Prediction of body weight of Large White Yorkshire fattener pigs from body measurements under farm conditions

D DIVYALAKSHMI[1], N KUMARAVELU[1] and A SERMA SARAVANA PANDIAN[2]

[1]Department of Livestock Production Management
[2]Department of Animal Husbandry Economics
Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University
Chennai 600007 Tamil Nadu, India
Email for correspondence: nandhi7121989@gmail.com

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ABSTRACT

Data on body weight and body measurement were collected from 80 swill-fed Large White Yorkshire fatteners. The correlation between body weight and body measurement was positive and strongly correlated in most of the cases. Body measurement succeeded to describe more variation in live weight. Separate prediction equations were made for females and males. The coefficient of determination in different equations indicated that chest girth and length succeeded in estimating body weight more than any other linear measurement and chest girth and length in combination with two or more measurements predicted the body weight better.

Keywords: Body measurements; body weight; correlation; fatteners; regression

INTRODUCTION

Pigs are efficient converters of feed to valuable animal protein with faster growth rate within a short span of six months. They substantially contribute to the rural economy and provide livelihood to the poor sections and supplement their food. Assessing the performance of pigs with the use of body weight is important for a number of reasons related to breeding (selection), feeding and healthcare. The main method of determining the weight of animals in the absence of weighing scales is to estimate the weight. Typically, weight is regressed on body measurements to determine a weight-prediction equation. However body weights are not often available to those working with pigs in the small scale farming sector due to the non-availability of scales. This paper therefore is aimed at establishing a correlation between heart girth and chest girth as predictors of body weight and finding ways of improving its efficiency in multiple regressions with other body measurements.

MATERIAL and METHODS

The study was conducted based on the data collected from the swill-fed pigs maintained at Livestock Farm Complex, TANUVAS, Chennai, Tamil Nadu. A total of 80 pigs of either sex (40 males and 40 females) were used in the present study. The data were recorded on pigs meant for fattening from the day of weaning till market age. Measurements used were body weight, chest girth and body length from weaning till market age. The fatteners were provided with swill feed at the rate of 4 kg per pig. A uniquely numbered ear tag was inserted in each pig's ear. Body weight was recorded using digital weighing balance and linear body measurements were made using the measuring tape. A measuring tape was then used to determine the body length in centimetres from the mid-point between the ears to the point where the tail joined the body. The chest girth was measured in centimetres around the pig's body just behind the forelegs. The body measurements were computed as mentioned by Pearson's coefficients of correlation between estimated body weight and all body measurements. To determine the regression equation, the coefficients of multiple determination were used. Step-wise regression procedure was carried out to determine the combination of body measurements that could explain the maximum variation in the dependent variable, the body weight.

RESULTS and DISCUSSION

Means and standard error of live weight and body measurement of female, male and pooled pigs are presented in Table 1. Among the body measurements body length was highest followed by chest girth and body length. Female fattener pigs had more body weight and body measurement as compared to males. Positive and highly significant ($p < 0.01$) correlations were observed between constant variable and both the body measurements. The correlation coefficients observed in the present study were comparable to the reported values of Topai and Macit (2004) who predicted body weight formula in sheep. Since there were high correlation coefficients between body weight and body measurement, either of these variables or combinations could provide a good estimate for predicting live weight. Both the body measurements showed high correlation with body weight. This tended to infer that different conformational traits may be more successfully used for selection of pigs.

The coefficient of determination (R^2) indicated that the body measurement succeeded to describe more variation in live weight. Thus chest girth accounted maximum to the total variation in body weight justifies the use of chest girth as a foremost weight predictor. The higher association of body weight with chest girth was possibly due to relatively larger contribution in body weight by chest girth (consisting of bones, muscles and viscera). The r^2 (coefficient of multiple determination) 0.649 indicated that 64.9 per cent of the variation in body weight was influenced by body measurement. The F-value of regression was 26.93 which was highly significant indicating the body measurement in female fatteners as a valuable indicator of body weight. Topai and Macit (2004) depicted that highest relationship was observed between heart girth and body weight of Morkaraman sheep in Turkey.

Since body measurements had high correlation with body weight this may be used as selection criteria. Mohammad et al (2012) found that chest girth was the best predictor for explaining variation in the body weight at yearling age in indigenous sheep breeds in Balochistan. Best-fitted regression equation and coefficient of determination (adjusted R^2) for female pigs is:

$$Y = -10.596 + 0.026X_1 + 0.459X_2$$

where X_1= Body length (cm), X_2= Chest girth (cm), Y= Body weight (kg)

In male fattener pigs, only the body length showed high correlation with body weight than chest girth. This suggests that one single body measurement cannot predict body weight accurately. The coefficient of determination (R^2) in male pigs was 0.459. Linear measurements such as length and height were related to bone growth and were closely related to body weight of growing animals and this is in agreement with Mutua et al (2011). The F-value of regression was 0.010. Best-fitted regression equation and coefficient of determination (adjusted R^2) for male fatteners is:

$$Y = -12.786 + 0.374X_1 + 0.029X_2$$

where X_1= Body length (cm), X_2= Chest girth (cm), Y=Body weight (kg)

Pooled data including both male and female pigs, indicated that both the body measurements were positively and highly correlated with the body weight which is the constant variable thus suggesting the measurement as a valuable predictor. The r^2 (coefficient of multiple determination) of pooled data was 0.638 indicating that 63.8 per cent of the variation in body weight was influenced by body measurement. The F-value of regression of pooled data was 38.86 which was highly significant indicating the body measurement as a valuable indicator of body weight. Raja et al (2013) explained high correlation coefficient between body weight and body measurement for all age groups in Attappady black goats. R^2 expressed that the body weight of pigs increased with increasing length and girth which may be due to skeletal growth while increase in girth was due to muscle development plus accumulation of adipose tissue. Best-fitted regression equation and coefficient of determination (adjusted R^2) for male pigs is:

$$Y = -11.985 + 0.164X_1 + 0.267X_2$$

where X_1= Body length (cm), X_2= Chest girth (cm), Y= Body weight (kg)

CONCLUSION

The results of this study identified heart girth as the best measurement for predicting live weight. Additionally its combination with body length/height at withers or both gavea better estimate.

Table 1. Mean ± SE of live weight and body measurements of fatteners

Parameter	Female	Male	Pooled
Body weight (kg)	10.0414 ± 3.03568	7.1000 ± 2.00464	9.0386 ± 3.04930
Body length (cm)	54.7276 ± 5.79056	49.9200 ± 3.66551	53.0886 ± 5.61448
Chest girth (cm)	48.0241 ± 5.70230	42.1600 ± 5.30859	46.0250 ± 6.18506

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