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# Estimation of The Correlation Value of Body Weight and Linear Body Size of KUB Chickens Fed Fermented Cow Feces

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## ABSTRACT

The purpose of this study was to estimate the correlation value of growth traits and linear body size of KUB chickens fed feed containing fermented cow feces such as body weight, shank length, chest circumference, back length, and wingspan of KUB chickens from 8 to 16 weeks of age. Forty-eight adult chickens were used as parents consisting of 8 males, and 40 females. From their AI mating, they produced 100 chicks as research materials. A completely Randomized Design with 4 treatments and 5 replications for each treatment was used in this study. A correlation analysis was carried out using Spearman correlation analysis to calculate the correlation value and error standard. All data obtained were analyzed using SPSS release 21 software. The results showed that KUB chickens that consumed feed containing fermented cow feces as much as 10% were able to produce body weight and linear body size that was better than other treatments. The estimated correlation value between body weight and linear body size of KUB chickens consuming fermented cow feces varied from very strong to very weak. For selection purposes, it can be carried out mainly on traits with high positive correlation values.

***Keywords:*** correlation value; body weight; linear body size; KUB chickens; fermented cow feces

## INTRODUCTION

Native chickens are one of the potential poultry livestock in improving national food security, namely as a source of community nutrition, especially as a source of animal protein both from eggs and meat. Native chickens have considerable potential to be developed. The large population and almost owned by the entire population indicate that native chickens are easily cultivated under existing climatic conditions. Fumihito *et al*. [1996] and Pramual *et al.* [2013] stated that Kampung chickens in Indonesia come from the subspecies *Gallus gallus bankiva* originating from Lampung, Java, and Bali.

Several types of local chickens can be chosen in Indonesia, one of which is KUB chicken. The adult weight of KUB chickens is quite high. Udjianto [2016] reported that KUB native chickens generally have various feather colors such as the color of native chicken feathers in general and with various beard shapes. KUB chickens have the advantage of being able to lay more eggs reaching 160-180 eggs/head/ year, have a body weight of 20 weeks [± 5 months old] ranging from 1,200-1,600 grams, the initial age of laying eggs earlier around 20-22 weeks with an egg weight of 35-45 grams. The incubation period of chickens is reduced to only 10% so that chickens quickly lay eggs again and have a stronger immune system so that there is very minimal use of vaccines, greater body weight, and better meat taste.

Basically, the genetics of livestock are unknown and cannot be measured or observed directly, but can be studied through their phenotypes with statistical tools based on the level of genetic diversity between individuals or groups in the population. This can be seen in the estimated value of genetic parameters, including heraticity [$h^2$] and genetic correlation [$r_G$]. The definition of a phenotypic trait is the outward appearance or other trait traits of an individual that can be observed or can be measured. Correlation analysis is a method used to find out the extent of the relationship between two properties compared through a number commonly called a correlation coefficient [Walpole, 1995].

Estimating the correlation value has an important meaning for selection to be done earlier. Early selection will provide advantages because it can reduce costs, energy, and time for farmers. Estimating the correlation value of several quantitative traits such as body weight and linear body size can be used as a basis for selection by breeders. Chickens raised to produce meat, an important estimation of the correlation value is the relationship between body weight at an earlier age and body weight at slaughter [Brandsch, 1981]. Under certain conditions, the parameters of a trait have a high heritability value and a positive genetic correlation, so the individual selection is the right method for improving the genetic quality of the trait because the expected selection response will be greater than the trait with low heritability and genetic correlation.

The correlation between the body weight trait and linear body size is important to know because by knowing this, it will be easy to interpret livestock body weight by measuring only certain body parts. Telupere et al. (2022) found a moderate to high positive correlation value for the phenotypic correlation of DOC weights with body weights aged 4 weeks and weights aged 4 weeks with weights aged 8 weeks, while between DOC weights with weights aged 8 weeks were all high positive for KUB chickens.

The body size of chickens is also influenced by the feed consumed so with the addition of fermented cow feces in the ration, it can be known its effect on the growth and changes in linear body size of female KUB chickens which include back length, chest circumference, wing span, and shank length. Based on the description above, a study has been carried out on the estimation of the correlation value of the character of body weight growth and linear body size of KUB chickens fed with feed containing fermented cow feces.

**MATERIALS AND METHODS**

This research has been carried out for 8 months using 48 adult chickens as parents consisting of 8 males, and 40 females. The parents used in this study were more than 1 year old and for females who had already laid eggs. The chickens are caged in individual cages and mating is carried out by artificial insemination. The eggs produced from the mating were hatched using a hatching machine to obtain as many as 100 DOC.

Feed was given to BR2 parents as basal rations and cow feces. Drinking water is given ad libitum. Feed for chicks consists of BR1 during the starter period of 0-4 weeks, and then given BR2 plus cow feces until 8 weeks of age.

There are 3 types of cages used in this study, namely male cages [8 boxes measuring 60x60xcm3 each], female cages [40 boxes measuring 40x40x40 cm3 each], and group cages for F1 offspring as many as 4 pieces with a size of 2 x 1.5 m2 each. The male cage and female cage are individual cages while the cages for F1 offspring are group cages, namely chicks are caged according to the feed given, so 4 group cages are obtained, which are grouped based on the treatment group given. Each cage plot has a place to eat and drink moderately.

This study was an experimental study and the experimental design used was a Complete Randomized Design with 4 treatments each treatment was repeated 2 times for parents, each treatment consisted of 2 males and 10 females, and each replication consisted of 1 male and 5 females. For offspring, each treatment is repeated 5 times and each replication consists of 5 chicks.

The treatment given was T0 = basal ration + 0% fermented cow feces [control]; T1 = 90% basal ration + 10% fermented cow feces; T2 = 80% basal ration + 20% fermented cow feces; T3 = 70% basal ration + 30% fermented cow feces.

The procedure for making fermented cow feces i.e. providing fresh cow feces and Probiotics [Pro-L], cow feces are aerated for 1 day to reduce their water content, and put cow feces in a closed drum for as much as 10 kg. Mix the feces with Probiotics as much as 200 ml and marinate for 7 days after that remove cow feces and dry until dry properly then mashed cow feces are ready to be used as chicken feed.

Mating is carried out by artificial insemination [IB] and each mating group produces a minimum of 20 chicks which are used as research material, so that 100 chicks are obtained as research material. The breeding chicks will be placed in group cages based on mating groups, so the chicks are placed in 4 group cages. Feed is given twice a day, namely in the morning and evening, the feed given is weighed before and while drinking water is given *ad libitum* so that chickens will consume feed according to their needs. Feeding containing fermented cow feces begins to be carried out at the time when chickens are 8 weeks old. The variables studied in this study were body weight age 8, 12, and 16 weeks, shank length age 8, 12, and 16 weeks, chest circumference age 8, 12, and 16 weeks, back length 8, 12, and 16 weeks and wing span age 8, 12 and 16 weeks.

The data obtained were analyzed using Analysis of Variance [ANOVA]. If the results of variance analysis show a significant effect, further analysis will be carried out using the Duncan Multiple Range Test. Correlation data using Spearman correlation analysis. All data analysis is carried out using the SSLS 21 software package.

**RESULTS AAND DISCUSSION**

**Effects of Treatment on Body Weight and Linear Body Size**

Data on the effect of treatment on body weight and linear body size of KUB chickens fed feed containing fermented cow feces are presented in Table 1.

**TABLE 1:** Body weight and linear body size of KUB chickens fed with fermented cow feces at various growth ages.

| Variable | Treatments | | | |
|---|---|---|---|---|
| | T0 | T1 | T2 | T3 |
| BW8 [g] | 526,38±55,41 | 521,06±59,38 | 506,56±44,41 | 504,75±52,69 |
| BW12 [g] | 919,31±72,51[a] | 905.75±79,93[a] | 838,19±51,83[b] | 833,69±37,73[b] |
| BW16 [g] | 1309,37±173,07[a] | 1304,00±122,27[a] | 1170,44±107,59[b] | 1164,00±57,50[b] |

| Variable | Treatments | | | |
|---|---|---|---|---|
| | T0 | T1 | T2 | T3 |
| SL8 [cm] | 4,95±0,37 | 5,03±0,11 | 5,01±0,19 | 4,93±0,23 |
| SL12 [cm] | 3,34±0,39[ab] | 5,51±0,42[ab] | 5,56±0,36[a] | 5,23±0,22[b] |
| SL16 [cm] | 5,99±0,54 | 6,13±0,63 | 6,14±0,53 | 5,86±0,39 |
| CC8 [cm] | 17,31±0,96 | 17,51±0,77 | 17,15±0,74 | 17,08±0,90 |
| CC12 [cm] | 20,77±1,23[a] | 20,37±0,76[a] | 19,49±0,91[b] | 19,00±0,96[b] |
| CC16 [cm] | 22,72±1,28 | 22,00±0,98 | 21,881,31 | 21,84±2,51 |
| BL8 [cm] | 14,19±1,19 | 14,14±0,98 | 13,87±0,93 | 13,94±1,22 |
| BL12 [cm] | 17,48±0,92[a] | 17,18±1,10[ab] | 17,01±1,01[ab] | 16,59±0,67[b] |
| BL16 [cm] | 19,21±0,98a | 18,94±1,12 | 18,71±0,10 | 18,61±1,22 |
| WS8 [cm] | 36,16±2,35 | 36,38±1,96 | 36,86±1,87 | 35,88±1,65 |
| WS12 [cm] | 40,93±2,17[ab] | 41,71±2,42[a] | 40,49±2,04[ab] | 39,43±1,40[b] |
| WS16 [cm] | 45,18±3,35[a] | 44,63±2,49[ab] | 44,16±2,16[ab] | 42,87±2,86[b] |

BW= body weight; SL= shank length; T0 = basal ration + 0% fermented cow feces [control]; T1 = 90% basal ration + 10% fermented cow feces; T2 = 80% basal ration + 20% fermented cow feces; T3 = 70% basal ration + 30% fermented cow feces CC= chest circumference; BL= back length; WS= wingspan. Different superscripts on the same line show a significant difference [P<0.05].

The body weight of the study chickens at the age of 8 weeks in various treatments ranged from 504.75±52.69 grams [T3] to 526.38±55.41 grams [T0]. It appears that chickens consuming feed containing fermented cow feces [FCF] were slightly lower in body weight than those consuming rations without FCF. This may be due to the relatively young age of chickens, so they have not been able to digest feed that is higher in crude fiber content.

The results of the variance analysis showed that the treatment had no significant effect [P>0.05] on the body weight of KUB chickens. The absence of the effect of treatment on body weight at the age of 8 weeks is due to the response of the chickens to the treatment given is no different at the beginning of the feeding period. Some previous studies found that the body weight of native chickens aged 8 weeks varied greatly, ranging from 482.50 g to 647 g [Bidura and Suasta, 2006]. The variation in body weight of native chickens is caused by different types of native chickens used, the maintenance system and feed given are also different.

At the age of 12 weeks, the effect of the feed given begins to appear where the body weight of chickens who get T0 treatment is better than other treatments. These findings indicate that cattle that consume feed containing FCF with levels of 20% [T2] and 30% [T3] tend to produce lower body weight from T0 and T1 treatments. This state persisted until the end of the study period [16 weeks].

The results of statistical analysis showed that at the age of 12 and 16 weeks, the treatment had a real effect [P<0.05] on the body weight of KUB chickens. The results of further tests showed that the T0 and T1 treatment was better [P<0.05] than the T2 and T3 treatment, so to get a good body weight with a more economical ratio, the provision of FCF in the ratio up to the level of 10% was more profitable.

The body weight of 12 weeks was slightly lower than that found by Ramdani et al. [2016], which ranges from 970.50 to 1033.75 grams. This difference is likely due to the different livestock used, as well as the environment imposed on the chickens is also different.

Shank length at 16 weeks of age ranged from 5.86 cm [T3] to 6.14 cm [T2]. These findings were lower than a previous study by Hasnelly and Armayanti [2005] which states that the length of an adult female chicken shank is 8.57±0.40cm, but lower than female Pelung chicken 10.6 cm and according to Saputra [2006] 10.73 cm for male and female Kampung chickens 8.77 cm. Munggaran [2004] obtained that the length of the shank of an adult Sentul chicken was 6.62cm.

Chest circumference in this study ranged from 21.84 cm [T3] to 22.72 cm [T0] and was lower than adult Merawang chickens i.e 25.1±2.2 cm and 23.5±1.9 cm [Hidayat *et al*., 2017], maybe due to the difference in age of chickens used. Measurement of back length is done by measuring the distance between the last cervical vertebra bone and the caudal vertebra. Sartika et al., [2006] found the back length of male and female Warek chickens at 15.5±1.7 cm and 13.4±1.0 cm respectively, was lower than this study. Wingspan is done by measuring the length in cm between the right wingtip and the left wingtip after the two wings are fully stretched. The wings in chickens function to help incubate eggs, the longer the wings, the more eggs that can be eradicated. Andrianto et al [2015] reported that the average length of the wingspan of female laughing chickens was 17.53±0.54 cm. In addition, Sartika *et al*. [2006] reported that Wareng male and female chickens have a wingspan length of 17.1cm and 14.1cm. The findings of this study were higher than the previous study.

### Correlation Between Body Weight and Shank Length

The correlation value refers to the closeness of the relationship between two or more variables.

The correlation value between body weight and shank length of KUB chickens fed feed containing FCF at various ages is presented in Table 2.

**TABLE 2:** Estimation of the correlation value of body weight [BW] and shank length [SL] of KUB chickens fed feed containing fermented cow feces at various growth ages.

| Variable | Treatments | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | T0 | | T1 | | T2 | | T3 | |
| | r | $R^2$ | R | $R^2$ | r | $R^2$ | r | $R^2$ |
| BW8 and SL8 | 0,43±0,27 | 0,18 | 0,47±0,17 | 0,22 | 0,23±0,23 | 0,05 | 0,08±0,34 | 0,01 |
| BW8 and SL12 | 0,70±0,12 | 0,49 | 0,83±0,12 | 0,69 | 0,59±0,32 | 0,35 | 0,61±0,17 | 0,37 |
| BW8 and SL16 | 0,42±0,14 | 0,18 | 0,84±0,10 | 0,71 | 0,15±0,42 | 0,02 | 0,06±0,21 | 0,00 |
| BW12 and SL12 | 0,58±0,29 | 0,34 | 0,83±0,22 | 0,69 | 0,51±0,47 | 0,26 | 0,17±0,30 | 0,03 |
| BW12 and SL16 | 0,79±0,11 | 0,62 | 0,86±0,16 | 0,74 | 0,52±0,44 | 0,27 | -0,27±0,30 | 0,07 |
| BW16 and SL16 | 0,89±0,14 | 0,79 | 0,70±0,41 | 0,49 | 0,56±0,17 | 0,31 | -0,18±0,22 | 0,03 |

BW= body weight; SL= shank length; r= correlation value; $R^2$= coeficient of determination; T0 = basal ration + 0% fermented cow feces [control]; T1 = 90% basal ration + 10% fermented cow feces; T2 = 80% basal ration + 20% fermented cow feces; T3 = 70% basal ration + 30% fermented cow feces.

Shank length and third finger length are two measures that can be used to estimate the ability to produce meat in chickens [Lukmanudin *et al*., 2018]. The correlation rate between BW8 and SL8 ranges from high positive to low positive. The treatment of T0 and T1 shows a high positive value, T2 indicates a medium positive value, while T3 indicates a low positive value. These results showed that there was a close relationship between BW8 and SL8 in T0 and T1 treatments, while for T2 and T3 treatments showed a less close or even weak relationship. This result is in accordance with the criteria [Sarwono, 2006] showing a strong correlation value of [0.50 – 0.75]. The higher the FCF level in the ration, the weaker the relationship between these variables even when viewed from the standard deviation, the increase in body weight, tends to decrease the length of the shank.

The correlation between BW8 and SL12 showed a high positive number for all treatments, indicating that the estimation of body weight at 12 weeks of age can be predicted through measuring shank length, where the longer the shank, the higher the weight. Chickens that consume rations containing FCF as much as 10% [T1] are able to produce high positive correlation values or there is a close relationship between BW8 and SL12.

The estimated correlation value between BW12 with SL12 and SL16 shows a high positive value for T0, T1, and T2 treatment, while for T3 treatment shows a low negative value. These results point to an inverse relationship between these variables in the T3 treatment, although in very small portions.

The coefficient of determination [$R^2$] is meaningful as the contribution of influence given by the independent variable or independent variable [X] to the dependent variable or dependent variable [Y]. The value of the coefficient of determination or R2 is useful for predicting and seeing how much influence the variable X contributes simultaneously [equally] to variable Y.

The coefficient of determination in the correlation relationship between BW12 and SL16 of 0.62 in T0 treatment means that 62% of shank length at the age of 16 weeks is influenced by body weight at the age of 12 weeks. Similarly, the T1 treatment of 0.74 means that 74% of the length of the 16-week-old shank is influenced by the weight of the 12-week-old body. For the T3 treatment, a relatively small coefficient of determination [0.07] was found, meaning that only 7% of the length of the 16-week-old shank was affected by the weight of the 12-week-old body. The small coefficient of determination in the T3 treatment on almost all variables points to the absence of a significant effect of body weight on the shank length of these variables.

### Correlation Between Body Weight and Chest Circumference

The estimation of the correlation value and coefficient of determination between body weight and breast circumference of KUB chickens fed feedcontaining CFC at various ages is presented in Table 3.

**TABLE 3:** Estimation of the correlation value between body weight and breast circumference of KUB chickens fed feed containing fermented cow feces at various growth ages.

| Variable | Treatments | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | T0 | | T1 | | T2 | | T3 | |
| | r | $R^2$ | R | $R^2$ | r | $R^2$ | r | |
| BW8 and CC8 | 0,29±0,24 | 0,08 | 0,59±0,18 | 0,35 | 0,58±0,15 | 0,34 | 0,64±0,14 | 0,41 |
| BW8 and CC12 | 0,56±0,16 | 0,31 | 0,63±0,21 | 0,40 | -0,11±0,22 | 0,16 | 0,61±0,17 | 0,37 |
| BW8 and CC16 | 0,61±0,13 | 0,37 | 0,58±0,17 | 0,34 | -0,32±0,27 | 0,12 | 0,23±0,28 | 0,05 |
| BW12 and CC12 | 0,77±0,10 | 0,59 | 0,62±0,27 | 0,38 | 0,02±0,27 | 0,14 | 0,17±0,24 | 0,02 |
| BW12 and CC16 | 0,57±0,16 | 0,29 | 0,39±0,23 | 0,15 | -0,18±0,27 | 0,03 | 0,14±0,29 | 0,00 |
| BW16 and CC16 | 0,61±0,22 | 0,37 | 0,08±0,32 | 0,01 | -0,39±0,25 | 0,15 | -0,22±0,23 | 0,05 |

BW= body weight; CC= chest circumference; r= correlation value; $R^2$= coeficient of determination; T0 = basal ration + 0% fermented cow feces [control]; T1 = 90% basal ration + 10% fermented cow feces; T2 = 80% basal ration + 20% fermented cow feces; T3 = 70% basal ration + 30% fermented cow feces.

The estimated correlation value between body weight and chest circumference varies from moderate to high positive. The correlation value is classified as very low when it is 0.00–0.05; low is worth 0.05–0.25; medium values are 0.25–0.50 and high when the correlation coefficient value is 0.5–1.0; [Warwick et al., 1995]. High positive values were found in the T0 treatment for all variables, except for the BW8 and CC8 variables, as well as in the T1 treatment except for the BW12 and CC16 variables [medium] and the BW16 and CC16 variables [low]. In T2 and T3 treatment, high positive values were found in variables BW8 and CC8 and BW8 and CC12 in T3 treatment. The correlation values in other variables in the T2 and TR3 treatment ranged from moderate negative to moderate positive.

The variation in the estimation of correlation values in various treatments points to the closeness of the relationship between these variables. Some variables have a very close relationship where the estimated value of the correlation is highly positive as in the T0 treatment i.e. between BW8 and CC12 and CC16, BW12 and CC12 and CC16, and BW16 and CC16. Strong correlations on T1 treatment were found between BW8 and CC12 and CC16, BW12 and CC12 and CC16 as well as between BW16 and CC16.

The functional relationship between these variables indicates that increasing one variable will increase the other, so it can be predicted that body weight for these treatments can be estimated based on the size of the chest circumference where the greater the size of the chest circumference, the higher the body weight.

The T2 and T3 treatments produced negative predictive numbers on some variables, indicating that an increase in one trait would decrease another. This event is found in the T2 treatment in the relationship between BW8 and CC12 and CC16, BW12, and CC16, and between BW16 and CC16. As for the T3 treatment, it was found to be a relationship between BW16 and CC16.

However, in the T2 treatment, a high positive value was found in the correlation between BW8 and CC8 [0.58], and in the T3 treatment, a high positive value was found in the correlation relationship between BW8 and CC8 [0.64] and BB8 and LD12. [0.61]. According to Wardono [2014], estimating the correlation value has an important meaning for livestock selection that can be done earlier.

### Correlation Between Body Weight and Back Length

Estimates of the correlation value between body weight and back length of KUB chickens fed feed containing FCF at various growth ages are presented in Table 4.

**TABLE 4:** Estimation of the correlation value between body weight and back length of KUB chickens fed feed containing fermented cow feces at various growth ages.

| Variable | Treatments | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | T0 | | T1 | | T2 | | T3 | |
| | r | $R^2$ | r | $R^2$ | r | $R^2$ | r | $R^2$ |
| BB8 and BL8 | 0,33±0,20 | 0,11 | 0,22±0,21 | 0,05 | 0,12±0,35 | 0,01 | 0,34±0,26 | 0,12 |
| BB8 and BL12 | 0,31±0,21 | 0,10 | 0,45±0,27 | 0,20 | 0,35±0,15 | 0,12 | 0,63±0,18 | 0,40 |
| BB8 and BL16 | 0,42±0,14 | 0,18 | 0,14±0,32 | 0,02 | 0,08±0,21 | 0,00 | 0,49±0,26 | 0,24 |
| BB12 and BL12 | 0,37±0,18 | 0,14 | 0,40±0,38 | 0,16 | 0,14±0,27 | 0,02 | -0,08±0,24 | 0,00 |
| BB12 and BL16 | 0,50±0,14 | 0,25 | 0,25±0,30 | 0,06 | 0,17±0,25 | 0,02 | -0,43±0,22 | 0,18 |
| BB16 and BL16 | 0,54±0,17 | 0,29 | 0,10±0,41 | 0,01 | 0,15±0,22 | 0,02 | -0,38±0,26 | 0,14 |

BW= body weight; BL= back length; r= correlation value; $R^2$= coeficient of determination; T0 = basal ration + 0% fermented cow feces [control]; T1 = 90% basal ration + 10% fermented cow feces; T2 = 80% basal ration + 20% fermented cow feces; T3 = 70% basal ration + 30% fermented cow feces.

The correlation coefficient between body weight and back length in the T0 treatment ranged from 0.33 to 0.54 or was in the medium to high positive category. In the T1 treatment, it ranged from 0.10 to 0.40 or in the low to medium category, in the T2 treatment it ranged from -0.12 to 0.17 or was in the low category, while in the T3 treatment, it ranged from -0.43 to 0.65 or in the medium to high category. The value of the correlation coefficient is important in selection to produce the desired production value [Setianto *et al.*, 2008]. According to Sartika [2013] bone growth is more regulated by genetic factors besides homon circulation.

The correlation value is not only influenced by genetic factors but also influenced by environmental factors, in this case, the environment of the feed consumed. KUB chickens that consume feed without CFC tend to produce positive correlation values, while those that consume feed containing CFC produce correlation values between body weight and back length were low to high. These findings indicate that higher CFC levels in the ratio [T2 and T3 treatment] tend to produce lower correlation values.

The coefficient of determination in each treatment varies showing the effect of back length on the body weight is different for each treatment at different growth ages. The T0 treatment ranges from 0.10-0.29 meaning that 10-29% of body weight is influenced by back length, and the rest is influenced by other factors. For T1 treatment, the coefficient of determination ranged from 0.01-0.16 meaning that 1-16% of body weight was influenced by body length, while for T2 treatment, the coefficient of determination ranged from 0.00-0.12 indicating that the variable body weight was not or slightly influenced by back length, as well as T3 treatment.

This finding shows that there is a tenuous relationship between body weight and back display of KUB chickens from 8 weeks to 16 weeks of age. The body weight produced does not come from the increase in back length alone, but the result of the increase in body size produced does not come from the increase in back length but the result of increasing other body sizes ranging from head to toe.

**Correlation Between Body Weight and Wing Span**

Data on the correlation between body weight and wing span of KUB chickens fed feed containing FCF at various growth ages are presented in Table 5.

**TABLE 5:** Estimation of the correlation value and coefficient of determination between body weight and wing span of KUB chickens fed with fermented cow feces at various growth ages.

| Variable | Treatments | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | T0 | | T1 | | T2 | | T3 | |
| | r | $R^2$ | R | $R^2$ | r | $R^2$ | r | $R^2$ |
| BW8 and WS8 | 0,42±0,21 | 0,18 | 0,22±0,21 | 0,05 | 0,84±0,15 | 0,71 | 0,74±0,16 | 0,55 |
| BW8 and WS12 | 0,57±0,17 | 0,32 | 0,45±0,27 | 0,20 | 0,58±0,32 | 0,34 | 0,16±0,22 | 0,03 |
| BW8 and WS16 | 0,28±0,23 | 0,08 | 0,14±0,32 | 0,02 | 0,59±0,31 | 0,35 | 0,12±0,20 | 0,01 |
| BW12 and WS12 | 0,71±0,15 | 0,50 | 0,40±0,38 | 0,16 | 0,73±0,51 | 0,53 | -0,07±0,33 | 0,00 |
| BW12 and WS16 | 0,67±0,14 | 0,45 | 0,25±0,30 | 0,06 | 0,72±0,52 | 0,52 | -0,26±0,21 | 0,07 |
| BW16 and WS16 | 0,78±0,13 | 0,61 | 0,10±0,41 | 0,01 | 0,48±0,27 | 0,23 | -0,10±0,22 | 0,01 |

BW= body weight; WS= wing span; r= correlation value; $R^2$= coeficient of determination; T0 = basal ration + 0% fermented cow feces [control]; T1 = 90% basal ration + 10% fermented cow feces; T2 = 80% basal ration + 20% fermented cow feces; T3 = 70% basal ration + 30% fermented cow feces.

The estimated correlation value between body weight and wingspan in the T0 treatment showed a positive value of medium [0.28] to high position [0.78]. Correlation values for T1 treatment ranged from 0.10 – 0.45 or were in the low to moderate category.

The T2 treatment showed correlation values in the medium to high category [0.48-0.84], but the T3 treatment showed very low to high values, ranging from -0.26 to 0.74. This shows that environmental factors in this case the feed environment greatly affect the correlation relationship between body weight and wing weight.

The high correlation value between body weight and wingspan in this study can be used as a parameter in the selection and estimation of body weight. High correlation values also have many uses, including estimating/predicting the performance of livestock.

The results of this study showed that the high correlation between body morphology and body weight in chickens can be used as a parameter to estimate body weight. Conversely, a low correlation value indicates that between the two variables, there is a tenuous relationship or it can be said that the increase in one variable is little or even not at all influenced by other factors. The negative value found points to an inverse relationship, where the increase in one factor causes a decrease in the other factor by the value of the correlation obtained.

The coefficient of determination in T0 treatment ranges from 0.08 to 0.61 or between 8-61%, meaning that body weight at 8 weeks of age slightly affects the size of the wingspan at 16 weeks, while WS16 greatly affects BW16. The T1 treatment has a coefficient of determination of 0.01-0.20 or 1-20% of the body weight affected by the wingspan at various growth ages.

The T2 treatment has a very good coefficient of determination, which is between 0.23 to 0.71 or between 23 to 71%, indicating that 23 to 71% of the body weight of KUB chickens is influenced by the length of the wingspan.

In the T3 treatment, the value of the coefficient of determination ranges from 0.00-0.55 or ranges from 0-55%, meaning that BW12 is not affected by WS12, and BW8 is strongly influenced by WS8. The results of this study show that there are different influences for each variable and the wingspan cannot be used as a guideline to determine body weight, so if selection is carried out on KUB chickens that receive feed containing 30% CFC, the wingspan cannot be used to estimate body weight. The results of this study are not in line with the opinion of Mariandayani et al. [2013] that morpho-metric parameters are used as breed markers or breed differentiating modifiers that can be determined using principal component analysis.

**CONCLUSION**

Based on the results and discussion, it can be concluded that KUB chickens that consume feed containing fermented cow feces as much as 10% can produce body weight and linear body size that are better than other treatments. The estimated correlation value between body weight and linear body size of KUB chickens consuming feed containing fermented cow feces varied from very strong to very weak. For selection purposes, it can be done mainly on properties with a high positive correlation value.

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