Effect of fermented peanuts shells in ration on productive performance of super local chicken aged 7 to 10 weeks

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Abstract. This study aimed to understand the effect of the use of fermented peanuts shells in feed on the productive performance of super local chicken aged 7 to 10 weeks. This research used a completely randomized design (CRD) with four treatments and 4 replications. Treatments were P0 = ration without fermented peanut shells, P1 = ration containing 2% of fermented peanut shells, P2 = ration containing 4% of fermented peanut shells, and P3 = ration containing 6% of fermented peanut shells. Each experimental unit consisted of 5 super-local chicken. The parameters measured were feed consumption, body weight gain and feed conversion. Data were analyzed by using analysis of variance (ANOVA) according to CRD and if there were differences between treatments then it will be tested by using the Duncan test. The results indicated that the using of fermented peanut shells in feed has no significant effect (P>0.05) on feed consumption, body weight gain and feed conversion of super local chicken. Based on the results of this study, it could be stated that fermented peanut shells can be used up to 6% in feed to substitute rice bran.

1. Introduction
Poultry is one of the livestock commodities to fulfill the meat needs of the Indonesian community. The demand of poultry meat increases as the increasing of people's income and their awareness in fulfilling animal protein needs. One of the efforts to meet the requirement is improving the super local chicken business.

Super local chicken is a result of crossbreeding of male cock and female layer chickens [1] which can grow relatively fast compared to local chicken. The quick growth of animals should be followed by feed containing adequate nutrients for chicken growth. However, the good quality of feed has a relatively expensive cost which spends about 60 to 70% of total production cost [2]. Production cost can be minimized by utilizing agriculture by-product including peanut peel.

Peanut peel is an agriculture by-product that is normally thrown away and burned. Nutrient content of peanut peel is low including protein 6.86% and fiber 36.53% [3] which makes it difficult to be utilized as chicken feed. Therefore, it is needed to increase peanut peel nutrient content by using fermentation technology.

Fermentation is a degradation process of the complex organic compound to be a simple compound by involving microorganisms including bacteria, protozoa, fungi, and yeast. Yeast that was used in this study is tempe yeast which contains Rhizopusoryzaemicroorganism that has capability in degrading a complex compound to be a simple compound. Research related to the
utilization of fermented peanut peel as local chicken feed is minimum therefore, it is required to conduct a study of the effect of fermented peanut peel in ration on the production performance of Super local chicken.

2. Methodology
2.1. Location and time of the research
This research was conducted for four weeks from February to March 2019 in Poultry Unit Laboratory Faculty of Animal Science University of Halu Oleo Kendari

2.2. Materials
Materials used in this study including Super local chicken as many 64 chickens aged seven weeks, complete ration BP 11, corn, rice bran, peanut peel, tempe yeast, clean water, and corn disinfectant, while tools used are digital balance, tarp, sack, can, and fluorescent lamp.

2.3. Cage and its equipment
The cage used in this study was a stacking cage consisted of 16 plots. Each plot was filled with 4 chickens and equipped with a feed container, drinking water, and incandescent lamps as heaters and lights as well as litters consisting of sawdust.

2.4. Study Procedure
2.4.1. Fermentation of peanut peel by using Tempe yeast
The first step of fermenting of peanut peel by using tempe yeast is soaking the peanut peel for one hour into water. After one hour, the peanut shells are drained then take as much as 10 kg placed in a bucket and 200 grams of tempe yeast are added and stirred until homogeneous. Then close the barrel and leave it for 14 days. Fermented peanut skin has a distinctive aroma, mildew, and soft texture. After fermented, the peanut peel was dried and grounded. Fermented peanut peel flour is ready to use [3]. Schematic of the process of making fermented peanut peel waste feed can be seen in Figure 1.

2.4.2. Cage preparation
Before being used, cages and other enclosure equipment are disinfected using Formades disinfectants to prevent contamination of parasitic microorganisms. Next, the cage floor was sprinkled with lime and given new sawdust with a thickness of ± 10 cm.

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**Figure 1.** Diagram of the fermentation process of peanut peel by using tempe yeast
2.4.3. Feed formulation

The feed used in this study was self-composed feed which is consisted of a complete mixture of BP 11 feed, corn, bran, and fermented peanut shells. The nutritional content of feed ingredients and the composition of control feed and treatment feeds are presented respectively in Table 1 and Table 2.

Table 1. Nutrient Content of Feedstuff

| Feedstuffs         | ME (Kcal/kg) | Fiber (%) | Crude Protein (%) |
|--------------------|--------------|-----------|------------------|
| Complete Feed BP 11| 3000[^6]     | 5[^1]     | 22[^1]           |
| Corn               | 3370[^2]     | 0.94[^3]  | 9.49[^3]         |
| Bran               | 1850[^2]     | 7.21[^3]  | 11.92[^3]        |
| Peanut shells      | 1994.79[^4]  | 50.36[^4] | 8.16[^4]         |

Notes:
1. [^4].
2. [^5].
3. Results of analysis in the Biochemistry Laboratory of Animal Feed University of Hasanuddin Makassar [^6].
4. Results of analysis in the Laboratory of Feed Science and Technology Faculty of Animal Science University of Halu Oleo (2018).
5. Measurement of Metabolism Energy of Fermented Peanut Shells by using Data Analysis Proximate and measured by using the Balton formula [^7].
6. Based on the energy requirement of broiler chicken according to Indonesia National Standard [^8].

Table 2. Composition of Treatments, Formulation, and Nutrient Content of Treatment Feed

| Feedstuff                    | Treatment (%) |
|------------------------------|---------------|
|                              | P0  | P1  | P2  | P3  |
| Complete feed BP 11          | 69  | 69  | 69  | 69  |
| Corn                         | 23  | 23  | 23  | 23  |
| Rice bran                    | 8   | 6   | 4   | 2   |
| Fermented peanut shells      | 0   | 2   | 4   | 6   |
| Total                        | 100 | 100 | 100 | 100 |

Feed nutrient content

|                        | P003.1 | 2994.2 | 2995.3 | 2996.4 |
|------------------------|--------|--------|--------|--------|
| Metabolism Energy      | 2993.1 | 2994.2 | 2995.3 | 2996.4 |
| Crude Protein (%)      | 18.3   | 18.2   | 18.2   | 18.1   |
| Fiber                  | 4.2    | 5.1    | 6.0    | 6.8    |

Notes: Result of measurement by using Microsoft Excel

Composition of treatments in this study as follows:
P0 = feed without fermented peanut shells flour.
P1 = feed with 2% of fermented peanut shells flour
P2 = feed with 4% of fermented peanut shells flour
P3 = feed with 6% of fermented peanut shells flour

2.4.4. Raising of super local chicken

Super-native chickens are raised from seven to ten. Application of treatment feed is given from the age of 7 weeks and feed is given twice a day at 07.00 in the morning and 04.00 at evening. Drinking water is given ad libitum. During maintenance, the total daily consumption of each animal is recorded by weighing the remaining daily feed. Weighing the chicken body weight is done once a week in the morning for 4 weeks.
2.4.5. Research design
The study design used was a completely randomized design (CRD) with 4 treatments and 4 replications, where each test consisted of 4 super native chickens. The mathematical model used refers to [9], namely:

\[ Y_{ij} = \mu + \alpha_i + \varepsilon_{ij} \]

Information:
\[ Y_{ij} \] = The observation value in replication 1 to 4, the effect of fermented peanut shells flour treatment
\[ \mu \] = General average value of treatment effect
\[ \alpha_i \] = Effect of \( i \)-treatment (\( i=1,2,3 \) dan 4)
\[ \varepsilon_{ij} \] = Effect of \( i \)-treatment error, on \( j \)-replication (\( i=1,2,3 \) dan 4) dan (\( j=1,2,3 \) dan 4).

2.5. Research Variable
Variable observed in this research as follows:

a. Feed consumption
Feed consumption can be measured by using the formula as follows [9]:

\[ \text{Feed consumption (g/chicken/day)} = \sum \text{Given feed (g/chicken/day)} - \sum \text{remain feed (g/chicken/day)} \]

b. Average daily gain (ADG)
Average daily gain can be measured by using the formula as follows [9]:

\[ \text{ADG (g/chicken/day)} = \frac{\text{Final body weight (g/chicken)-initial body weight (g/chicken)}}{\text{Research period}} \]

c. Feed conversion
Feed conversion can be measured by using the formula as follows [9]:

\[ \text{Feed conversion} = \frac{\sum \text{feed consumption (g/chicken/day)}}{\sum \text{ADG (g/chicken/day)}} \]

2.6. Data Analysis
The data obtained were analyzed by analysis of variance to determine the effect of treatment on research variables. The treatment that significantly affects the measured variable, will be followed by Duncan's test which refers to Hanafiah [10].

3. Result and discussion
3.1. Feed Consumption
Feed consumption is the amount of feed consumed by each of the chicken in a certain period of time. The consumption of super native chicken feed for each treatment with different levels of fermented peanut shells flour in this study is presented in Table 3.

Table 3. Average Feed Consumption (g/chicken/day) of Super Local Chicken Aged 7 to 10 fed fermented peanut shells flour with different levels in Feed

| Replication | Treatment |
|-------------|-----------|
|             | P0        | P1        | P2        | P3        |
| 1           | 59.96     | 61.54     | 55.89     | 65.54     |
| 2           | 55.89     | 60.12     | 58.90     | 68.74     |
| 3           | 55.25     | 54.16     | 57.44     | 63.49     |
Results of the analysis of variance showed that the treatment had no significant effect on feed consumption (P > 0.05). This shows that the application of peanut shell flour with different levels (2-6%) in the feed has not been significantly affected. This is caused by the nutrient content in the treatment feed is almost the same (iso calorie). The energy level in all treatments is 2900 kcal/kg. Therefore, fermented peanut shells can replace rice bran as a super native chicken feedstuff. 

The average feed consumption of super native chicken aged 7 to 10 weeks with the use of fermented peanut shells flour at different levels in feed is 58.04 to 64.02 g/chicken/day. The results of this study are higher than other study that the average consumption of 8 weeks old native chicken feed by protected fatty acids in the ration was around 38.86 to 50.72 g/chicken/day [11] and lower than other study that the average feed consumption of super native chicken aged 8 to 12 weeks fed with different level of tofu dregs in ration was 62.19 to 75.57 g/chicken/day [12]. The difference in the results of this study can be influenced by several factors including sex, age, the chemical composition of feed, and feed quality. This is in accordance that the factors that influence feed consumption are chicken size, chicken breed, sex, environmental temperature, activity, and feed quality [5]. Moreover, feed consumption is influenced by odor, shape, taste, color, and texture of feed [13].

3.2. Average Daily Gain (ADG)

Weight gain is the difference between initial body weight and final body weight for a certain time [14]. The average body weight gained by super native chickens per treatment can be seen in table 4.

**Table 4.** Average Daily Gain (g/chicken/day) of Super Local Chicken Aged 7 to 10 fed fermented peanut shells flour with different levels in Feed

| Replication | P0      | P1      | P2      | P3      |
|-------------|---------|---------|---------|---------|
| 1           | 20.53   | 21.80   | 17.25   | 19.65   |
| 2           | 17.39   | 17.69   | 18.25   | 24.87   |
| 3           | 19.05   | 17.93   | 18.86   | 18.07   |
| 4           | 18.93   | 18.12   | 20.51   | 18.62   |
| Average     | 18.97 ± 1.28 | 19.05 ± 1.44 | 18.72 ± 1.37 | 19.11 ± 3.51 |

Results of the analysis of variance showed that the treatment had no significant effect on the body weight gain of super native chickens. This shows that the addition of fermented peanut shells flour with different levels in feed does not affect the body weight gain of super native chicken. Bodyweight gain that has no significant effect is in line with feed consumption which also has no significant effect. This is in accordance with that fast growth is sometimes supported by a large consumption of feed as well [15]. In addition, to achieve optimal growth rates in accordance with genetic potential needed foods that contain sufficient nutrients qualitatively and quantitatively [16].

The average body weight gain of super-native chicken aged 7 to 10 weeks fed with fermented peanut skin flour with different levels is 18.72 to 19.11 g/chicken/day. Results of this study are lower than other study that the average body weight gain of native chicken aged 8 to 16 weeks given organic vitamins at different levels is 20.03 to 21.96 g/chicken/day [17] and higher than other research that the average body weight gain of super-native chicken aged 8 to 12 weeks given different tofu dregs in ration was 15.51 to 18.67 g/chicken/day [11]. The difference in the results of
this study can be influenced by several factors including food consumption, age, sex, and genetics. Factors that influence body weight gain in poultry are genetic, health, the nutritional value of feed, food balance, stress and the environment [13] and species, production types, and sex [18].

3.3. Feed Conversion

Feed conversion is a comparison between the amount of feed consumed and body weight gain. The more efficient the use of feed, the smaller the amount of feed needed to produce the same body weight. The average conversion of super native chicken feed per treatment can be seen in Table 5.

Table 5. Average Feed Conversion of Super Local Chicken Aged 7 to 10 fed fermented peanut shells flour with different levels in Feed

| Replication | Treatments |
|-------------|------------|
|             | P0         | P1         | P2         | P3         |
| 1           | 2.92       | 2.92       | 3.24       | 3.36       |
| 2           | 3.21       | 3.15       | 3.23       | 2.83       |
| 3           | 2.90       | 3.01       | 3.05       | 2.54       |
| 4           | 3.27       | 3.11       | 2.98       | 3.03       |
| **Average** | **3.08 ± 0.19** | **3.05 ± 0.10** | **3.12 ± 0.13** | **3.19 ± 0.32** |

Results of the analysis of variance showed that the treatment had no significant effect (P>0.05) on the feed conversion of super native chicken. This shows that the use of fermented peanut shells flour with different levels in feed does not affect the feed conversion of super native chicken. Therefore, fermented peanut shells flour can replace rice bran as a super native chicken feedstuff.

The average feed conversion of super native chicken fed fermented peanut shells flour with different levels is 3.05 to 3.19. Results of this study are higher than other investigation that the average of feed conversion of super native chicken in growth phase fed protected palm oil in feed ranges between 2.45 to 2.81 [19] and lower than another study that the average feed conversion of super native chicken fed the substitution of fermented rice bran with different fermenters is 4.09 to 4.99 [20]. The difference in the results of this study was caused by several factors including the form of feed, feed quality, environmental temperature, and sex. Factors that influence feed conversion are the physical form of the feed, body weight, nutrient content in the feed, ambient temperature, the state of the cage and sex [21]. The higher feed conversion rate shows a low level of feed efficiency, conversely, the lower feed conversion rate shows a higher level of feed efficiency and can provide a higher body weight gain [22]. Feed conversion shows an indication of the efficient use of feed in terms of technical efficiency. Feed conversion rates vary depending on protein content and metabolic energy of the feed, environmental temperature, chicken age, health conditions, and feed composition.

4. Conclusion

Based on the results of research that has been done, it can be concluded that the use of fermented peanut shells flour in feed with different levels (2 to 6%) has no significant effect (P> 0.05) on feed consumption, body weight gain and feed conversion of super native chicken aged 7 to 10 weeks.

5. References

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