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Relationships among Testicular Traits, Body Measurements and Body Weight in Beetal Male Goats in Pakistan

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ABSTRACT: This research was conducted to determine relationships among testicular traits and body measurements. Testicular traits and body weight of 34 male Beetal goats kept at different government livestock farms were recorded during Feb to Jul 2009. Scrotal circumference, testicular length, body length, rump height, withers height and body weight for the male goats ranging from 24 to 40 months of age were measured. Pearson correlation coefficients were computed to determine bivariate relationships among these traits. Prediction equation was calculated for explaining variation in body weight. All of the correlation coefficients were positive. A low-insignificant correlation coefficient between scrotal circumference and body length was low (0.082). The correlation coefficients of scrotal circumference with heart girth, rump height, withers height and body weight were found as 0.392, 0.425, 0.433 and 0.516, respectively. Similarly, correlation coefficients of testicular length with heart girth, rump height, withers height and body weight were 0.206, 0.180, 0.304, 0.365 and 0.347, respectively. As a result, regression analysis reflected that the scrotal circumference (SC) was a better predictor of explaining body weight than testicular length ($\hat{Y}$= 0.322+2.654SC+0.098Age, with R^2 0.463).

Keywords: Beetal goat, Body weight, Scrotal circumference, Testicular length

Pakistan'daki Beetal Tekelerinin Testis Özellikleri, Vücut Ölçüleri ve Canlı Ağırlıkları Arasındaki İlişkiler

ÖZET: Bu çalışma, testis özellikleri ve vücut ölçümleri arasındaki ilişkileri belirlemek için yürütülmüştür. Farklı devlet üretme çiftliklerinde yetiştirilen 34 Beetal tekesinin testis özellikleri ve canlı ağırlıkları 2009 Şubat-Temmuz aylarında kaydedilmiştir. Yaşları 24 ile 40 ay arasında değişen tekelerin skrotum çevresi, testis uzunluğu, vücut uzunluğu, sağrı yüksekliği, cidago yüksekliği ve canlı ağırlıkları ölçülmüştür. Bu özellikler arasındaki ikili ilişkileri belirlemek için Pearson korelasyon katsayıları hesaplanmıştır. Canlı ağırlıktaki varyasyonu açıklamak amacıyla tahmin denklemi hesaplanmıştır. Tüm korelasyon katsayıları pozitif bulunmuştur. Skrotum çevresi ve vücut uzunluğu arasında düşük ve önemsiz bir korelasyon katsayısı (0.082) tespit edilmiştir. Skrotum çevresinin göğüs çevresi, sağrı yüksekliği, cidağo yüksekliği ve canlı ağırlık ile korelasyonları, sırasıyla 0.392, 0.425, 0.433 ve 0.516 olarak bulunmuştur. Benzer şekilde testis uzunluğunun göğüs çevresi, sağrı yüksekliği, cidağo yüksekliği ve canlı ağırlık ile korelasyonları, sırasıyla 0.206, 0.180, 0.304, 0.365 ve 0.347 olmuştur. Sonuç olarak, regresyon analizi sonuçları ($\hat{Y}$= 0.322+2.654SC+0.098Age, R2 0.463), canlı ağırlığı açıklama bakımından skrotum çevresinin testis uzunluğundan daha iyi bir tahminleyici olduğunu göstermiştir.

Anahtar kelimeler: Beetal keçisi, Canlı ağırlık, Skrotum çevresi, Testis uzunluğu

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INTRODUCTION

Bucks consisting important part of the flock are considered as half of the flock. Therefore, selection of bucks with superior genetic material is important. There are no specific means of selecting bucks with superior fertility because there is lack of information about basic measurable traits of males related to male fertility and also the cost and difficulty of obtaining such data on individual males (Lunstra et al., 1993).

Testicular characteristics such as testicular diameter, testicular length, scrotal circumference, and scrotal length are used as indirect selection criteria for genetically improving fertility (Koyuncu et al., 2005). It was reported that large testicular sizes are connected with the enhanced sperm production (Coutler and Foote, 1977; Blockey, 1980). However, there were some environmental factors (age, body weight, season) that significantly affect these characteristics, which can be measured easily (Karakus et al., 2010). The close relationships between testicular characteristics, body measurements, and body weight, must be investigated for breeding purposes. Males that have higher values in terms of testicular characteristics had higher body weights (Raji et al., 2008). In the most of the related studies, body weight, age and testicular characteristics have been considered in prediction equations (Rege et al., 2000; Raji et al., 2008; Salhab et al., 2001; Karakus et al., 2010). There have been a small number of studies regarding testicular biometry of male goats. Therefore, the current study was planned to determine the relationships among testicular traits and body measurements in male Beetal goats and to predict body weight from testicular traits (testicular length and scrotal circumference).

MATERIAL AND METHOD

Data on 34 male goats of Beetal breed were recorded at four government livestock farms including Livestock Experiment Station, Rakh Kheirewala, district Layyah, Livestock Experiment Station, Rakh Ghulaman, district Bhakkar, Livestock Experiment Station, Allad, district Khanewal, Livestock Experiment Station, Chak Katora, district Bahawalpur and Livestock Production Research Institute, Bahadurnagar, district Okara during Feb to Jul 2009. Scrotal circumference, testicular length, body length, rump height, withers height and live body weight were measured using tailor tape and weigh bridge. Males were composed of mixed age groups ranging from 24 to 40 months. Pearson correlation coefficients were computed among these characteristics. Regression analysis was performed to predict body weight from testicular characteristics (scrotal circumference and testicular length). All statistical analyses were performed using SPSS Version 10 (SPSS, 1999).

Body weight was predicted with the following simple linear regression equation:

$$Y = a + b_1 (X) + b_2 (Age)$$

Where;

Y: Live Body Weight

a: Intercept

X: Scrotal circumference or testicular length

b_1 and b_2: The regression coefficients

Age: Age at the time of measurement taken

Coefficient of determination (R^2%) was also computed to determine quality of the regression analysis.

RESULTS AND DISCUSSION

Least squares means (LSM) and SE values of the examined characteristics and correlation coefficients among these characteristics are given in Table 1 and 2, respectively. The LSM (±SE) for scrotal circumference, testicular length, body length, rump height, withers height and live weight were 24.3±0.72, 12.81±0.40, 76.14±1.63, 84.81±2.43, 89.15±2.37 cm and 51.44±3.20, respectively. The correlation coefficients of scrotal circumference with body length, heart girth, rump height, withers height and body weight were found to be 0.08, 0.39, 0.43, 0.52 and 0.43, respectively. Correlation coefficient between scrotal circumference and body length was non-significant ($P>0.05$). The correlation coefficients of scrotal circumference with heart girth, rump height and body weight were statistically significant ($P<0.05$) but scrotal circumference was strongly correlated ($P<0.01$) with withers height. The insignificant correlation coefficients of testicular length with body length, heart girth, and body weight were 0.21, 0.18 and 0.30, respectively ($P>0.05$). Correlation coefficients of testicular length with withers height and rump height were significant with 0.35 and 0.30, ($P<0.05$), respectively. Keith et al. (2009) reported highly significant correlations between body weight and chest girth (r=0.84) and between body weight and scrotal circumference (r=0.79). Scrotal length had a significant ($P<0.01$) correlation with body weight in Red Sokoto (r=0.74) and White Borno goats (r=0.82)

(Raji et al., 2008), showing higher values as obtained in the present study. The findings of the present study were in agreement with findings of Marquez et al. (2003) who reported similar correlations between body weight and testicular traits. The correlation coefficients reported by Koyuncu et al., (2005) between scrotum circumference and body weight (r=0.85) and testis length and body weight (r=0.92) were much higher than the present findings. The results of present study matched with Toelle and Robison (1985) who reported positive correlation coefficients among testicular and body measurements. Tabba et al. (2006) also reported higher estimates of correlation between scrotal circumference and body weight (r=0.73). The present estimates had excellent similarity with the findings of Bourdon et al. (1985), who estimated positive and medium correlation coefficients between scrotal circumference and live weight. As sample size could have a considerable effect on correlation coefficients, the low values of correlation coefficients as found in the present study would be significant with an increase in sample size. Although preliminary in nature, the findings suggest that selection for large scrotal circumference or longer testes will result in faster growth and more weight.

The multiple regression analysis equations in estimating body weight from scrotal circumference and testicular length are given in Table 3. In the first regression equation, (Y = 0.322+2.654SC+0.098Age), 42.5(%) of variation in body weight was explained by scrotal circumference (SC) and age. This estimate of 42.5(% R^2) was lower than the estimate of Keith et al., (2009), who reported that 62% (R^2) of variation of body weight was explained by only scrotal circumference (Y = -6.84 + 1.58SC) in pubertal Boer goats. Raji et al., (2008) reported that regression equations in Red Skoto and Borno White male goats were Y = 4.206+0.563SC (R^2=51.7%) and Y 4.699+0.711SC (R^2=70.5%), respectively. In the first equation, an increase of 2.645 kg in body weight would be expected with a unit increase in scrotal circumference (P<0.05). The difference may be due to variation in age, genetics, and environmental factors. In the second regression equation (Y = 1.202+1.805TL), 30.4% of variation in body weight was accounted for by testicular length. The regression of body weight on scrotal circumference was positive and significant (P<0.05), whereas the regression of body weight on testicular length was positive and non-significant. In the prediction of body weight, scrotal circumference was more reliable and explanatory than testicular length in the present study. In a study conducted on Norduz male lambs, the body weight (P<0.001) and age (P<0.001) significantly affected testicular traits such as testicular length and diameter, and scrotal circumference and length (P<0.001) as reported by Salhab et al., (2001), in Awassi ram lamb.

CONCLUSION

Scrotal circumference and testicular length can be excellent and valid measures of buck's breeding ability together with more effective selection programs. Body weight was moderately to highly correlated with other measurements. The measurement of scrotal circumference and testicular length provide considerable opportunity to breeders for selection strategies on phenotypic basis. As a result, in all the studies on the body weight estimation from testicular traits and body measurements, age of animals should be taken into consideration.

Table 1. Least square means and standard error of testicular and body measurements

Trait	**Mean**	**SE**
Age	44.08	3.69
Body length	76.14	1.63
Heart Girth	88.03	1.49
Body weight	51.44	3.20
Rump height	84.81	2.43
Withers height	89.15	2.37
Scrotal circumference	24.30	0.72
Testicular length	12.81	0.40

Table 2. Correlation coefficients among Scrotal Circumference, testicular length and body measurements

Traits	Body Length	Heart Girth	Body Weight	Rump Height	Withers Height
Scrotum circumference	0.082^{NS}	0.392*	0.425*	0.433*	0.516**
Testicular length	0.206^{NS}	0.18^{NS}	0.304^{NS}	0.365*	0.347*

* P<0.05, **P<0.01, NS: Non-Significant

Table 3. Prediction equations for live weight from testicular biometry

Trait	Regression equation	R^2	Significance
Scrotum umference	Y = 0.322+2.654SC+0.098Age	42.5	*
Testicular length	Y = 1.202+1.805TL+0.027Age	30.4	NS

Y= Live weight; SC = Scrotal Circumference; TL= Testicular length; * P<0.05; NS: Not Significant

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