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# THE EFFECTS of TRANSFERRIN GENOTYPES on TESTIS TRAITS in KARAKAŞ MALE LAMBS

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**Karakaş erkek kuzularında transferrin genotiplerinin testis özellikleri üzerine etkisi.**


## SUMMARY

This study was conducted to investigate the relation between transferrin genotypes with testis and scrotal traits in Karakaş (variety of Akkaraman) male lambs. Testicular size including testis length, testis diameter, scrotum length and scrotum circumference were determined in 120, 130, 170 and 200 days old.

The fourteen transferrin genotypes (AA, AB, AD, AE, AM, BB, BD, BM, BS, DD, DS, MM, MD and ME) were described from six alleles system (A, B, D, E, M and S). Transferrin genotype had a significant effect ($p<0.01$) on all testis and scrotum measurements. But same characteristics were not affected by homozygous and heterozygous transferrin genotype.

Generally, the values of testis diameters and scrotum measurements were biggest for AA, AB, AD and AE genotypes; and were smallest for DD, DS and ME genotypes.


KEY WORDS: Transferrin genotypes, testis measurements, male lamb, Karakaş.


## ÖZET

Bu araştırma Karakaş (Akkaraman varyetesi) erkek kuzularının testis ve skrotum özellikleri ile transferrin genotipleri arası ilişkileri ortaya koymak amacıyla gerçekleştirilmiştir. Testis uzunluğu, testis çapı, skrotum uzunluğu ve skrotum çevresi olarak belirlenen testis ve skrotum özellikleri 120, 130, 170 ve 200 günlük yaşlarda saptanmıştır.

Altı allel sistemine (A, B, D, E, M ve S) bağlı ondört transferrin genotipi (AA, AB, AD, AE, AM, BB, BD, BM, BS, DD, DS, MM, MD ve ME) tanımlanmıştır. Transferrin genotiplerinin testis ve skrotum özelliklerine etkilerinin çok önemli ($p<0.01$) olduğu görülmüştür. Ancak aynı özellikler için heterozigot ve homozigot genotipler bakımından farklılık bulunmamıştır.

Genel olarak, testis ve skrotum özelliklerine ilişkin değerler AA, AB, AD ve AE genotiplerinde en büyük; DD, DS ve ME genotiplerinde en küçük olmuştur.


ANAHTAR KELİMELER: Transferrin genotipleri, testis ölçüleri, erkek kuzu, Karakaş

## INTRODUCTION

The possible relationships between transferrin types and production or reproductive traits have so far received little attention. There are some indications from the literatures that transferrin types may have an important influence on the reproductive performance of sheep (Aliev *et al.* 1975, Atroshi 1979, Mayo *et al.* 1970, Rasmusen and Tucker 1973, Vanlı *et al.* 1990). Obviously, it seems that measuring the effects of transferrin on reproductive performance is not easy.

Heritabilities of sheep reproductive traits are low. There are other factors contribute to the difficulty of improving the reproduction by direct selection. Testicular size adjusted for body weight in male lambs has been reported to be important for indirect selection for female reproductive performance (Haley *et al.* 1990, Lee and Land 1985, Lee and Haley 1990, Matos *et al.* 1992, Purvis *et al.* 1988).

The association of the transferrin types with testis characteristics has not been studied until recent years. This is a restudy for future related in this topic.

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## MATERIALS and METHODS

This study was conducted on Karakaş (a variety of Akkaraman breed) male lambs in Van. The testis and scrotum characteristics were determined at average 120, 150, 170 and 200 days of age. Testis measurements were obtained via a technique reported by Sönmez and Kaymakçı (1987). Briefly, male lambs were held in a position which fore legs were up. Scrotum circumference and scrotal length were measured with a cloth tape. The length and diameter of testis were measured with a caliper.

Plasma samples were analyzed for determining the transferrin types by the polyacrylamide gel electrophoresis technique.

The data were analyzed by using the LSMLMW computer program (Harvey 1987). Linear model used for two data type (total homozygous and heterozygous transferrin genotypes or all different transferrin genotypes) analysis is given as below.

$$Y_{ijklm} = \mu + a_i + b_j + c_k + d_l + b\,(X_{ijklm} - \bar{X}) + e_{ijklm}$$

Where;

$Y_{ijklm}$ =denotes each observation of testis character,

$\mu$ =the overall mean,

$a_i$ =the effect of the $i^{th}$ age period, i= 1,2,3,and 4 for 120,150,170 and 200 days of age,

$b_j$ =the effect of the $j^{th}$ age of dam , j= 1,2,3,4,5,6 and 7,

$c_k$ =the effect of the $k^{th}$ farm, k= 1,2,3,4 and 5,

$d_l$ =the effect of homozygous and heterozygous transferrin genotype, l= 1 and 2 (homozygous and heterozygous) for data type 1 or the effect of $l^{th}$ transferrin genotype, l= 1,2,3, ... , and 14 (AA, AB, AD, ... , and MM) for data type 2,

b = the partial regression coefficient of testis or scrotum measure on live weight of male lamb,

$X_{ijklm}$ = live weight of each male lamb (kg),

$\bar{X}$ = the mean live weight of male lambs,

$e_{ijklm}$ = the unclassifiable random element for the $m^{th}$ record in the ultimate subclass.

From the standpoint of transferrin genotype groups, testicular size were arranged from biggest to smallest and were estimated by using Duncan Tests (1975).

## RESULTS

The Least-Squares means and standard errors of testis and scrotum traits for different age period, dam ages, farms and heterozigot-homozigot transferrin genotypes in the male lambs of Karakaş are shown in Table 1. The all main environmental factors had highly significant ($p<0.01$) effect on both testis and scrotum traits.

The results of the least square means of dam age groups for testis and scrotum traits were the most impressive shown in Table 1. The testis and scrotum traits peaked at the age 4 and there was almost a regular increasing and decreasing trend before and after this age. In other word, the effect of age of dam on both side of testis diameter and length were the same.

The Least-Square means estimates of farms and age periods ranged from slightly underestimated to dramatically overestimated for testis and scrotum traits. For example means of all observed traits underestimated for farm 1, 2, 3 and 4 compared with farm 5. Likewise the same sizes conclusion can be made for sequential age periods. The biggest means for testis and scrotum were observed from $5^{th}$ farm and differences between means of this farm and others were statistically significant ($p<0.05$). The differences between age period for investigated traits were highly significant ($p<0.01$). The means of testis and scrotum sizes increased as age period increased. Consequently, the biggest means for all traits were acquired from the $4^{th}$ age period.

Table 1. Least-Squares Means and Standard Errors of Age Period, Age of Dam, Farm and Homozygous-heterozygous. Transferrin Genotypes for Testis and Scrotum Traits in the Male Lambs of Karakaş (data type 1).

| | | Testis Diameter | | Testis Length | | | |
|---|---|---|---|---|---|---|---|
| | | Right | Left | Right | Left | Scrotum Lenght | Scrotum Circumference |
| Group | N | Mean | Mean | Mean | Mean | Mean | Mean |
| Overall | 166 | 3.21±0.09 | 3.24±0.10 | 6.28±0.18 | 6.26±0.19 | 11.37±0.31 | 20.14±0.42 |
| Period of Age | | ** | ** | ** | ** | ** | ** |
| 1 | 42 | 2.25±0.14 | 2.33±0.15 | 4.22±0.27 | 4.17±0.28 | 7.85±0.46 | 15.60±0.72 |
| 2 | 42 | 2.62±0.12 | 2.73±0.13 | 5.13±0.22 | 5.17±0.23 | 9.45±0.38 | 17.85±0.59 |
| 3 | 42 | 2.87±0.11 | 3.04±0.12 | 5.84±0.21 | 5.87±0.22 | 10.21±0.35 | 20.14±0.55 |
| 4 | 40 | 3.50±0.13 | 3.65±0.13 | 7.40±0.23 | 7.52±0.25 | 11.94±0.40 | 22.24±0.63 |
| Age of Dam | | ** | ** | ** | ** | ** | ** |
| 1 | 8 | 2.56±0.23 | 2.69±0.24 | 4.74±0.42 | 4.81±0.45 | 8.80±0.73 | 18.59±1.14 |
| 2 | 52 | 2.85±0.13 | 2.93±0.14 | 5.60±0.24 | 5.70±0.26 | 9.62±0.42 | 18.33±0.65 |
| 3 | 39 | 2.86±0.10 | 2.99±0.11 | 5.74±0.19 | 5.78±0.20 | 10.72±0.33 | 19.02±0.52 |
| 4 | 36 | 3.02±0.11 | 3.00±0.12 | 6.05±0.21 | 5.99±0.22 | 10.94±0.36 | 19.65±0.55 |
| 5 | 15 | 2.80±0.15 | 2.98±0.17 | 5.51±0.29 | 5.51±0.30 | 10.15±0.49 | 18.58±0.77 |
| 6 | 8 | 2.89±0.23 | 3.06±0.25 | 5.99±0.44 | 6.08±0.46 | 9.75±0.75 | 19.80±1.17 |
| 7 | 8 | 2.69±0.22 | 2.91±0.24 | 5.90±0.42 | 5.92±0.44 | 9.05±0.72 | 18.74±1.13 |
| Farms | | ** | ** | ** | ** | ** | ** |
| 1 | 6 | 2.33±0.25 | 2.53±0.27 | 5.09±0.47 | 5.11±0.49 | 8.59±0.80 | 17.29±1.25 |
| 2 | 28 | 2.77±0.13 | 2.83±0.14 | 5.31±0.25 | 5.45±0.26 | 9.49±0.43 | 18.60±0.67 |
| 3 | 28 | 2.68±0.16 | 2.84±0.17 | 5.12±0.30 | 5.14±0.31 | 8.19±0.51 | 18.14±0.80 |
| 4 | 28 | 2.57±0.13 | 2.74±0.14 | 5.41±0.24 | 5.40±0.25 | 9.46±0.41 | 18.09±0.64 |
| 5 | 76 | 3.70±0.11 | 3.74±0.12 | 7.29±0.21 | 7.31±0.22 | 13.58±0.36 | 22.67±0.56 |
| Type of Transf. | | | | | | | |
| Heterozygous | 121 | 2.88±0.09 | 2.93±0.10 | 5.72±0.17 | 5.66±0.18 | 9.85±0.30 | 18.91±0.46 |
| Homozygous | 45 | 2.74±0.11 | 2.94±0.12 | 5.57±0.21 | 5.71±0.22 | 9.87±0.36 | 19.02±0.56 |
| Regress. (Lin.) | | * | * | * | * | | * |
| Live Weight | | .0009±.0001 | .0009±.0001 | .0012±.0002 | .0013±.0002 | .0019±.0003 | .0042±.0396 |

(*): $p<0.05$, (**): $p<0.01$.

Table 2. Least-Squares Means and Standard Errors of Fourteen Transferrin Types for Testis and Scrotum Traits from Data Type 2 in the Male Lambs of Karakaş.

| | | Testis Diameter | | Testis Length | | Scrotum | Scrotum |
|---|---|---|---|---|---|---|---|
| | N | Right | Left | Right | Left | Length | Circumference |
| Type of Transf. | | ** | ** | ** | ** | ** | ** |
| AA | 4 | 3.68±0.36 | 4.05±0.39 | 8.04±0.66 | 8.18±0.70 | 14.08±1.13 | 23.00±1.75 |
| AB | 24 | 3.43±0.17 | 3.43±0.18 | 6.93±0.30 | 6.98±0.32 | 11.87±0.52 | 21.20±0.80 |
| AD | 12 | 3.57±0.26 | 3.57±0.29 | 6.76±0.49 | 6.76±0.52 | 13.00±0.83 | 21.83±1.29 |
| AE | 4 | 4.58±0.29 | 4.39±0.32 | 8.05±0.54 | 7.91±0.57 | 15.05±0.92 | 24.15±1.43 |
| AM | 23 | 3.02±0.16 | 3.15±0.17 | 5.86±0.29 | 5.81±0.31 | 10.42±0.50 | 20.00±0.77 |
| BB | 12 | 3.25±0.19 | 3.35±0.20 | 6.26±0.35 | 6.39±0.37 | 11.64±0.59 | 20.37±0.92 |
| BD | 20 | 2.95±0.14 | 3.13±0.15 | 6.33±0.26 | 6.30±0.28 | 11.36±0.44 | 20.06±0.69 |
| BM | 15 | 3.31±0.20 | 3.31±0.22 | 6.45±0.37 | 6.42±0.39 | 12.27±0.63 | 19.68±0.97 |
| BS | 12 | 3.18±0.20 | 3.11±0.22 | 6.16±0.37 | 5.86±0.40 | 10.74±0.64 | 19.42±0.99 |
| DD | 20 | 2.74±0.17 | 2.81±0.19 | 5.40±0.32 | 5.45±0.34 | 10.14±0.54 | 18.79±0.85 |
| DS | 4 | 2.66±0.14 | 2.59±0.37 | 4.71±0.63 | 4.51±0.67 | 9.63±1.08 | 15.00±1.67 |
| MD | 4 | 3.28±0.30 | 2.96±0.32 | 4.54±0.55 | 5.90±0.59 | 11.63±0.94 | 19.88±1.46 |
| ME | 4 | 2.46±0.32 | 2.63±0.35 | 6.30±0.59 | 4.65±0.63 | 7.75±1.00 | 16.00±1.56 |
| MM | 8 | 3.25±0.26 | 3.39±0.28 | 6.55±0.48 | 6.79±0.51 | 11.44±0.81 | 20.95±1.26 |

(**): p<0.01.

Table 3. Fourteen Transferrin Types Arranged for Testis and Scrotum Traits from the Biggest to the Smallest.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Right Testis Diameter | | | | | | | | | | | | | |
| AE | AA | AD | AB | BM | MD | BB | MM | BS | AM | BD | DD | DS | ME |
| a | b | bc | bcd | bcd | bcd | bcd | bcd | cd | de | de | Ef | ef | f |
| Left Testis Diameter | | | | | | | | | | | | | |
| AE | AA | AD | AB | MM | BB | BM | AM | BD | BS | MD | DD | ME | DS |
| a | a | b | b | b | b | b | bc | bc | bcd | bcd | Cde | de | e |
| Right Testis Length | | | | | | | | | | | | | |
| AE | AA | AB | AD | MM | BM | BD | ME | BB | BS | AM | DD | DS | MD |
| a | a | b | bc | bc | bc | bcd | bcd | cd | cd | cd | De | e | e |
| Left Testis Length | | | | | | | | | | | | | |
| AA | AE | AB | MM | AD | BM | BB | BD | MD | BS | AM | DD | ME | DS |
| a | a | b | bc | bc | bcd | bcd | bcd | cd | cd | cd | De | ef | f |
| Scrotum Length | | | | | | | | | | | | | |
| AE | AA | AD | BM | AB | BB | MD | MM | BD | BS | AM | DD | DS | ME |
| a | ab | bc | bc | cd | cde | cde | cde | cde | cde | def | Ef | f | g |
| Scrotum Circumference | | | | | | | | | | | | | |
| AE | AA | AD | AB | MM | BB | BD | AM | MD | BM | BS | DD | ME | DS |
| a | ab | bc | cd | cde | cde | cde | cde | cde | cde | de | E | f | f |

(a,b,c,d,e,f,g) : Significantly different (p<0.05) transferrin genotypes are indicated by different letters.

There were no differences (p>0.05) between means of transferrin types for testis and scrotum traits when transferrin types were classified into two groups as homozygous and heterozygous.

The biggest average for the concerned traits was observed in AE heterozygous and AA homozygous transferrin genotypes among all transferrin types. The Least-Square means related to testis and scrotum traits for fourteen types of transferrin are shown in Table 2. There were significant (p<0.01) differences between means of transferrin genotypes with respect to testis and scrotum traits. In addition, from the standpoint of transsferrin genotype groups, testicular size were arranged from biggest to smallest (Table 3).

Results revealed that the biggest means for testis and scrotum traits were obtained from AA and AE transferrin genotypes. The smallest testis and scrotum values were obtained from DS and ME transferrin genotypes. The effects of fourteen transferrin genotypes on the scrotum traits were the same as the effects on the testis traits. Generally, the values of testis diameters and scrotum characteristics for AM, BB, BD, BM, BS, MM and MD genotypes were smaller than AA, AB, AD ve AE genotypes, and were bigger than DD, DS and ME genotypes. Except AB and AD genotypes, the frequencies of extreme genotypes (AA, AE, DD, DS and ME) were very low.

## DISCUSSION

The parameters of main environmental effects were obtained to evaluate effects of transferrin genotypes. Excepted results on mentioned factors were mingles to make detailed discussion. But, the harmony of different parameters indicates sensitivity of experiment.

The fourteen transferrin genotypes (AA, AB, AD, AE, AM, BB, BD, BM, BS, DD, DS, MM, MD and ME) were described from six alleles system (A, B, D, E, M and S) for male lambs. The number of transferrin genotypes were found 19 for ewe and male lambs by Baş *et al.* (1996) in same herd.

Transferrin genotype had a very significant effect ($p<0.01$) on all testis and scrotum characteristics. But same characteristics were not affected by homozygous and heterozygous transferrin genotype.

All transferrin types affected scrotum and testis traits similarly. It is possible to interpret the obtained results in such a way that AA, AB, AD, AE and partly BB, BM, MM genotypes appear to be high testicular size performance, compared to the other genotypes.

AD, BB and MM phenotypes seemed to be important with respect to reproductive traits in ewe (Atroshi 1979, Vanlı *et al.* 1990). A simple relation can be established between these genotypes and genotypes of male lambs which have high testis and scrotum performance. This result, however, should not be considered as a certain conclusion. Because sheep numbers in this study were not large enough to provide a final conclusion. Thus, one should study on a large population for general conclusion on the effect of transferrin on mentioned characteristics.

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