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THE DEVELOPMENT OF TESTICLE DIMENSIONS AND BODY GROWTH IN ARABI SHEEP, WITH REFERENCE TO SOME PREDICTION EQUATIONS FOR THESE DIMENSIONS

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Abstract:

This study was conducted in the fields of the College of Agriculture, University of Basra, for the period from 10/10/2023 to 1/2/2024. The research included a group of Arabi sheep lambs at the ages of 1 to 4 months, and testicle measurements were taken for them at different ages, as the dimensions included both the length and thickness of the testicles. The right and left testicles, the diameter and thickness of the testicles, and the circumference of the testicles were calculated to demonstrate the possibility of relying on these characteristics in selecting males for breeding. It was found that there were significant differences between the ages and different weights of the lambs for the above dimensions. Phenotypic correlation coefficients were also calculated between these characteristics, which were highly significant, high, and positive. Equations were estimated to predict these characteristics based on body weight at early ages, and they all had a high coefficient of determination ranging from 0.83 to 0.91.

Keywords: Arabi sheep, testicle dimensions, prediction equations

INTRODUCTION

It has become necessary to focus on developing livestock in Iraq because of its important role in the national economy. Therefore, the problems that could affect the production, performance, and fertility of animals were studied, and researchers sought to develop new formulas that suit the requirements of animals to increase production and raise reproductive efficiency (Al-Wadh, 2018). Sheep constitute an important part of the livestock in Iraq because of their importance in meeting the needs of consumers as well as being the most suitable for their desires. They also constitute an important source of income for residents of pastoral areas in Iraq (Arab Organization for Agricultural Development, 2009), as they are distinguished by their adaptation to environmental conditions. In addition to its tolerance to high temperatures and resistance to diseases (FAO, 2006), measuring testicle dimensions is of great importance in evaluating the reproductive ability of male sheep due to the link between its development and reproductive activity and it can be used as an important measure for estimating the production and size of sperm (Yağcı, 2022). Measurements of testicle dimensions are considered an indicator for evaluating the reproductive status and fertilization capacity of males (Benoit, 2017), and there is a positive correlation between the different measurements of testicle dimensions, as it was found that there is a significant correlation between the development in testicle dimensions measures and the phenomenon of the beginning of sperm formation. Others have also relied on measuring the weight of the testicles. Identifying the histological changes in them and the beginning of sperm formation determines the age of sexual maturity (Elmaz, 2008). The dimensions of the testicles increase as the lambs grow older until they reach sexual maturity. The circumference of the testicles is an indicator of the reproductive efficiency of animals, and the scrotal circumference is one of the important indicators for measuring reproductive ability, as in Indian bulls, due to its strong association with the size of the testicles and the production and quality of semen (Babashani, 2015). The size and weight of the testicles is also affected by the seasons of the year and temperature, as they are large in the cold months of the year, while they become flabby and small during the period of sexual rest, that is, in the summer (Aslan, 2019) .

MATERIALS AND METHODS :

This study was conducted in the fields of the College of Agriculture affiliated with the University of Basra. It included 79 Arabi males. All lambs were fed one ration. Testicle dimensions measurements were taken for all lambs, which included (length, circumference, thickness). The measurement was done using special Calipper tapes for length and

circumference, while Vernier testicle thickness measurement (Al-Kanzawi, 1996). The statistical analysis was conducted using the General Linear Model (GLM) method within the statistical program Statistical Analysis System (SAS, 2012). The effects of age (one month) and weight at one month of age on the characteristics of the testicles studied were studied, assuming the mathematical model. The following:

Yij k = M + Ti +Wj + b1(x1- x̄) + eijk

Since**:**

Yij = viewing value (K) due to age (i) and weight (j)**.**

M = the general average of the trait**.**

Ti = Effect of age in month (i)**.(1,2,3,4)**

Wj = Effect of weight at one month old (j) (1,2,3,4) weight categories**.**

eijk = random error that is normally distributed with a mean equal to zero and a variance of ∂2 e**.**

b1(x1-x̄) = simple linear regression for prediction of the studied traits**.**

The coefficient of determination **(R2)** was estimated to describe the effects of the factors on the studied traits**.**

RESULTS AND DISCUSSION

The results of the current study (Tables 1 and 2) showed significant differences in the averages of the lengths and thickness of the right and left testicles and testicle circumference as the animal aged, as it showed a significant increase at age (4 months), which amounted to 14.310±0.07 and 14.610±0.061 for the length of the right and left testicles, while it was 4.560. ±0.063 and 5.809±0.033 for the thickness of the right and left testicles, while the circumference of the testicle was recorded as 26.41±0.17. We also note the presence of significant effects of weight on the traits studied by increasing the weight of the animal, as the treatment with a weight of more than 31 kg was significantly superior in the average lengths of the right and left testicles, where it was recorded as 13.285. ±0.051a and 13.007±0.055a, respectively. It also reached 5.041±0.067a and 4.787±0.037a for the average thickness of the right and left testicles, while the circumference of the testicles recorded an average weight of 26.428±0.180a. The reason for this is the increased growth of the testicles as the animal grows, including Its dimensions increase as the animal ages (Attiya, 2008) and (Yeni, 2018)**.**

Table (1) Analysis of variance for factors affecting testicle characteristics

Sources of variation	Degrees of freedom	Mean squares					F value				
		Length of right testicle	Length of left testicle	Testicle circumference	Thickness of right testicle	Thickness of left testicle	Length of right testicle	Length of left testicle	Testicle circumference	Thickness of right testicle	Thickness of left testicle
age	3	**44.586**	**67.165**	**61.584**	**4.266**	**5.569**	**438.14**	**730.3**	**110.7**	**51.3**	**256.2**
weight	3	**2.089**	**3.851**	**5.434**	**0.895**	**25.912**	**20.53**	**41.88**	**9.77**	**10.7**	**1192.2**

Table (2) Least squares mean ± standard error for the studied traits

Influencing factors	Number of animals	Thickness of left testicle	Thickness of right testicle	Testicle circumference	Length of left testicle	Length of right testicle
Means	79	**4.310±0.320**	**4.93±0.077**	**24.282±0.191**	**12.295±0.69**	**12.515±0.08**
Age						
1	19	**4.576±0.034 b**	**3.44±0.067d**	**22.227±0.17d**	**10.207±0.06d**	**10.789±10.07 d**
2	20	**4.861±0.033 b**	**3.823±0.066 c**	**23.540±0.17c**	**11.510±0.069 c**	**11.900±0.07 c**
3	20	**5.327±0.033 b**	**4.171±0.066 b**	**24.960±0.17b**	**12.860±0.068 b**	**13.07±0.06 b**
4	20	**5.809±0.033 a**	**4.560±0.063 a**	**26.41±0.17a**	**14.610±0.061 a**	**14.310±0.07 a**
Weight						
10-15	32	**3.904±0.040 b**	**3.841±0.067 b**	**24.265±0.160 b**	**12.105±0.061 c**	**12.109±0.051 b**
21-25	21	**5.224±0.039 a**	**3.953±0.077 b**	**24.095±0.170 b**	**12.378±0.061 c**	**12.738±0.052 b**

26-30	19	**3.820±0.044 b**	**3.839±0.080 b**	**24.131±0.170 b**	**12.738±0.056 b**	**12.869±0.060 b**
31-and more	7	**4.787±0.037 a**	**5.041±0.067 a**	**26.428±0.180 a**	**13.007±0.055 a**	**13.285±0.051 a**

Phenotypic Correlations

The phenotypic correlations that were calculated between the traits under study (Table 3) were high, positive, and highly significant (P<0.01) between all traits and ranged from 0.88 (between the thickness of the right testicle and the circumference of the testicles) to 0.98 (between the length of the right and left testicles). As for the rest of the correlations, their estimates ranged between the two values above, and these results were consistent with (Yakubu, 2013; Yılmaz, 2006) that selection for fertility in males can take place through selection for traits associated with young males, such as testicle measurements, and that young males may differ in Its potential reproductive performance**.**

Table (3) Phenotypic correlation coefficients between the studied traits

trait	Length of right testicle	Length of left testicle	Testicle circumference	Thickness of right testicle	Thickness of left testicle
Length of right testicle	**-**	**0.980**	**0.890**	**0.912**	**0.922**
Length of left testicle	**-**	**_**	**0.900**	**0.892**	**0.921**
Testicle circumference	**-**	**_**	**_**	**0.881**	**0.941**
Thickness of right testicle	**-**	**_**	**_**	**_**	**0.950**
Thickness of left testicle	**-**	**_**	**_**	**_**	**_**

PREDICTION EQUATIONS

The results obtained from the prediction equations in this study, as well as the values of the coefficient of determination (R2), which were calculated on the basis of predicting the values of the testicular characteristics under study by relying on body weight, indicated the existence of a linear relationship between the studied testicular characteristics and body weight in a highly significant manner (P<0.01) as indicated by (Table 4), as these equations indicate that there is a significant regression for the length of the right testicle, the length of the left testicle, the circumference of the testicle, the thickness of the right testicle and the thickness of the left testicle on body weight, with a high coefficient of determination (from 0.83 to 0.91).). These percentages of the coefficient of determination indicate that 83-91% of the variation in these traits is due to variation in body weight. These results are consistent with what was stated in a number of previous studies (Abbasi, 2011; Yes, 2018**)**

Table (4) Prediction coefficients for the studied traits based on body weight

Trait	Regression equation	R^2
Length of right testicle y/body weight x	**y^= - 41.081+12.05 (x)**	**0.90****
Length of left **testicle y/body weight x**	**y^= - 39.099+19.07 (x)**	**0.84****
Testis circumference y/body weight x	**y^= - 27.71+10.10 (x)**	**0.87****
Right testicle thickness y/body weight x	**y^= - 20.39+17.20 (x)**	**0.91****
Left **testicle thickness y/body weight x**	**y^= - 19.28+15.94 (x)**	**0.83****

CONCLUSIONS

Through the results in the previous tables of this study, we conclude that testicular measurements can be considered an important criterion for early selection of males in sheep, and that selection for breeding males (rams) by relying on testicular measurements alone is insufficient and future studies must be conducted in which other additional characteristics are studied. Such as the concentration of testosterone and the effectiveness of sperm to confirm the current results of this study**.**

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