatments*]			
	R0	R1	R2	R3
BB0	45.70 ± 5.69^{a}	46.60 ± 5.03^{a}	48.45 ± 3.00^{a}	47.90 ± 3.42^{a}
BB1	156.80 ± 9.04^{a}	153.55 ± 7/04^{ab}	154.50 ± 4.87^{a}	149.30 ± 6.69^{b}
BB2	362.05± 40.60^{a}	366.70± 40.04^{a}	346.75 20.21^{a}	305.90± 42.18^{b}
BB3	896.65 ± 96.32^{a}	835.20 ± 104.27^{b}	819.35 ± 62.92^{b}	792.80 ± 72.66^{b}
BB4	1271.25 ±155.51^{a}	1211.85 ±119.93^{a}	1195.25 ± 97.60^{a}	1101.75 ±92.57^{b}
BB5	1725.75±193.08^{a}	1621.85±121.11^{b}	1567.45±115.20^{b}	1473.35±101.84^{c}
BB6	2065.05± 159.96^{a}	2001.90± 127.24^{ab}	1932.30±124.20^{bc}	1865.05±104.18^{c}

**] different superscripts on the same row showed a significant differences [P<0.05].*

Table 2 showed the highest average body weight of broiler chickens aged 3 weeks was found in R0 [896.65 ± 96.32g] followed by R1 [835.20 ± 104.27g], R2 [819.35 ± 62.92g] and the lowest R3 [792.80 ± 72.66g] with the average for that week [836.00 ± 92.42]. There was no significant difference among the treatments because it was still the first week of treatment. From 4 to 6 weeks of age, the highest body weight was found in treatment R0 followed by R1, R2, and R3. The average value in this study was different than the existing literature, possibly influenced by two factors, namely internal factors, and external factors. Internal factors include feeding patterns and maintenance management, while external factors such as temperature are also very important. Hot temperatures inhibit the production of thyroid-stimulating hormone [TSH] thereby disrupting growth and affecting the final weight [Adriyanto, et al., 2015].

Primasanti, *et al*. [2014] found a lower body weight for broiler chickens than this study, both at 1 week of age [163.38g] and also at 5 weeks of age [1207.53g]. But at 5 weeks of age, Risnajati [2012] found a higher body weight than this study. According to Siregar [2005] quoted by Primasanti et al. [2014] that broiler chickens less than 8 weeks old have body weights ranging from 1.5-2.0 kg/head. Husna, et al., [2017] found the average body weight of several strains of broiler chickens in Bangladesh at 30 days of age ranged from 1490-1553g lower than this study. Setyaningrum and Siregar [2021] found lower body weights at 30 days old, which ranged from 1315-1367g.

The results of statistical analysis showed that the treatment of FCF substitution in commercial rations had a significant effect [P<0.05] on the body weight of broiler chickens.

The results of Duncan's test showed that at 3 weeks of age, R0 was significantly different from R1, R2, and R3. At week 4 the treatment of R3 was significantly different from R0, R1, and R2. In week 5 the treatment of R0 was significantly different from R1, R2, and R3. R1 was different from R3 and R0 but not different from R2. At week 6 the treatment of R0 was different from R2 and R3 but not different from R1. This finding might be due to the better palatability of the R0 ration, so that the consumption was higher. Higher feed consumption causes higher body weight.

Rasyaf [2008] stated that ration consumption is a reflection of the entry of a number of nutrient elements into the body of the chicken.

Effect of Treatment on Feed Consumption

Feed consumption is a factor that needs to be considered in feeding livestock because the process of providing feed for chickens must have nutritional value to meet the needs of this livestock. The average effect of treatment on the feed consumption of broiler chickens can be seen in Table 3.

TABLE 3: The average of feed consumption of research chicken from 0-6 weeks of age (grams/head/day).

Age period (week)	Treatments*]			
	R0	R1	R2	R3
2-3	27,99 ±1,20^{a}	26,47 ± 0,86^{b}	27,04 ±1,20^{ab}	23,94 ± 0,71^{c}
3-4	29,28 ± 1,70^{a}	27,58 ± 1,25^{a}	27,85 ± 1,30^{a}	28,09 ± 1,41^{a}
4-5	36,62 ± 0,29^{a}	29,57 ± 0,87^{b}	30,02 ± 1,08^{b}	29,41 ± 1,11^{b}
5-6	37,50± 0,00^{a}	36,48 ± 0,47^{a}	34,74 ±1,28^{b}	33,49 ±1,30^{b}
2-6	131,39 ± 2,51^{a}	120,10 ± 1,08^{b}	119,65 ± 4,53^{b}	114,93 ± 3,50^{c}

*] *different superscripts on the same row showed a significant differences [P<0.05].*

Feed consumption of broiler chicken in Table 4 shows an increase in line with the increasing age of chickens. It can be seen that in the average feed consumption at 2-3 weeks of age period, the treatment R0 was highest, followed by R2, R1, and the lowest was noted in R3. At 5-6 weeks of age period, the highest was R0 followed by R2, R1, and the lowest was found in R3. The highest total ration feed consumption for 2-6 week age period was in R0 and the lowest was in treatment R3. The low feed consumption in chickens that received fermented cow feces treatment was probably influenced by the adaptation or adjustment period of the chickens and also palatability of the ration.

The results of the analysis of variance showed that the treatment had a significant effect [P<0.05] on feed consumption. The results of Duncan's further test showed that the chickens that consumed the ration without FST [R0] were significantly higher than the other treatments.

This happened from the beginning of the study to the end of the study. There was a tendency for ration consumption to decrease as the FCF level increases. This finding is probably due to the presence of a sour smell from FCF which has an impact on palatability so that feed consumption is also low. Nuraini *et al*. [2020] stated that low feed consumption is suspected because of the level of chicken palatability to feed form. Apart from that, Sondakh, *et al*. [2015] states that that commercial feed is a mixture of several ingredients that have been prepared in such a way with certain formulations to meet the needs of livestock

Effect of treatment on weight gain

Body weight gain is calculated based on the weight at the end of the week minus the weight at the beginning of the week in grams/head/week. The average body weight gain for broiler chickens can be seen in Table 4.

TABLE 4: Average weight gain of broiler chickens [grams/head/day].

Age period [week]	Treatments *]			
	R0	R1	R2	R3
2-3	19,09 ± 1,24^{a}	17,01 ± 1,60^{b}	16,88 ± 1,24^{b}	17,39 ± 1,97^{b}
3-4	13,38 ± 1,80^{a}	13,24 ± 2,19^{a}	13,43 ± 1,35^{a}	11,03 ± 1,98^{b}
4-5	16,23 ± 1,35^{a}	14,71± 0,54^{ab}	13,29 ± 1,02^{b}	13,27 ± 1,31^{b}
5-6	12,12 ± 2,05^{a}	13,71 ± 1,13^{a}	13,03 ± 1,75^{a}	13,99 ± 1,11^{a}
2-6	60,82±2,35^{a}	58,68±1,32^{ab}	56,63±2,06^{b}	55,69±2,71^{b}

*] *different superscripts on the same row showed a significant differences [P<0.05].*

The data in Table 5 showed that the R0 treatment had better weight gain than the other treatments [2-5 weeks of age], but in the 5-6 weeks of age, the R3 treatment was the best. Overall, the R0 treatment had better body weight gain than the other treatments. These findings indicated that chickens that consume rations without FCF have slightly better growth than chickens that consume rations containing FCF.

The average body weight gain in this study was not much different from that found by Nuraini, et al., [2020] and was even higher than chickens that consumed PFS feed, which was only 36 grams/head/day. Koshaev and Gruzd in Sharipova *et al*. (2017) found that supplemented broilers diets with the probiotic preparations "Bacell" and "Monosporin" results the average daily gain of chicken-broilers was 48.3 g for I experimental group (animal feed with 0.2% of "Bacell" probiotic preparation); 50.9 g for II experimental group (animal feed with 0.2% of "Bacell" probiotic preparation and "Monosporin") and 50.6 g for III experimental group (animal feed with 0.1% of the probiotic preparation with enzymic activity). That findings were lower than this study.

The results of the analysis of variance showed that FCF substitution in the ration had a significant effect (P<0.05) on body weight gain. Duncan's further test showed that the R0 treatment was significantly different (P<0.05) with the R1, R2 and R3 treatments, R0 treatment produced the highest daily weight gain. This is probably caused by the average ration consumption of R0 treatment was high, which causes high body weight gain.

Rasyaf (2008) stated that body weight gain is related to feed consumption. In addition, Uzer., et al. (2013) stated that body weight gain is closely related to feed in this case the quantity related to feed consumption. If feed consumption is disturbed, it will interfere with the growth of broiler chickens.

Effect of treatment on feed conversion

The conversion rate showed how much feed is needed to increase 1 kg of body weight. Data on average feed conversion of research chickens calculated at various growth periods is presented in Table 5.

TABLE 5: Average feed conversion of broiler chicken consuming feed containing FCF.

Age Period (week)	Treatments*]			
	R0	R1	R2	R3
2-3	1,47±0,07^{ab}	1,56±0,11^{ab}	1,61±0,15^{a}	1,39±0,16^{b}
3-4	2,22±0,33^{ab}	2,12±0,30^{b}	2,09±0,19^{b}	2,60±0,50^{a}
4-5	2,27±0,19^{a}	2,01±0,11^{a}	2,27±0,24^{a}	2,23±0,18^{a}
5-6	3,17±0,54^{a}	2,67±0,22^{b}	2,69±0,27^{ab}	2,41±0,25^{b}
2-6	2,21±0,09^{a}	2,10±0,03^{a}	2,17±0,10^{a}	2,12 ±0,11^{a}

*] *different superscripts on the same row showed a significant differences [P<0.05].*

The data in Table 5 shows that the conversion rate fluctuated from week to week for each treatment. The R3 and R1 treatments produced a better conversion rate than the other treatments. Likewise during the study, the conversion rate of treatment R3 was 2.12, slightly higher than treatment R1, which was 2.10. This finding points to FCF substitution tends to reduce conversion rates. Rasyaf (2004) states that if you want to improve conversion rates, you should choose a low conversion rate.

The conversion rate from this study was greater than that found by Haryanto, *et al*., [2017] who examined the effect of chicken feather meal on the feed conversion ratio and blood lipid profile of broiler chickens, which ranged from 1.51-1, 68 and also greater than that found by Budiarta, *et al*., [2014], which ranged from 1.81-1.90. The existence of this difference is probably due to the strains of chickens used, maintenance management, and different research environmental conditions. A low feed conversion value indicates that the efficiency of using feed is good, because the more efficiently chickens consume feed to produce meat.

Statistical analysis results showed that FCF substitution in the ration had a significant effect (P<0.05) on the conversion rate of broiler chicken rations for the age period 2-3 weeks, 3-4 weeks, 4-5 weeks, 5-6 weeks, but overall (2-6 week period), treatment had no significant effect (P>0.05). These findings point to FCF substitution of up to 15% in commercial rations was able to reduce feed conversion rates. Duncan's test results showed that in the 2-3 week age period the treatment was significantly different (P<0.05), where the R3 treatment was significantly different from R2 while R2 was not significantly different from R1 and R0. These findings indicate that broiler chickens can still produce a fairly good conversion rate with feed conditions containing FCF. When compared with the control, it is clear that rations containing FCF are able to produce better conversion rates.

CONCLUSION

Based on the results and discussion, it can be concluded that substitution of fermented cow feces in commercial feed up to 15% level can still produce good production characteristics for broiler chickens such as body weight, weight gain, feed consumption and feed conversion, even for feed conversion rate, the higher of the FCF level the better feed conversion rate.

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